EUROPEAN COMMISSION
Innovation and Networks Executive Agency

Director

GRANT AGREEMENT

NUMBER 815098 — PAsCAL

This **Agreement** ('the Agreement') is **between** the following parties:

on the one part,

the **Innovation and Networks Executive Agency (INEA)** ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

represented for the purposes of signature of this Agreement by Head of Department HORIZON 2020, Innovation and Networks Executive Agency, Horizon 2020 Department, Alan HAIGH,

and

on the other part,

1. 'the coordinator':

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY (LIST), established in 5 AVENUE DES HAUTS FOURNEAUX, ESCH SUR ALZETTE 4362, Luxembourg, VAT number: LU27327040, represented for the purposes of signing the Agreement by CEO, Thomas Kallstenius

and the following other beneficiaries, if they sign their 'Accession Form' (see Annex 3 and Article 56):

2. **AUTOMOBILE CLUB D ITALIA (ACI)**, established in VIA MARSALA 8, ROMA 00185, Italy, VAT number: IT00907501001,

3. **LUXMOBILITY S.A.R.L. (LuxMobility)**, established in 70, Boulevard de la Fraternite, Luxembourg L-1541, Luxembourg, VAT number: LU26663075,

4. **RDS DRIVING SERVICES LIMITED (RDS Driving)**, established in PAVILION 6, COXWOLDS WAY, BELASIS TECH PARK, BILLINGHAM TS23 4EA, United Kingdom, VAT number: GB198193557,

5. **ETELÄTÄR INNOVATION OÜ (ETELÄTÄR)**, established in NARVA MAANTEE 5, HARJU MAAKOND KESKLINNA LINNAOSA, TALLINN 10117, Estonia, VAT number: EE101823966,

6. **UNIVERSITY OF LEEDS (UNIVLEEDS)**, established in WOODHOUSE LANE, LEEDS LS2 9JT, United Kingdom, VAT number: GB613451470,

7. **THE UNIVERSITY OF LIVERPOOL (LIV)**, established in BROWNLOW HILL 765 FOUNDATION BUILDING, LIVERPOOL L69 7ZX, United Kingdom, VAT number: GB673598875,

8. **COMMUNAUTE D' UNIVERSITES ET ETABLISSEMENTS UNIVERSITE BOURGOGNE - FRANCHE - COMTE (UBFC)**, established in 32 AVENUE DE L'OBSERVATOIRE, BESANCON 25000, France, VAT number: FR37130020910,

9. **EXAMOTIVE SA (ExaMotive S.A.)**, established in AVENUE DU BLUES 9, BELVAUX 4386, Luxembourg, VAT number: LU28292684,

10. **UNIVERSITAET MANNHEIM (UMA)**, established in SCHLOSS, MANNHEIM 68131, Germany, VAT number: DE143845342,

11. **E-BUS COMPETENCE CENTER S.A.R.L (E-Bus)**, established in 1, RUE FONTEBIERG, LIVANGE 3381, Luxembourg, VAT number: LU27977245,

12. **UNION EUROPEENNE DES AVEUGLES UEAASSOCIATION (EBU)**, established in RUE GAGER GABILLOT 6, PARIS 75015, France,

13. **REALDOLMEN NV (RDGFI)**, established in A VAUCAMPSLAAN 42, HUIZINGEN 1654, Belgium, VAT number: BE0429037235,

Unless otherwise specified, references to ‘beneficiary’ or ‘beneficiaries’ include the coordinator.

The parties referred to above have agreed to enter into the Agreement under the terms and conditions below.

By signing the Agreement or the Accession Form, the beneficiaries accept the grant and agree to implement it under their own responsibility and in accordance with the Agreement, with all the obligations and conditions it sets out.

The Agreement is composed of:

Terms and Conditions

Annex 1 Description of the action

Annex 2 Estimated budget for the action

2a Additional information on the estimated budget

Annex 3 Accession Forms

Annex 4 Model for the financial statements

Annex 5 Model for the certificate on the financial statements

Annex 6 Model for the certificate on the methodology

TERMS AND CONDITIONS

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CHAPTER 1 GENERAL

ARTICLE 1 — SUBJECT OF THE AGREEMENT

This Agreement sets out the rights and obligations and the terms and conditions applicable to the grant awarded to the beneficiaries for implementing the action set out in Chapter 2.

CHAPTER 2 ACTION

ARTICLE 2 — ACTION TO BE IMPLEMENTED

The grant is awarded for the action entitled '**Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes**' — '**PAsCAL**' **('action')**, as described in Annex 1.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **36 months** as of 1 June 2019 ('**starting date of the action**').

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

The '**estimated budget**' for the action is set out in Annex 2.

It contains the estimated eligible costs and the forms of costs, broken down by beneficiary (and linked third party) and budget category (see Articles 5, 6, and 14).

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted — without an amendment (see Article 55) — by transfers of amounts between beneficiaries, budget categories and/or forms of costs set out in Annex 2, if the action is implemented as described in Annex 1.

However, the beneficiaries may not add costs relating to subcontracts not provided for in Annex 1, unless such additional subcontracts are approved by an amendment or in accordance with Article 13.

CHAPTER 3 GRANT

ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS

5.1 Maximum grant amount

The '**maximum grant amount**' is **EUR 3 974 041.25** (three million nine hundred and seventy four thousand forty one EURO and twenty five eurocents).

5.2 Form of grant, reimbursement rates and forms of costs

The grant reimburses **100% of the action's eligible costs** (see Article 6) ('**reimbursement of eligible costs grant**') (see Annex 2).

The estimated eligible costs of the action are EUR **3 974 041.25** (three million nine hundred and seventy four thousand forty one EURO and twenty five eurocents).

Eligible costs (see Article 6) must be declared under the following forms ('**forms of costs**'):

(a) for **direct personnel costs**:

- as actually incurred costs ('**actual costs**') or
- on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices ('**unit costs**').

Personnel **costs for SME owners** or **beneficiaries that are natural persons** not receiving a salary (see Article 6.2, Points A.4 and A.5) must be declared on the basis of the amount per unit set out in Annex 2a (**unit costs**);

(b) for **direct costs for subcontracting**: as actually incurred costs (**actual costs**);

(c) for **direct costs of providing financial support to third parties**: not applicable;

(d) for **other direct costs**:

- for costs of internally invoiced goods and services: on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices ('**unit costs**');
- for all other costs: as actually incurred costs (**actual costs**);

(e) for **indirect costs**: on the basis of a flat-rate applied as set out in Article 6.2, Point E ('**flat-rate costs**');

(f) **specific cost category(ies):** not applicable.

5.3 Final grant amount — Calculation

The '**final grant amount**' depends on the actual extent to which the action is implemented in accordance with the Agreement's terms and conditions.

This amount is calculated by the Agency — when the payment of the balance is made (see Article 21.4) — in the following steps:

Step 1 — Application of the reimbursement rates to the eligible costs

Step 2 — Limit to the maximum grant amount

Step 3 — Reduction due to the no-profit rule

Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

5.3.1 Step 1 — Application of the reimbursement rates to the eligible costs

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries and linked third parties (see Article 20) and approved by the Agency (see Article 21).

5.3.2 Step 2 — Limit to the maximum grant amount

If the amount obtained following Step 1 is higher than the maximum grant amount set out in Article 5.1, it will be limited to the latter.

5.3.3 Step 3 — Reduction due to the no-profit rule

The grant must not produce a profit.

'**Profit**' means the surplus of the amount obtained following Steps 1 and 2 plus the action's total receipts, over the action's total eligible costs.

The '**action's total eligible costs**' are the consolidated total eligible costs approved by the Agency.

The '**action's total receipts**' are the consolidated total receipts generated during its duration (see Article 3).

The following are considered **receipts**:

(a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;

(b) financial contributions given by third parties to the beneficiary or to a linked third party specifically to be used for the action, and

(c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

(a) income generated by exploiting the action's results (see Article 28);

(b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);

(c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

If there is a profit, it will be deducted from the amount obtained following Steps 1 and 2.

5.3.4 Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the Agency will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors,

irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the maximum grant amount set out in Article 5.1.

The final grant amount will be the lower of the following two:

- the amount obtained following Steps 1 to 3 or
- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

If — after the payment of the balance (in particular, after checks, reviews, audits or investigations; see Article 22) — the Agency rejects costs (see Article 42) or reduces the grant (see Article 43), it will calculate the '**revised final grant amount**' for the beneficiary concerned by the findings.

This amount is calculated by the Agency on the basis of the findings, as follows:

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the Agency for the beneficiary concerned;
- in case of **reduction of the grant**: by calculating the concerned beneficiary's share in the grant amount reduced in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations (see Article 43.2).

In case of **rejection of costs and reduction of the grant**, the revised final grant amount for the beneficiary concerned will be the lower of the two amounts above.

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

'**Eligible costs**' are costs that meet the following criteria:

(a) for **actual costs**:

(i) they must be actually incurred by the beneficiary;

(ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);

(iii) they must be indicated in the estimated budget set out in Annex 2;

(iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;

(v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices;

(vi) they must comply with the applicable national law on taxes, labour and social security, and

(vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

(i) they must be calculated as follows:

{amounts per unit set out in Annex 2a or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A and Article 6.2.D.5)

multiplied by

the number of actual units};

(ii) the number of actual units must comply with the following conditions:

- the units must be actually used or produced in the period set out in Article 3;
- the units must be necessary for implementing the action or produced by it, and
- the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for **flat-rate costs**:

(i) they must be calculated by applying the flat-rate set out in Annex 2, and

(ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

A. direct personnel costs;
B. direct costs of subcontracting;
C. not applicable;
D. other direct costs;
E. indirect costs;
F. not applicable.

'Direct costs' are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

'Indirect costs' are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

A. Direct personnel costs

<u>Types of eligible personnel costs</u>

A.1 Personnel costs are eligible, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action ('**costs for employees (or equivalent)**'). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the **remuneration**, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities[1] may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

(a) it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;

(b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

'Additional remuneration' means any part of the remuneration which exceeds what the person would be paid for time worked in projects funded by national schemes.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

(a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;

(b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or

(c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:

{{EUR 8 000

divided by

the number of annual productive hours (see below)},

multiplied by

the number of hours that the person has worked on the action during the year}.

A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:

(a) the person works under conditions similar to those of an employee (in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed);

(b) the result of the work carried out belongs to the beneficiary (unless exceptionally agreed otherwise), and

[1] For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: '**non-profit legal entity**' means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

(c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

A.3 The **costs of personnel seconded by a third party against payment** are eligible personnel costs, if the conditions in Article 11.1 are met.

A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises ('**SME owners**') who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

A.5 **Costs of 'beneficiaries that are natural persons'** not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

{{hourly rate

multiplied by

the number of actual hours worked on the action},

plus

for non-profit legal entities: additional remuneration to personnel assigned to the action under the conditions set out above (Point A.1)}.

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant are:

{number of annual productive hours for the year (see below)

minus

total number of hours declared by the beneficiary, for that person in that year, for other EU or Euratom grants}.

The '**hourly rate**' is one of the following:

(a) for personnel costs declared as **actual costs** (i.e. budget categories A.1, A.2, A.3): the hourly rate is calculated *per full financial year*, as follows:

{actual annual personnel costs (excluding additional remuneration) for the person

divided by

number of annual productive hours}.

using the personnel costs and the number of productive hours for each full financial year covered by the reporting period concerned. If a financial year is not closed at the end of the

reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the 'number of annual productive hours', the beneficiaries may choose one of the following:

(i) 'fixed number of hours': 1 720 hours for persons working full time (or corresponding pro-rata for persons not working full time);

(ii) 'individual annual productive hours': the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law)

plus

overtime worked

minus

absences (such as sick leave and special leave)}.

'Annual workable hours' means the period during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.

If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

(iii) 'standard annual productive hours': the 'standard number of annual hours' generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the 'standard annual workable hours'.

If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours.

As an alternative, beneficiaries may calculate the hourly rate *per month*, as follows:

{actual monthly personnel cost (excluding additional remuneration) for the person

divided by

{number of annual productive hours / 12}}

using the personnel costs for each month and (one twelfth of) the annual productive hours calculated according to either option (i) or (iii) above, i.e.:

- fixed number of hours or
- standard annual productive hours.

Time spent on **parental leave** may not be deducted when calculating the hourly rate per month. However, beneficiaries may declare personnel costs incurred in periods of parental leave in proportion to the time the person worked on the action in that financial year.

If parts of a basic remuneration are generated over a period longer than a month, the beneficiaries may include only the share which is generated in the month (irrespective of the amount actually paid for that month).

Each beneficiary must use only one option (per full financial year or per month) for each full financial year;

(b) for personnel costs declared on the basis of **unit costs** (i.e. budget categories A.1, A.2, A.4, A.5): the hourly rate is one of the following:

(i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2a (see Points A.4 and A.5 above), or

(ii) for personnel costs declared on the basis of the beneficiary's usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

  The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

B. Direct costs of subcontracting (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

C. Direct costs of providing financial support to third parties

Not applicable

D. Other direct costs

D.1 **Travel costs and related subsistence allowances** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.

D.2 The **depreciation costs of equipment, infrastructure or other assets** (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with

Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The **costs of renting or leasing** equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

D.3 **Costs of other goods and services** (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:

(a) purchased specifically for the action and in accordance with Article 10.1.1 or

(b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

D.4 **Capitalised and operating costs of 'large research infrastructure'**[2] directly used for the action are eligible, if:

(a) the value of the large research infrastructure represents at least 75% of the total fixed assets (at historical value in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure[3]);

(b) the beneficiary's methodology for declaring the costs for large research infrastructure has been positively assessed by the Commission ('**ex-ante assessment**');

(c) the beneficiary declares as direct eligible costs only the portion which corresponds to the duration of the action and the rate of actual use for the purposes of the action, and

(d) they comply with the conditions as further detailed in the annotations to the H2020 grant agreements.

[2] '**Large research infrastructure**' means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

[3] For the definition, see Article 2(6) of the H2020 Framework Programme Regulation No 1291/2013: '**Research infrastructure**' are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'.

D.5 **Costs of internally invoiced goods and services** directly used for the action are eligible, if:

(a) they are declared on the basis of a unit cost calculated in accordance with the beneficiary's usual cost accounting practices;

(b) the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;

(c) the unit cost is calculated using the actual costs for the good or service recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the costs, reasonable and correspond to objective and verifiable information;

(d) the unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service.

'Internally invoiced goods and services' means goods or services which are provided by the beneficiary directly for the action and which the beneficiary values on the basis of its usual cost accounting practices.

E. Indirect costs

Indirect costs are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

(a) costs of subcontracting and

(b) costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises;

(c) not applicable;

(d) not applicable.

Beneficiaries receiving an operating grant[4] financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant, unless they can demonstrate that the operating grant does not cover any costs of the action.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

[4] For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 ('**Financial Regulation No 966/2012**')(OJ L 218, 26.10.2012, p.1): '**operating grant**' means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

Costs incurred by linked third parties are eligible if they fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 14.1.1.

6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible

In-kind contributions provided free of charge are eligible direct costs (for the beneficiary or linked third party), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

6.5 Ineligible costs

'**Ineligible costs**' are:

(a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:

(i) costs related to return on capital;

(ii) debt and debt service charges;

(iii) provisions for future losses or debts;

(iv) interest owed;

(v) doubtful debts;

(vi) currency exchange losses;

(vii) bank costs charged by the beneficiary's bank for transfers from the Agency;

(viii) excessive or reckless expenditure;

(ix) deductible VAT;

(x) costs incurred during suspension of the implementation of the action (see Article 49);

(b) costs declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the Agency for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period, unless it can demonstrate that the operating grant does not cover any costs of the action.

6.6 Consequences of declaration of ineligible costs

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement and all legal obligations under applicable EU, international and national law.

7.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION

The beneficiaries must have the appropriate resources to implement the action.

If it is necessary to implement the action, the beneficiaries may:

- purchase goods, works and services (see Article 10);
- use in-kind contributions provided by third parties against payment (see Article 11);
- use in-kind contributions provided by third parties free of charge (see Article 12);
- call upon subcontractors to implement action tasks described in Annex 1 (see Article 13);
- call upon linked third parties to implement action tasks described in Annex 1 (see Article 14);
- call upon international partners to implement action tasks described in Annex 1 (see Article 14a).

In these cases, the beneficiaries retain sole responsibility towards the Agency and the other beneficiaries for implementing the action.

ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING

Not applicable

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

10.1.1 If necessary to implement the action, the beneficiaries may purchase goods, works or services.

The beneficiaries must make such purchases ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The beneficiaries must ensure that the Agency, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their contractors.

10.1.2 Beneficiaries that are 'contracting authorities' within the meaning of Directive 2004/18/EC[5] (or 2014/24/EU[6]) or 'contracting entities' within the meaning of Directive 2004/17/EC[7] (or 2014/25/EU[8]) must comply with the applicable national law on public procurement.

10.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 10.1.1, the costs related to the contract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 10.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT

11.1 Rules for the use of in-kind contributions against payment

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties against payment.

The beneficiaries may declare costs related to the payment of in-kind contributions as eligible (see Article 6.1 and 6.2), up to the third parties' costs for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services.

The third parties and their contributions must be set out in Annex 1. The Agency may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Agency, the Commission, the European Court of Auditors

[5] Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public work contracts, public supply contracts and public service contracts (OJ L 134, 30.04.2004, p. 114).

[6] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC. (OJ L 94, 28.03.2014, p. 65).

[7] Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.04.2004, p. 1)

[8] Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (OJ L 94, 28.03.2014, p. 243).

(ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

11.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs related to the payment of the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE

12.1 Rules for the use of in-kind contributions free of charge

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties free of charge.

The beneficiaries may declare costs incurred by the third parties for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services as eligible in accordance with Article 6.4.

The third parties and their contributions must be set out in Annex 1. The Agency may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Agency, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

12.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs incurred by the third parties related to the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

13.1.1 If necessary to implement the action, the beneficiaries may award subcontracts covering the implementation of certain action tasks described in Annex 1.

Subcontracting may cover only a limited part of the action.

The beneficiaries must award the subcontracts ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The tasks to be implemented and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2. The Agency may however approve subcontracts not set out in Annex 1 and 2 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Agency, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their subcontractors.

13.1.2 The beneficiaries must ensure that their obligations under Articles 35, 36, 38 and 46 also apply to the subcontractors.

Beneficiaries that are 'contracting authorities' within the meaning of Directive 2004/18/EC (or 2014/24/EU) or 'contracting entities' within the meaning of Directive 2004/17/EC (or 2014/25/EU) must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 13.1.1, the costs related to the subcontract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 13.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

14.1 Rules for calling upon linked third parties to implement part of the action

14.1.1 The following **affiliated entities**[10] and **third parties with a legal link to a beneficiary**[11] ('**linked third parties**') may implement the action tasks attributed to them in Annex 1:

[10] For the definition see Article 2.1(2) Rules for Participation Regulation No 1290/2013: '**affiliated entity**' means any legal entity that is:
- under the direct or indirect control of a participant, or
- under the same direct or indirect control as the participant, or
- directly or indirectly controlling a participant.

'Control' may take any of the following forms:
(a) the direct or indirect holding of more than 50% of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;
(b) the direct or indirect holding, in fact or in law, of decision-making powers in the legal entity concerned.

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:
(a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
(b) the legal entities concerned are owned or supervised by the same public body.

- ACI INFORMATICA SOCIETA PER AZIONI (ACI INFORMATICA), affiliated or linked to ACI

- UNIVERSITE DE TECHNOLOGIE DE BELFORT - MONTBELIARD (UTBM), affiliated or linked to UBFC

The linked third parties may declare as eligible the costs they incur for implementing the action tasks in accordance with Article 6.3.

The beneficiaries must ensure that the Agency, the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their linked third parties.

14.1.2 The beneficiaries must ensure that their obligations under Articles 18, 20, 35, 36 and 38 also apply to their linked third parties.

14.2 Consequences of non-compliance

If any obligation under Article 14.1.1 is breached, the costs of the linked third party will be ineligible (see Article 6) and will be rejected (see Article 42).

If any obligation under Article 14.1.2 is breached, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14a — IMPLEMENTATION OF ACTION TASKS BY INTERNATIONAL PARTNERS

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE

16.1 Rules for providing trans-national access to research infrastructure

[11] '**Third party with a legal link to a beneficiary**' is any legal entity which has a legal link to the beneficiary implying collaboration that is not limited to the action.

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

The beneficiaries must provide — during implementation of the action or afterwards and in accordance with Article 41.2 — any information requested in order to verify eligibility of the costs, proper implementation of the action and compliance with any other obligation under the Agreement.

17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement

Each beneficiary must keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system; see Article 52) up to date, in particular, its name, address, legal representatives, legal form and organisation type.

Each beneficiary must immediately inform the coordinator — which must immediately inform the Agency and the other beneficiaries — of any of the following:

(a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's financial interests, in particular:

  (i) changes in its legal, financial, technical, organisational or ownership situation or those of its linked third parties and

  (ii) changes in the name, address, legal form, organisation type of its linked third parties;

(b) **circumstances** affecting:

  (i) the decision to award the grant or

  (ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

The beneficiaries must — for a period of five years after the payment of the balance — keep records and other supporting documentation in order to prove the proper implementation of the action and the costs they declare as eligible.

They must make them available upon request (see Article 17) or in the context of checks, reviews, audits or investigations (see Article 22).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under the Agreement (including the extension of findings; see Article 22), the beneficiaries must keep the records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The Agency may accept non-original documents if it considers that they offer a comparable level of assurance.

18.1.1 Records and other supporting documentation on the scientific and technical implementation

The beneficiaries must keep records and other supporting documentation on scientific and technical implementation of the action in line with the accepted standards in the respective field.

18.1.2 Records and other documentation to support the costs declared

The beneficiaries must keep the records and documentation supporting the costs declared, in particular the following:

(a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;

(b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

In addition, **for unit costs calculated in accordance with the beneficiary's usual cost accounting practices**, the beneficiaries must keep adequate records and documentation to prove that the cost accounting practices used comply with the conditions set out in Article 6.2.

The beneficiaries and linked third parties may submit to the Commission, for approval, a certificate (drawn up in accordance with Annex 6) stating that their usual cost accounting practices comply with these conditions (‘**certificate on the methodology**’). If the certificate is approved, costs declared in line with this methodology will not be challenged subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

(c) for **flat-rate costs**: adequate records and other supporting documentation to prove the eligibility

of the costs to which the flat-rate is applied. The beneficiaries do not need to identify the costs covered or provide supporting documentation (such as accounting statements) to prove the amount declared at a flat-rate.

In addition, for **personnel costs** (declared as actual costs or on the basis of unit costs), the beneficiaries must keep **time records** for the number of hours declared. The time records must be in writing and approved by the persons working on the action and their supervisors, at least monthly. In the absence of reliable time records of the hours worked on the action, the Agency may accept alternative evidence supporting the number of hours declared, if it considers that it offers an adequate level of assurance.

As an exception, for **persons working exclusively on the action**, there is no need to keep time records, if the beneficiary signs a **declaration** confirming that the persons concerned have worked exclusively on the action.

For costs declared by linked third parties (see Article 14), it is the beneficiary that must keep the originals of the financial statements and the certificates on the financial statements of the linked third parties.

18.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 42), and the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

The coordinator must submit the '**deliverables**' identified in Annex 1, in accordance with the timing and conditions set out in it.

19.2 Consequences of non-compliance

If the coordinator breaches any of its obligations under this Article, the Agency may apply any of the measures described in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the Agency (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2 Reporting periods

The action is divided into the following '**reporting periods**':

- RP1: from month 1 to month 18
- RP2: from month 19 to month 36

20.3 Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

The **periodic report** must include the following:

(a) a '**periodic technical report**' containing:

(i) an **explanation of the work carried out** by the beneficiaries;

(ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

The report must detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated '**plan for the exploitation and dissemination of the results**'.

The report must indicate the communication activities;

(iii) a **summary** for publication by the Agency;

(iv) the answers to the '**questionnaire**', covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;

(b) a '**periodic financial report**' containing:

(i) an '**individual financial statement**' (see Annex 4) from each beneficiary and from each linked third party, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries and linked third parties must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the Agency.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary and each linked third party must **certify** that:

- the information provided is full, reliable and true;

- the costs declared are eligible (see Article 6);
- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and
- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

(ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary and from each linked third party, for the reporting period concerned;

(iii) not applicable;

(iv) a '**periodic summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

(a) a '**final technical report**' with a **summary** for publication containing:

(i) an overview of the results and their exploitation and dissemination;

(ii) the conclusions on the action, and

(iii) the socio-economic impact of the action;

(b) a '**final financial report**' containing:

(i) a '**final summary financial statement**', created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and

(ii) a '**certificate on the financial statements**' (drawn up in accordance with Annex 5) for each beneficiary and for each linked third party, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries and linked third parties with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the *Official Journal of the European Union*, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal of the European Union* for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission's website, calculated over the corresponding reporting period.

Beneficiaries and linked third parties with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance

If the reports submitted do not comply with this Article, the Agency may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6.

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder, the Agency may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

- one **pre-financing payment**;
- one or more **interim payments**, on the basis of the request(s) for interim payment (see Article 20), and
- one **payment of the balance**, on the basis of the request for payment of the balance (see Article 20).

21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund

The aim of the pre-financing is to provide the beneficiaries with a float.

It remains the property of the EU until the payment of the balance.

The amount of the pre-financing payment will be EUR **3 179 233.00** (three million one hundred and seventy nine thousand two hundred and thirty three EURO).

The Agency will — except if Article 48 applies — make the pre-financing payment to the coordinator

within 30 days, either from the entry into force of the Agreement (see Article 58) or from 10 days before the starting date of the action (see Article 3), whichever is the latest.

An amount of EUR **198 702.06** (one hundred and ninety eight thousand seven hundred and two EURO and six eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the Agency from the pre-financing payment and transferred into the '**Guarantee Fund**'.

21.3 Interim payments — Amount — Calculation

Interim payments reimburse the eligible costs incurred for the implementation of the action during the corresponding reporting periods.

The Agency will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report (see Article 20.3), except if Articles 47 or 48 apply.

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as interim payment** is calculated by the Agency in the following steps:

Step 1 — Application of the reimbursement rates

Step 2 — Limit to 90% of the maximum grant amount

21.3.1 Step 1 — Application of the reimbursement rates

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries and the linked third parties (see Article 20) and approved by the Agency (see above) for the concerned reporting period.

21.3.2 Step 2 — Limit to 90% of the maximum grant amount

The total amount of pre-financing and interim payments must not exceed 90% of the maximum grant amount set out in Article 5.1. The maximum amount for the interim payment will be calculated as follows:

{90% of the maximum grant amount (see Article 5.1)

minus

{pre-financing and previous interim payments}}.

21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund

The payment of the balance reimburses the remaining part of the eligible costs incurred by the beneficiaries for the implementation of the action.

If the total amount of earlier payments is greater than the final grant amount (see Article 5.3), the payment of the balance takes the form of a recovery (see Article 44).

If the total amount of earlier payments is lower than the final grant amount, the Agency will pay the

balance within 90 days from receiving the final report (see Article 20.4), except if Articles 47 or 48 apply.

Payment is subject to the approval of the final report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as the balance** is calculated by the Agency by deducting the total amount of pre-financing and interim payments (if any) already made, from the final grant amount determined in accordance with Article 5.3:

{final grant amount (see Article 5.3)

minus

{pre-financing and interim payments (if any) made}}.

At the payment of the balance, the amount retained for the Guarantee Fund (see above) will be released and:

- if the balance is positive: the amount released will be paid in full to the coordinator together with the amount due as the balance;
- if the balance is negative (payment of the balance taking the form of recovery): it will be deducted from the amount released (see Article 44.1.2). If the resulting amount:
  - is positive, it will be paid to the coordinator
  - is negative, it will be recovered.

The amount to be paid may however be offset — without the beneficiaries' consent — against any other amount owed by a beneficiary to the Agency, the Commission or another executive agency (under the EU or Euratom budget), up to the maximum EU contribution indicated, for that beneficiary, in the estimated budget (see Annex 2).

21.5 Notification of amounts due

When making payments, the Agency will formally notify to the coordinator the amount due, specifying whether it concerns an interim payment or the payment of the balance.

For the payment of the balance, the notification will also specify the final grant amount.

In the case of reduction of the grant or recovery of undue amounts, the notification will be preceded by the contradictory procedure set out in Articles 43 and 44.

21.6 Currency for payments

The Agency will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

Payments to the coordinator will discharge the Agency from its payment obligation.

The coordinator must distribute the payments between the beneficiaries without unjustified delay.

Pre-financing may however be distributed only:

(a) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and

(b) to beneficiaries that have acceded to the Agreement (see Article 56).

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: BANQUE ET CAISSE D'EPARGNE DE L'ETAT
Full name of the account holder: LIST LUX INSTITUTE OF SCIENCE&TECH
IBAN code: LU490019445558337000

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the Agency bears the cost of transfers charged by its bank;
- the beneficiary bears the cost of transfers charged by its bank;
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

21.10 Date of payment

Payments by the Agency are considered to have been carried out on the date when they are debited to its account.

21.11 Consequences of non-compliance

21.11.1 If the Agency does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus three and a half points. The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only upon request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

Suspension of the payment deadline or payments (see Articles 47 and 48) will not be considered as late payment.

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

21.11.2 If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or the participation of the coordinator may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS

22.1 Checks, reviews and audits by the Agency and the Commission

22.1.1 Right to carry out checks

The Agency or the Commission will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing deliverables and reports.

For this purpose the Agency or the Commission may be assisted by external persons or bodies.

The Agency or the Commission may also request additional information in accordance with Article 17. The Agency or the Commission may request beneficiaries to provide such information to it directly.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

22.1.2 Right to carry out reviews

The Agency or the Commission may — during the implementation of the action or afterwards — carry out reviews on the proper implementation of the action (including assessment of deliverables and reports), compliance with the obligations under the Agreement and continued scientific or technological relevance of the action.

Reviews may be started up to two years after the payment of the balance. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the review is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Agency or the Commission may carry out reviews directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The Agency or the Commission may request beneficiaries to provide such information to it directly.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with external experts.

For **on-the-spot** reviews, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a '**review report**' will be drawn up.

The Agency or the Commission will formally notify the review report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory review procedure**').

Reviews (including review reports) are in the language of the Agreement.

22.1.3 Right to carry out audits

The Agency or the Commission may — during the implementation of the action or afterwards — carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Audits may be started up to two years after the payment of the balance. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the audit is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Agency or the Commission may carry out audits directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. The Agency or the Commission may request beneficiaries to provide such information to it directly.

For **on-the-spot** audits, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a '**draft audit report**' will be drawn up.

The Agency or the Commission will formally notify the draft audit report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory audit procedure**'). This period may be extended by the Agency or the Commission in justified cases.

The '**final audit report**' will take into account observations by the coordinator or beneficiary concerned. The report will be formally notified to it.

Audits (including audit reports) are in the language of the Agreement.

The Agency or the Commission may also access the beneficiaries' statutory records for the periodical assessment of unit costs or flat-rate amounts.

22.2 Investigations by the European Anti-Fraud Office (OLAF)

Under Regulations No 883/2013[16] and No 2185/96[17] (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

22.3 Checks and audits by the European Court of Auditors (ECA)

Under Article 287 of the Treaty on the Functioning of the European Union (TFEU) and Article 161 of the Financial Regulation No 966/2012[18], the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

The ECA has the right of access for the purpose of checks and audits.

22.4 Checks, reviews, audits and investigations for international organisations

Not applicable

22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings

22.5.1 Findings in this grant

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to the rejection of ineligible costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44) or to any of the other measures described in Chapter 6.

Rejection of costs or reduction of the grant after the payment of the balance will lead to a revised final grant amount (see Article 5.4).

Findings in checks, reviews, audits or investigations may lead to a request for amendment for the modification of Annex 1 (see Article 55).

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or

[16] Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18.09.2013, p. 1).

[17] Council Regulation (Euratom, EC) No 2185/1996 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15.11.1996, p. 2).

[18] Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 298, 26.10.2012, p. 1).

breach of obligations may also lead to consequences in other EU or Euratom grants awarded under similar conditions ('**extension of findings from this grant to other grants**').

Moreover, findings arising from an OLAF investigation may lead to criminal prosecution under national law.

22.5.2 Findings in other grants

The Agency or the Commission may extend findings from other grants to this grant ('**extension of findings from other grants to this grant**'), if:

(a) the beneficiary concerned is found, in other EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and

(b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — no later than two years after the payment of the balance of this grant.

The extension of findings may lead to the rejection of costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44), suspension of payments (see Article 48), suspension of the action implementation (see Article 49) or termination (see Article 50).

22.5.3 Procedure

The Agency or the Commission will formally notify the beneficiary concerned the systemic or recurrent errors and its intention to extend these audit findings, together with the list of grants affected.

22.5.3.1 If the findings concern **eligibility of costs**: the formal notification will include:

(a) an invitation to submit observations on the list of grants affected by the findings;

(b) the request to submit **revised financial statements** for all grants affected;

(c) the **correction rate for extrapolation** established by the Agency or the Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:

(i) considers that the submission of revised financial statements is not possible or practicable or

(ii) does not submit revised financial statements.

The beneficiary concerned has 90 days from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method**. This period may be extended by the Agency or the Commission in justified cases.

The Agency or the Commission may then start a rejection procedure in accordance with Article 42, on the basis of:

- the revised financial statements, if approved;
- the proposed alternative correction method, if accepted

or

- the initially notified correction rate for extrapolation, if it does not receive any observations or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements.

22.5.3.2 If the findings concern **substantial errors**, **irregularities or fraud** or **serious breach of obligations**: the formal notification will include:

(a) an invitation to submit observations on the list of grants affected by the findings and

(b) the flat-rate the Agency or the Commission intends to apply according to the principle of proportionality.

The beneficiary concerned has 90 days from receiving notification to submit observations or to propose a duly substantiated alternative flat-rate.

The Agency or the Commission may then start a reduction procedure in accordance with Article 43, on the basis of:

- the proposed alternative flat-rate, if accepted

or

- the initially notified flat-rate, if it does not receive any observations or does not accept the observations or the proposed alternative flat-rate.

22.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, any insufficiently substantiated costs will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

The Agency or the Commission may carry out interim and final evaluations of the impact of the action measured against the objective of the EU programme.

Evaluations may be started during implementation of the action and up to five years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the coordinator or beneficiaries.

The Agency or the Commission may make these evaluations directly (using its own staff) or indirectly (using external bodies or persons it has authorised to do so).

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

23.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the Agency may apply the measures described in Chapter 6.

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities[19].

This does not change the obligations set out in Subsections 2 and 3 of this Section.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Agency may apply any of the measures described in Chapter 6.

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

The beneficiaries must identify and agree (in writing) on the background for the action ('**agreement on background**').

'**Background**' means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that:

(a) is held by the beneficiaries before they acceded to the Agreement, and

(b) is needed to implement the action or exploit the results.

24.2 Consequences of non-compliance

[19] Commission Recommendation C(2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

25.1 Exercise of access rights — Waiving of access rights — No sub-licensing

To exercise access rights, this must first be requested in writing ('**request for access**').

'**Access rights**' means rights to use results or background under the terms and conditions laid down in this Agreement.

Waivers of access rights are not valid unless in writing.

Unless agreed otherwise, access rights do not include the right to sub-license.

25.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to background needed to implement their own tasks under the action, unless the beneficiary that holds the background has — before acceding to the Agreement —:

(a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or

(b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

25.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other access — under fair and reasonable conditions — to background needed for exploiting their own results, unless the beneficiary that holds the background has — before acceding to the Agreement — informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel).

'**Fair and reasonable conditions**' means appropriate conditions, including possible financial terms or royalty-free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel) —

to affiliated entities[20] established in an EU Member State or '**associated country**'[21], if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 25.1), the affiliated entity concerned must make the request directly to the beneficiary that holds the background.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.5 Access rights for third parties

Not applicable

25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

'**Results**' means any (tangible or intangible) output of the action such as data, knowledge or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights.

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

(a) they have jointly generated them and

(b) it is not possible to:

(i) establish the respective contribution of each beneficiary, or

(ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

[20] For the definition, see 'affiliated entity' footnote (Article 14.1).

[21] For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: '**associated country**' means a third country which is party to an international agreement with the Union, as identified in Article 7 of Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership ('**joint ownership agreement**'), to ensure compliance with their obligations under this Agreement.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

(a) at least 45 days advance notice and

(b) fair and reasonable compensation.

Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

26.3 Rights of third parties (including personnel)

If third parties (including personnel) may claim rights to the results, the beneficiary concerned must ensure that it complies with its obligations under the Agreement.

If a third party generates results, the beneficiary concerned must obtain all necessary rights (transfer, licences or other) from the third party, in order to be able to respect its obligations as if those results were generated by the beneficiary itself.

If obtaining the rights is impossible, the beneficiary must refrain from using the third party to generate the results.

26.4 Agency ownership, to protect results

26.4.1 The Agency may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in any of the following cases:

(a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);

(b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or

(c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

Before the results are disseminated and unless any of the cases above under Points (a), (b) or (c) applies, the beneficiary must formally notify the Agency and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Agency decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

No dissemination relating to these results may take place before the end of this period or, if the Agency takes a positive decision, until it has taken the necessary steps to protect the results.

26.4.2 The Agency may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to stop protecting them or not to seek an extension of protection, except in any of the following cases:

(a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;

(b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the Agency at least 60 days before the protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Agency decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

26.5 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to the any of the other measures described in Chapter 6.

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF EU FUNDING

27.1 Obligation to protect the results

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage — if:

(a) the results can reasonably be expected to be commercially or industrially exploited and

(b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

27.2 Agency ownership, to protect the results

If a beneficiary intends not to protect its results, to stop protecting them or not seek an extension of protection, the Agency may — under certain conditions (see Article 26.4) — assume ownership to ensure their (continued) protection.

27.3 Information on EU funding

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must — unless the Agency requests or agrees otherwise or unless it is impossible — include the following:

> "The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815098".

27.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

Each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure '**exploitation**' of its results (either directly or indirectly, in particular through transfer or licensing; see Article 30) by:

(a) using them in further research activities (outside the action);

(b) developing, creating or marketing a product or process;

(c) creating and providing a service, or

(d) using them in standardisation activities.

This does not change the security obligations in Article 37, which still apply.

28.2 Results that could contribute to European or international standards — Information on EU funding

If results are incorporated in a standard, the beneficiary concerned must — unless the Agency requests or agrees otherwise or unless it is impossible — ask the standardisation body to include the following statement in (information related to) the standard:

> "Results incorporated in this standard received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815098".

28.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced in accordance with Article 43.

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF EU FUNDING

29.1 Obligation to disseminate results

Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — '**disseminate**' its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

If a beneficiary intends not to protect its results, it may — under certain conditions (see Article 26.4.1) — need to formally notify the Agency before dissemination takes place.

29.2 Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

(a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

(b) ensure open access to the deposited publication — via the repository — at the latest:

(i) on publication, if an electronic version is available for free via the publisher, or

(ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.

(c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms “European Union (EU)” and “Horizon 2020”;
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier.

29.3 Open access to research data

Regarding the digital research data generated in the action (‘**data**’), the beneficiaries must:

(a) deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate — free of charge for any user — the following:

(i) the data, including associated metadata, needed to validate the results presented in scientific publications, as soon as possible;

(ii) not applicable;

(iii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan' (see Annex 1);

(b) provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

As an exception, the beneficiaries do not have to ensure open access to specific parts of their research data under Point (a)(i) and (iii), if the achievement of the action's main objective (as described in Annex 1) would be jeopardised by making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access.

29.4 Information on EU funding — Obligation and right to use the EU emblem

Unless the Agency requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

(a) display the EU emblem and

(b) include the following text:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815098".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Agency.

This does not however give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

29.5 Disclaimer excluding Agency responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the Agency is not responsible for any use that may be made of the information it contains.

29.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

It must however ensure that its obligations under Articles 26.2, 26.4, 27, 28, 29, 30 and 31 also apply to the new owner and that this owner has the obligation to pass them on in any subsequent transfer.

This does not change the security obligations in Article 37, which still apply.

Unless agreed otherwise (in writing) for specifically-identified third parties or unless impossible under applicable EU and national laws on mergers and acquisitions, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice (or less if agreed in writing) to the other beneficiaries that still have (or still may request) access rights to the results. This notification must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Unless agreed otherwise (in writing) for specifically-identified third parties, any other beneficiary may object within 30 days of receiving notification (or less if agreed in writing), if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

30.2 Granting licenses

Each beneficiary may grant licences to its results (or otherwise give the right to exploit them), if:

(a) this does not impede the access rights under Article 31 and

(b) not applicable.

In addition to Points (a) and (b), exclusive licences for results may be granted only if all the other beneficiaries concerned have waived their access rights (see Article 31.1).

This does not change the dissemination obligations in Article 29 or security obligations in Article 37, which still apply.

30.3 Agency right to object to transfers or licensing

Not applicable

30.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

31.1 Exercise of access rights — Waiving of access rights — No sub-licensing

The conditions set out in Article 25.1 apply.

The obligations set out in this Article do not change the security obligations in Article 37, which still apply.

31.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to results needed for implementing their own tasks under the action.

31.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other — under fair and reasonable conditions (see Article 25.3) — access to results needed for exploiting their own results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 31.1), the affiliated entity concerned must make any such request directly to the beneficiary that owns the results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.5 Access rights for the EU institutions, bodies, offices or agencies and EU Member States

The beneficiaries must give access to their results — on a royalty-free basis — to EU institutions, bodies, offices or agencies, for developing, implementing or monitoring EU policies or programmes.

Such access rights are limited to non-commercial and non-competitive use.

This does not change the right to use any material, document or information received from the beneficiaries for communication and publicising activities (see Article 38.2).

31.6 Access rights for third parties

Not applicable

31.7 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers[23], in particular regarding:

- working conditions;
- transparent recruitment processes based on merit, and
- career development.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

32.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Agency may apply any of the measures described in Chapter 6.

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

The beneficiaries must take all measures to promote equal opportunities between men and women in the implementation of the action. They must aim, to the extent possible, for a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

33.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Agency may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS AND RESEARCH INTEGRITY

34.1 Obligation to comply with ethical and research integrity principles

[23] Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

The beneficiaries must carry out the action in compliance with:

(a) ethical principles (including the highest standards of research integrity)

and

(b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States or for activities which destroy human embryos (for example, for obtaining stem cells).

The beneficiaries must ensure that the activities under the action have an exclusive focus on civil applications.

The beneficiaries must ensure that the activities under the action do not:

(a) aim at human cloning for reproductive purposes;

(b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or

(c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

In addition, the beneficiaries must respect the fundamental principle of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity[24].

This implies compliance with the following fundamental principles:

- **reliability** in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources;

- **honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way;

- **respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment;

- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts

and means that beneficiaries must ensure that persons carrying out research tasks follow the good research practices and refrain from the research integrity violations described in this Code.

This does not change the other obligations under this Agreement or obligations under applicable international, EU or national law, all of which still apply.

34.2 Activities raising ethical issues

[24] European Code of Conduct for Research Integrity of ALLEA (All European Academies) http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

Activities raising ethical issues must comply with the '**ethics requirements**' set out as deliverables in Annex 1.

Before the beginning of an activity raising an ethical issue, each beneficiary must have obtained:

(a) any ethics committee opinion required under national law and

(b) any notification or authorisation for activities raising ethical issues required under national and/or European law

needed for implementing the action tasks in question.

The documents must be kept on file and be submitted upon request by the coordinator to the Agency (see Article 52). If they are not in English, they must be submitted together with an English summary, which shows that the action tasks in question are covered and includes the conclusions of the committee or authority concerned (if available).

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out, in addition to Article 34.1, only if:

- they are set out in Annex 1 or
- the coordinator has obtained explicit approval (in writing) from the Agency (see Article 52).

34.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the action is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest ('**conflict of interests**').

They must formally notify to the Agency without delay any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The Agency may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

35.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

During implementation of the action and for four years after the period set out in Article 3, the parties must keep confidential any data, documents or other material (in any form) that is identified as confidential at the time it is disclosed ('**confidential information**').

If a beneficiary requests, the Agency may agree to keep such information confidential for an additional period beyond the initial four years.

If information has been identified as confidential only orally, it will be considered to be confidential only if this is confirmed in writing within 15 days of the oral disclosure.

Unless otherwise agreed between the parties, they may use confidential information only to implement the Agreement.

The beneficiaries may disclose confidential information to their personnel or third parties involved in the action only if they:

(a) need to know to implement the Agreement and

(b) are bound by an obligation of confidentiality.

This does not change the security obligations in Article 37, which still apply.

The Agency may disclose confidential information to its staff, other EU institutions and bodies. It may disclose confidential information to third parties, if:

(a) this is necessary to implement the Agreement or safeguard the EU's financial interests and

(b) the recipients of the information are bound by an obligation of confidentiality.

Under the conditions set out in Article 4 of the Rules for Participation Regulation No 1290/2013[25], the Commission must moreover make available information on the results to other EU institutions, bodies, offices or agencies as well as Member States or associated countries.

The confidentiality obligations no longer apply if:

(a) the disclosing party agrees to release the other party;

(b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;

(c) the recipient proves that the information was developed without the use of confidential information;

[25] Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 December 2013 laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" (OJ L 347, 20.12.2013 p.81).

(d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or

(e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified information

Not applicable

37.3 Activities involving dual-use goods or dangerous materials and substances

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF EU FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

The beneficiaries must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

This does not change the dissemination obligations in Article 29, the confidentiality obligations in Article 36 or the security obligations in Article 37, all of which still apply.

Before engaging in a communication activity expected to have a major media impact, the beneficiaries must inform the Agency (see Article 52).

38.1.2 Information on EU funding — Obligation and right to use the EU emblem

Unless the Agency requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) and any infrastructure, equipment and major results funded by the grant must:

(a) display the EU emblem and

(b) include the following text:

For communication activities:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815098".

For infrastructure, equipment and major results:

"This *[infrastructure][equipment][insert type of result]* is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815098".

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Agency.

This does not, however, give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

38.1.3 Disclaimer excluding Agency and Commission responsibility

Any communication activity related to the action must indicate that it reflects only the author's view and that the Agency and the Commission are not responsible for any use that may be made of the information it contains.

38.2 Communication activities by the Agency and the Commission

38.2.1 Right to use beneficiaries' materials, documents or information

The Agency and the Commission may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material received from any beneficiary (including in electronic form).

This does not change the confidentiality obligations in Article 36 and the security obligations in Article 37, all of which still apply.

If the Agency's or the Commission's use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the Agency or the Commission not to use it (see Article 52).

The right to use a beneficiary's materials, documents and information includes:

(a) **use for its own purposes** (in particular, making them available to persons working for the Agency, the Commission or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);

(b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting

by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);

(c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);

(d) translation;

(e) giving **access in response to individual requests** under Regulation No 1049/2001[27], without the right to reproduce or exploit;

(f) **storage** in paper, electronic or other form;

(g) **archiving**, in line with applicable document-management rules, and

(h) the right to authorise **third parties** to act on its behalf or sub-license the modes of use set out in Points (b), (c), (d) and (f) to third parties if needed for the communication and publicising activities of the Agency or the Commission.

If the right of use is subject to rights of a third party (including personnel of the beneficiary), the beneficiary must ensure that it complies with its obligations under this Agreement (in particular, by obtaining the necessary approval from the third parties concerned).

Where applicable (and if provided by the beneficiaries), the Agency or the Commission will insert the following information:

> "© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the Innovation and Networks Executive Agency (INEA) and the European Union (EU) under conditions."

38.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the Agency and the Commission

Any personal data under the Agreement will be processed by the Agency or the Commission under Regulation No 45/2001[28] and according to the 'notifications of the processing operations' to the Data Protection Officer (DPO) of the Agency or the Commission (publicly accessible in the DPO register).

Such data will be processed by the '**data controller**' of the Agency or the Commission for the purposes

[27] Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents, OJ L 145, 31.5.2001, p. 43.

[28] Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.01.2001, p. 1).

of implementing, managing and monitoring the Agreement or protecting the financial interests of the EU or Euratom (including checks, reviews, audits and investigations; see Article 22).

The persons whose personal data are processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the data controller, via the contact point indicated in the privacy statement(s) that are published on the Agency and the Commission websites.

They also have the right to have recourse at any time to the European Data Protection Supervisor (EDPS).

39.2 Processing of personal data by the beneficiaries

The beneficiaries must process personal data under the Agreement in compliance with applicable EU and national law on data protection (including authorisations or notification requirements).

The beneficiaries may grant their personnel access only to data that is strictly necessary for implementing, managing and monitoring the Agreement.

The beneficiaries must inform the personnel whose personal data are collected and processed by the Agency or the Commission. For this purpose, they must provide them with the privacy statement(s) (see above), before transmitting their data to the Agency or the Commission.

39.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 39.2, the Agency may apply any of the measures described in Chapter 6.

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE AGENCY

The beneficiaries may not assign any of their claims for payment against the Agency to any third party, except if approved by the Agency on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the Agency has not accepted the assignment or the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the Agency.

CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION

41.1 Roles and responsibility towards the Agency

The beneficiaries have full responsibility for implementing the action and complying with the Agreement.

The beneficiaries are jointly and severally liable for the **technical implementation** of the action as described in Annex 1. If a beneficiary fails to implement its part of the action, the other beneficiaries become responsible for implementing this part (without being entitled to any additional EU funding for doing so), unless the Agency expressly relieves them of this obligation.

The **financial responsibility** of each beneficiary is governed by Article 44.

41.2 Internal division of roles and responsibilities

The internal roles and responsibilities of the beneficiaries are divided as follows:

(a) Each **beneficiary** must:

(i) keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system) up to date (see Article 17);

(ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);

(iii) submit to the coordinator in good time:

- individual financial statements for itself and its linked third parties and, if required, certificates on the financial statements (see Article 20);
- the data needed to draw up the technical reports (see Article 20);
- ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);
- any other documents or information required by the Agency or the Commission under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the Agency or the Commission.

(b) The **coordinator** must:

(i) monitor that the action is implemented properly (see Article 7);

(ii) act as the intermediary for all communications between the beneficiaries and the Agency (in particular, providing the Agency with the information described in Article 17), unless the Agreement specifies otherwise;

(iii) request and review any documents or information required by the Agency and verify their completeness and correctness before passing them on to the Agency;

(iv) submit the deliverables and reports to the Agency (see Articles 19 and 20);

(v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);

(vi) inform the Agency of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the Agency.

The coordinator may not delegate or subcontract the above-mentioned tasks to any other beneficiary or third party (including linked third parties).

41.3 Internal arrangements between beneficiaries — Consortium agreement

The beneficiaries must have internal arrangements regarding their operation and co-ordination to ensure that the action is implemented properly. These internal arrangements must be set out in a written '**consortium agreement**' between the beneficiaries, which may cover:

- internal organisation of the consortium;
- management of access to the electronic exchange system;
- distribution of EU funding;
- additional rules on rights and obligations related to background and results (including whether access rights remain or not, if a beneficiary is in breach of its obligations) (see Section 3 of Chapter 4);
- settlement of internal disputes;
- liability, indemnification and confidentiality arrangements between the beneficiaries.

The consortium agreement must not contain any provision contrary to the Agreement.

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE

SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

The Agency will — after **termination of the participation of a beneficiary**, at the time of an **interim**

payment, **at the payment of the balance** or **afterwards** — reject any costs which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 22).

The rejection may also be based on the **extension of findings from other grants to this grant** (see Article 22.5.2).

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the rejection of costs does not lead to a recovery (see Article 44), the Agency will formally notify the coordinator or beneficiary concerned of the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the Agency of its disagreement and the reasons why.

If the rejection of costs leads to a recovery, the Agency will follow the contradictory procedure with pre-information letter set out in Article 44.

42.3 Effects

If the Agency rejects costs at the time of an **interim payment** or **the payment of the balance**, it will deduct them from the total eligible costs declared, for the action, in the periodic or final summary financial statement (see Articles 20.3 and 20.4). It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Agency rejects costs **after termination of the participation of a beneficiary**, it will deduct them from the costs declared by the beneficiary in the termination report and include the rejection in the calculation after termination (see Article 50.2 and 50.3).

If the Agency — **after an interim payment but before the payment of the balance** — rejects costs declared in a periodic summary financial statement, it will deduct them from the total eligible costs declared, for the action, in the next periodic summary financial statement or in the final summary financial statement. It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Agency rejects costs **after the payment of the balance**, it will deduct the amount rejected from the total eligible costs declared, by the beneficiary, in the final summary financial statement. It will then calculate the revised final grant amount as set out in Article 5.4.

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

The Agency may — **after termination of the participation of a beneficiary**, **at the payment of the balance** or **afterwards** — reduce the grant amount (see Article 5.1), if :

(a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:

(i) substantial errors, irregularities or fraud or

(ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or

(b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the seriousness of the errors, irregularities or fraud or breach of obligations.

Before reduction of the grant, the Agency will formally notify a '**pre-information letter**' to the coordinator or beneficiary concerned:

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and

- inviting it to submit observations within 30 days of receiving notification.

If the Agency does not receive any observations or decides to pursue reduction despite the observations it has received, it will formally notify **confirmation** of the reduction (if applicable, together with the notification of amounts due; see Article 21).

43.3 Effects

If the Agency reduces the grant **after termination of the participation of a beneficiary**, it will calculate the reduced grant amount for that beneficiary and then determine the amount due to that beneficiary (see Article 50.2 and 50.3).

If the Agency reduces the grant **at the payment of the balance**, it will calculate the reduced grant amount for the action and then determine the amount due as payment of the balance (see Articles 5.3.4 and 21.4).

If the Agency reduces the grant **after the payment of the balance**, it will calculate the revised final grant amount for the beneficiary concerned (see Article 5.4). If the revised final grant amount for the beneficiary concerned is lower than its share of the final grant amount, the Agency will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The Agency will — after **termination of the participation of a beneficiary, at the payment of the balance** or **afterwards** — claim back any amount that was paid, but is not due under the Agreement.

Each beneficiary's financial responsibility in case of recovery is limited to its own debt (including

undue amounts paid by the Agency for costs declared by its linked third parties), except for the amount retained for the Guarantee Fund (see Article 21.4).

44.1.1 Recovery after termination of a beneficiary's participation

If recovery takes place after termination of a beneficiary's participation (including the coordinator), the Agency will claim back the undue amount from the beneficiary concerned, by formally notifying it a debit note (see Article 50.2 and 50.3). This note will specify the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Agency or the Commission will **recover** the amount:

(a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Agency, the Commission or another executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Agency or the Commission may offset before the payment date specified in the debit note;

(b) not applicable;

(c) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial regulation No 966/2012.

If payment is not made by the date specified in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Agency or the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC[29] applies.

44.1.2 Recovery at payment of the balance

If the payment of the balance takes the form of a recovery (see Article 21.4), the Agency will formally notify a '**pre-information letter**' to the coordinator:

- informing it of its intention to recover, the amount due as the balance and the reasons why;
- specifying that it intends to deduct the amount to be recovered from the amount retained for the Guarantee Fund;
- requesting the coordinator to submit a report on the distribution of payments to the beneficiaries within 30 days of receiving notification, and

[29] Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC (OJ L 319, 05.12.2007, p. 1).

- inviting the coordinator to submit observations within 30 days of receiving notification.

If no observations are submitted or the Agency decides to pursue recovery despite the observations it has received, it will **confirm recovery** (together with the notification of amounts due; see Article 21.5) and:

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or

- formally notify to the coordinator a **debit note** for the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is negative**. This note will also specify the terms and the date for payment.

If the coordinator does not repay the Agency by the date in the debit note and has not submitted the report on the distribution of payments: the Agency or the Commission will **recover** the amount set out in the debit note from the coordinator (see below).

If the coordinator does not repay the Agency by the date in the debit note, but has submitted the report on the distribution of payments: the Agency will:

(a) identify the beneficiaries for which the amount calculated as follows is negative:

{{{{beneficiary's costs declared in the final summary financial statement and approved by the Agency multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties' costs declared in the final summary financial statement and approved by the Agency multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1}

multiplied by

the final grant amount (see Article 5.3)},

minus

{pre-financing and interim payments received by the beneficiary}}.

(b) formally notify to each beneficiary identified according to point (a) a **debit note** specifying the terms and date for payment. The amount of the debit note is calculated as follows:

{{amount calculated according to point (a) for the beneficiary concerned

divided by

the sum of the amounts calculated according to point (a) for all the beneficiaries identified according to point (a)}

multiplied by

the amount set out in the debit note formally notified to the coordinator}.

If payment is not made by the date specified in the debit note, the Agency or the Commission will **recover** the amount:

(a) by **offsetting** it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Agency, the Commission or another executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Agency or the Commission may offset before the payment date specified in the debit note;

(b) by **drawing on the Guarantee Fund**. The Agency or the Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

(i) not applicable;

(ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Agency or the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

44.1.3 Recovery of amounts after payment of the balance

If, for a beneficiary, the revised final grant amount (see Article 5.4) is lower than its share of the final grant amount, it must repay the difference to the Agency.

The beneficiary's share of the final grant amount is calculated as follows:

{{{beneficiary's costs declared in the final summary financial statement and approved by the Agency multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned

plus

its linked third parties' costs declared in the final summary financial statement and approved by the Agency multiplied by the reimbursement rate set out in Article 5.2 for each linked third party concerned}

divided by

the EU contribution for the action calculated according to Article 5.3.1}

multiplied by

the final grant amount (see Article 5.3)}.

If the coordinator has not distributed amounts received (see Article 21.7), the Agency will also recover these amounts.

The Agency will formally notify a **pre-information letter** to the beneficiary concerned:

- informing it of its intention to recover, the due amount and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If no observations are submitted or the Agency decides to pursue recovery despite the observations it has received, it will **confirm** the amount to be recovered and formally notify to the beneficiary concerned a **debit note**. This note will also specify the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Agency or the Commission will **recover** the amount:

(a) by **offsetting** it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Agency, the Commission or another executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Agency or the Commission may offset before the payment date specified in the debit note;

(b) by **drawing on the Guarantee Fund**. The Agency or the Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

(i) not applicable;

(ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the date for payment in the debit note, up to and including the date the Agency or the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

ARTICLE 45 — ADMINISTRATIVE SANCTIONS

In addition to contractual measures, the Agency or the Commission may also adopt administrative sanctions under Articles 106 and 131(4) of the Financial Regulation No 966/2012 (i.e. exclusion from future procurement contracts, grants, prizes and expert contracts and/or financial penalties).

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the Agency

The Agency cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of implementing the Agreement, including for gross negligence.

The Agency cannot be held liable for any damage caused by any of the beneficiaries or third parties involved in the action, as a consequence of implementing the Agreement.

46.2 Liability of the beneficiaries

Except in case of force majeure (see Article 51), the beneficiaries must compensate the Agency for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

The Agency may — at any moment — suspend the payment deadline (see Article 21.2 to 21.4) if a request for payment (see Article 20) cannot be approved because:

(a) it does not comply with the provisions of the Agreement (see Article 20);

(b) the technical or financial reports have not been submitted or are not complete or additional information is needed, or

(c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

The Agency will formally notify the coordinator of the suspension and the reasons why.

The suspension will **take effect** the day notification is sent by the Agency (see Article 52).

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining period will resume.

If the suspension exceeds two months, the coordinator may request the Agency if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the technical or financial reports (see Article 20) and the revised report or statement is not submitted or was submitted but is also rejected, the Agency may also terminate the Agreement or the participation of the beneficiary (see Article 50.3.1(l)).

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The Agency may — at any moment — suspend payments, in whole or in part and interim payments or the payment of the balance for one or more beneficiaries, if:

(a) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed or is suspected of having committed:

  (i) substantial errors, irregularities or fraud or

  (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or

(b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

If payments are suspended for one or more beneficiaries, the Agency will make partial payment(s) for the part(s) not suspended. If suspension concerns the payment of the balance, — once suspension is lifted — the payment or the recovery of the amount(s) concerned will be considered the payment of the balance that closes the action.

48.2 Procedure

Before suspending payments, the Agency will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend payments and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Agency does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the suspension procedure is not continued.

The suspension will **take effect** the day the confirmation notification is sent by the Agency.

If the conditions for resuming payments are met, the suspension will be **lifted**. The Agency will formally notify the coordinator or beneficiary concerned.

During the suspension, the periodic report(s) for all reporting periods except the last one (see Article 20.3), must not contain any individual financial statements from the beneficiary concerned and its linked third parties. The coordinator must include them in the next periodic report after the suspension is lifted or — if suspension is not lifted before the end of the action — in the last periodic report.

The beneficiaries may suspend implementation of the action (see Article 49.1) or terminate the Agreement or the participation of the beneficiary concerned (see Article 50.1 and 50.2).

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

The beneficiaries may suspend implementation of the action or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 51) — make implementation impossible or excessively difficult.

49.1.2 Procedure

The coordinator must immediately formally notify to the Agency the suspension (see Article 52), stating:

- the reasons why and
- the expected date of resumption.

The suspension will **take effect** the day this notification is received by the Agency.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the Agency and request an **amendment** of the Agreement to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

The suspension will be **lifted** with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension of the action implementation are not eligible (see Article 6).

49.2 Suspension of the action implementation, by the Agency

49.2.1 Conditions

The Agency may suspend implementation of the action or any part of it, if:

(a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed or is suspected of having committed:

  (i) substantial errors, irregularities or fraud or

  (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);

(b) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or

(c) the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the Agency will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend the implementation and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Agency does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the procedure is not continued.

The suspension will **take effect** five days after confirmation notification is received (or on a later date specified in the notification).

It will be **lifted** if the conditions for resuming implementation of the action are met.

The coordinator or beneficiary concerned will be formally notified of the lifting and the Agreement will be **amended** to set the date on which the action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement has already been terminated (see Article 50).

The suspension will be lifted with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension are not eligible (see Article 6).

The beneficiaries may not claim damages due to suspension by the Agency (see Article 46).

Suspension of the action implementation does not affect the Agency's right to terminate the Agreement or participation of a beneficiary (see Article 50), reduce the grant or recover amounts unduly paid (see Articles 43 and 44).

ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES

50.1 Termination of the Agreement, by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

The coordinator must formally notify termination to the Agency (see Article 52), stating:

- the reasons why and
- the date the termination will take effect. This date must be after the notification.

If no reasons are given or if the Agency considers the reasons do not justify termination, the Agreement will be considered to have been '**terminated improperly**'.

The termination will **take effect** on the day specified in the notification.

50.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a periodic report (for the open reporting period until termination; see Article 20.3) and

(ii) the final report (see Article 20.4).

If the Agency does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Agency will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Improper termination may lead to a reduction of the grant (see Article 43).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries

50.2.1 Conditions and procedure

The participation of one or more beneficiaries may be terminated by the coordinator, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must formally notify termination to the Agency (see Article 52) and inform the beneficiary concerned.

If the coordinator's participation is terminated without its agreement, the formal notification must be done by another beneficiary (acting on behalf of the other beneficiaries).

The notification must include:

- the reasons why;
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing);
- the date the termination takes effect. This date must be after the notification, and
- a request for amendment (see Article 55), with a proposal for reallocation of the tasks and the estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination takes effect after the period set out in Article 3, no request for amendment must be included unless the beneficiary concerned is the coordinator. In this case, the request for amendment must propose a new coordinator.

If this information is not given or if the Agency considers that the reasons do not justify termination, the participation will be considered to have been **terminated improperly**.

The termination will **take effect** on the day specified in the notification.

50.2.2 Effects

The coordinator must — within 30 days from when termination takes effect — submit:

(i) a report on the distribution of payments to the beneficiary concerned and

(ii) if termination takes effect during the period set out in Article 3, a '**termination report**' from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Articles 20.3 and 20.4).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Agency (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Agency, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Agency will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report and approved by the Agency.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Agency will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Agency will formally notify the amount unduly received and request

the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Agency will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Agency will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Agency the amount due and the Agency will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:

  - termination takes effect after an interim payment and

  - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

  In this case, the Agency will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Agency the amount due. The Agency will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Agency does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Agency does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that

- the beneficiary concerned must not repay any amount to the coordinator.

Improper termination may lead to a reduction of the grant (see Article 43) or termination of the Agreement (see Article 50).

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the Agency

50.3.1 Conditions

The Agency may terminate the Agreement or the participation of one or more beneficiaries, if:

(a) one or more beneficiaries do not accede to the Agreement (see Article 56);

(b) a change to their legal, financial, technical, organisational or ownership situation (or those

of its linked third parties) is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;

(c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);

(d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:

(i) resumption is impossible, or

(ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;

(e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;

(f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;

(g) a beneficiary does not comply with the applicable national law on taxes and social security;

(h) the action has lost scientific or technological relevance;

(i) not applicable;

(j) not applicable;

(k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity;

(l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:

(i) substantial errors, irregularities or fraud or

(ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);

(m) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2);

(n) despite a specific request by the Agency, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its linked third parties or international partners that is in one of the situations under points (e), (f), (g), (k), (l) or (m) and to reallocate its tasks.

50.3.2 Procedure

Before terminating the Agreement or participation of one or more beneficiaries, the Agency will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to terminate and the reasons why and
- inviting it, within 30 days of receiving notification, to submit observations and — in case of Point (l.ii) above — to inform the Agency of the measures to ensure compliance with the obligations under the Agreement.

If the Agency does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator or beneficiary concerned **confirmation** of the termination and the date it will take effect. Otherwise, it will formally notify that the procedure is not continued.

The termination will **take effect**:

- for terminations under Points (b), (c), (e), (g), (h), (j), (l.ii) and (n) above: on the day specified in the notification of the confirmation (see above);
- for terminations under Points (a), (d), (f), (i), (k), (l.i) and (m) above: on the day after the notification of the confirmation is received.

50.3.3 Effects

(a) for **termination of the Agreement**:

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a periodic report (for the last open reporting period until termination; see Article 20.3) and

(ii) a final report (see Article 20.4).

If the Agreement is terminated for breach of the obligation to submit reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the Agency does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Agency will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

This does not affect the Agency's right to reduce the grant (see Article 43) or to impose administrative sanctions (Article 45).

The beneficiaries may not claim damages due to termination by the Agency (see Article 46).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

(b) for **termination of the participation of one or more beneficiaries**:

The coordinator must — within 60 days from when termination takes effect — submit:

(i) a report on the distribution of payments to the beneficiary concerned;

(ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and

(iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Agency (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Agency, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Agency will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary and its linked third parties in the termination report and approved by the Agency.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Agency will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud

or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Agency will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Agency will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Agency will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Agency the amount due and the Agency will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);

- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:

  - termination takes effect after an interim payment and

  - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

  In this case, the Agency will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Agency the amount due. The Agency will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Agency does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Agency does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that

- the beneficiary concerned must not repay any amount to the coordinator.

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, 'formal notifications', etc.) must:

- be made in writing and
- bear the number of the Agreement.

All communication must be made through the Participant Portal **electronic** exchange system and using the forms and templates provided there.

If — after the payment of the balance — the Agency finds that a formal notification was not accessed, a second formal notification will be made by registered post with proof of delivery ('formal notification on **paper**'). Deadlines will be calculated from the moment of the second notification.

Communications in the electronic exchange system must be made by persons authorised according to the Participant Portal Terms & Conditions. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a 'legal entity appointed representative

(LEAR)'. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Participant Portal Terms & Conditions).

If the electronic exchange system is temporarily unavailable, instructions will be given on the Agency and Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

https://ec.europa.eu/research/participants/portal/desktop/en/projects/

The Agency will formally notify the coordinator and beneficiaries in advance any changes to this URL.

Formal notifications on paper (only after the payment of the balance) addressed **to the Agency** must be sent to the official mailing address indicated on the Agency's website.

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the Participant Portal Beneficiary Register.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Not applicable

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71[30], periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

Amendments may be requested by any of the parties.

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents, and
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The Agency may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the Agency has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected

An amendment **enters into force** on the day of the signature of the receiving party.

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

[30] Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58).

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the Agency's right to terminate the Agreement (see Article 50).

56.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

57.2 Dispute settlement

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

If a dispute concerns administrative sanctions, offsetting or an enforceable decision under Article 299 TFEU (see Articles 44, 45 and 46), the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU. Actions against offsetting and enforceable decisions must be brought against the Commission (not against the Agency).

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the Agency or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

Fernand REINIG with ECAS id nreinife signed in the Participant Portal on 06/05/2019 at 14:11:13 (transaction id SigId-136371-nLJzsLiqzpITuEC6ns74zr4IvMXvXWf4nTQb4ndknzpj1IzvFXcJ7ezW2hWW13ydGc7tYIpzooRWFH2Y4c5zZfua-jpJZscgsw0KN09GwxKpZgW-x3ZCf7o6MjmVOcztewV3wc4uj822n2tWFHmfNnjcOG9). Timestamp by third party at Mon May 06 15:11:19 CEST 2019

For the Agency

Signed by Alan HAIGH with ECAS id haigala as an authorised representative on 06-05-2019 16:55:22 (transaction id SigId-139188-6AVh2bNqtf8PrwnXzl7Wzwotj5lGWIA2uaWzYv7hNDJBqGs6gfWzhbl14lGDLbCLwuGZWqOeLsnSv1Rnmzx3zaeW-jpJZscgsw0KN09GwxKpZgW-QCWdzLLVG2nWVjdg8bN8fGQViKo0O8FBuzwXbb2RIlbW) Mon May 06 16:55:26 CEST 2019

EUROPEAN COMMISSION
Innovation and Networks Executive Agency
Transport Research

ANNEX 1 (part A)

Research and Innovation action

NUMBER — 815098 — PAsCAL

Table of Contents

1.1. The project summary

Project Number [1]	815098	Project Acronym [2]	PAsCAL

One form per project

General information	
Project title [3]	Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes
Starting date [4]	01/06/2019
Duration in months [5]	36
Call (part) identifier [6]	H2020-MG-2018-TwoStages
Topic	MG-3-3-2018 Driver behaviour and acceptance of connected, cooperative and automated transport
Fixed EC Keywords	Public engagement, Human behaviour modelling and simulation, Transport & Mobility, Human computer interaction
Free keywords	

Abstract [7]

The 36-month PAsCAL project proposes an awareness-driven and large-scale penetration approach to address all issues raised by the majority (if not all) of the general public that hinder the wide market uptake of Connected and Autonomous Vehicles (CAV). It will not only focus on the interaction of the “users” in or near CAV, but also assess the impact of connected transport on people’s well-being, quality of life, and equity. PAsCAL will use of a strongly interdisciplinary mix of innovative tools from both human science and technology, to capture the public’s acceptance and attitude, analyse and assess their concerns, model and simulate realistic scenarios for hand-on practices, and validate the research innovation in a number of trials in the real world. The association to the consortium of special categories of users, such as disabled persons, and of service providers with a global outreach of millions of members and several thousand customers across the EU will ensure results consistency, taking into account major social obstacles/barriers that may hinder the acceptance of CAV and would allow their reuse in new businesses, services and applications.

1.2. List of Beneficiaries

Project Number [1]	815098	Project Acronym [2]	PAsCAL

List of Beneficiaries

No	Name	Short name	Country	Project entry month[8]	Project exit month
1	LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY	LIST	Luxembourg	1	36
2	AUTOMOBILE CLUB D ITALIA	ACI	Italy	1	36
3	LUXMOBILITY S.A.R.L.	LuxMobility	Luxembourg	1	36
4	RDS DRIVING SERVICES LIMITED	RDS Driving	United Kingdom	1	36
5	ETELÄTÄR INNOVATION OÜ	ETELÄTÄR	Estonia	1	36
6	UNIVERSITY OF LEEDS	UNIVLEEDS	United Kingdom	1	36
7	THE UNIVERSITY OF LIVERPOOL	LIV	United Kingdom	1	36
8	COMMUNAUTE D' UNIVERSITES ET ETABLISSEMENTS UNIVERSITE BOURGOGNE - FRANCHE - COMTE	UBFC	France	1	36
9	EXAMOTIVE SA	ExaMotive S.A.	Luxembourg	1	36
10	UNIVERSITAET MANNHEIM	UMA	Germany	1	36
11	E-BUS COMPETENCE CENTER S.A.R.L	E-Bus	Luxembourg	1	36
12	UNION EUROPEENNE DES AVEUGLES UEAASSOCIATION	EBU	France	1	36
13	REALDOLMEN NV	RDGFI	Belgium	1	36

1.3. Workplan Tables - Detailed Implementation

1.3.1. WT1 List of work packages

WP Number[9]	WP Title	Lead beneficiary[10]	Person-months[11]	Start month[12]	End month[13]
WP1	Project Management, Coordination and Quality Control	1 - LIST	19.50	1	36
WP2	Ethics and Data Protection	6 - UNIVLEEDS	24.00	1	33
WP3	Comprehensive Assessment of Public Acceptance	10 - UMA	42.50	1	36
WP4	Scenarios Design and Simulation Systems	8 - UBFC	64.50	9	22
WP5	Capacity Building, Training and Education	2 - ACI	40.00	10	24
WP6	Pilot Implementation	5 - ETELÄTÄR	56.50	16	30
WP7	Impact Assessment	6 - UNIVLEEDS	36.00	3	32
WP8	Guide2Autonomy, Policy Recommendation and Guidelines	3 - LuxMobility	40.00	12	33
WP9	Outreach	13 - RDGFI	38.00	1	36
WP10	Ethics requirements	1 - LIST	N/A	1	36
		Total	361.00		

1.3.2. WT2 list of deliverables

Deliverable Number[14]	Deliverable Title	WP number[9]	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.1	Project Management Plan and Quality handbook	WP1	3 - LuxMobility	Report	Confidential, only for members of the consortium (including the Commission Services)	2
D1.2	Risk Management Plan	WP1	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	3
D1.3	Updated detailed Project Management Plan with a Gantt chart and a Work Breakdown Structure	WP1	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D1.4	Final Project Management Plan with Gantt chart and a Work breakdown structure	WP1	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D2.1	Ethics Handbook	WP2	10 - UMA	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D2.2	Data Management Setup	WP2	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Confidential, only for members of the consortium (including the Commission Services)	4
D2.3	Data Protection Handbook	WP2	6 - UNIVLEEDS	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D2.4	Intermediate Data Management Plan	WP2	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Confidential, only for members of the consortium (including the Commission Services)	18

Deliverable Number[14]	Deliverable Title	WP number[9]	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D2.5	European Data and Ethics handbook in the field of autonomous driving, vehicles and usages of humans and data	WP2	6 - UNIVLEEDS	Report	Public	32
D2.6	Open Research Data Report	WP2	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Public	32
D3.1	User-centered recommendations	WP3	10 - UMA	Report	Public	18
D3.2	360°Acceptance Map	WP3	10 - UMA	Report	Public	30
D3.3	CAVA (Connected and Autonomous Vehicles Acceptance Assessment Tool)	WP3	10 - UMA	Report	Public	30
D3.4	Cross Skill ™	WP3	1 - LIST	Demonstrator	Public	36
D4.1	Scenarios and experimental protocols	WP4	8 - UBFC	Report	Public	20
D4.2	Guidelines and recommendations from simulations	WP4	6 - UNIVLEEDS	Report	Public	22
D5.1	Requirements and competence models for CAV relevant training situations	WP5	1 - LIST	Report	Public	20
D5.2	Educational scenarios and tasks for CAV relevant training situations	WP5	1 - LIST	Report	Public	24
D5.3	Tested simulation-based training solutions and training modules	WP5	2 - ACI	Demonstrator	Public	24
D6.1	Pilot handbook for pilot managers	WP6	5 - ETELÄTÄR	Report	Public	22
D6.2	Pilot Setup	WP6	5 - ETELÄTÄR	Report	Public	24
D6.3	Pilot implementation and evaluation	WP6	5 - ETELÄTÄR	Report	Public	30
D7.1	Impact areas and paths	WP7	3 - LuxMobility	Report	Public	6
D7.2	Impact indicators	WP7	10 - UMA	Report	Public	8
D7.3	Data analysis of user acceptance from trials and simulations	WP7	6 - UNIVLEEDS	Report	Public	32

Deliverable Number[14]	Deliverable Title	WP number[9]	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D7.4	Long term impact analysis with a system-dynamics model	WP7	6 - UNIVLEEDS	Report	Public	32
D8.1	Common issues, approaches and lessons learned across all modes for Industry and Public Authorities	WP8	3 - LuxMobility	Report	Public	24
D8.2	Guide2Autonomy	WP8	3 - LuxMobility	Websites, patents filling, etc.	Public	24
D8.3	Filled Guide2Autonomy	WP8	1 - LIST	Websites, patents filling, etc.	Public	33
D9.1	Plan for promotion of results	WP9	2 - ACI	Report	Public	2
D9.2	Communication material and Website	WP9	13 - RDGFI	Websites, patents filling, etc.	Public	4
D9.3	Preliminary exploitation framework	WP9	13 - RDGFI	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D9.4	Final exploitation framework	WP9	13 - RDGFI	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D10.1	H - Requirement No. 3	WP10	1 - LIST	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

1.3.3. WT3 Work package descriptions

Work package number [9]	WP1	**Lead beneficiary** [10]	1 - LIST
Work package title	Project Management, Coordination and Quality Control		
Start month	1	**End month**	36

Objectives

To ensure effective coordination of the project and to implement efficient administration
To facilitate professional communication between project partners and external stakeholders
To coordinate the communication between the Consortium and the European Commission
To arrange required documentation and timely reporting by using a collaborative working environment
To solve financial issues and controlling of the appropriate use of resources (personnel, finance,equipment etc.)
To assess the quality of the R&D activities and their compliance with ethical standards
To oversee legal compliance and promote the exploitation of IPs
To monitor potential risks and plan and execute mitigation measures

Description of work and role of partners

WP1 - Project Management, Coordination and Quality Control [Months: 1-36]
LIST, ACI, LuxMobility, RDS Driving, ETELÄTÄR, UNIVLEEDS, LIV, UBFC, ExaMotive S.A., UMA, E-Bus, EBU, RDGFI
LIST, as coordinator is responsible for WP1 and LuxMobility supports LIST with respect to reporting, monitoring, and quality management.
Task 1.1 Organisation and Administration (lead partner: LIST; participants: LuxMobility, all) (duration: M01-M36) LIST has the final responsibility for the overall organisation of the project. LuxMobility will be in charge of the day-to-day administration of the project supported by LIST, using classic project management tools and techniques to ensure qualitative and timely results according to the project's objectives.

Task 1.2 Coordination and Communication (lead partner: LIST; participants: LuxMobility) (duration: M01-M36)
The Coordinator (LIST) will be responsible for
Monitoring the collaboration among the PAsCAL partners (community management)
Coordinating communication between the consortium bodies and committees based on the management structure described in Section 3.2.
Managing relationship with related activities in the H2020 program and in the research related community.

Task 1.3 Reporting and Monitoring of Work Progress (leader: LIST; participants: LuxMobility) (duration: M01-M36)
The Administrative reporting and monitoring will be the responsibility of the Project Manager assisted by (LuxMobility) to make sure that they are timely reporting:
Collecting, compiling and editing input from all partners for the 4-monthly internal financial reports and 4-monthly activity report. These will help identify and reduce potential risks.
LIST validates and submits the mandatory periodic and the final reports to the EC within 60 days after the end of each reporting period.
LuxMobility arranges the review meeting with the EC around the end of the 1st and 2nd reporting period.
All reports will strictly follow the "Guidelines on project reporting" for H2020 collaborative projects.

Task 1.4 Financial Management and Controlling (lead partner: LIST; participants: LuxMobility) (duration: M01-M36)
LIST will be responsible for distributing the EC contribution to partners according to the payment scheme as defined in the Consortium Agreement and for approving financial statements of partners as part of the Periodic reports of the Action. LuxMobility will monitor the appropriate use of resources by all partners and assist all partners on financial issues.

Task 1.5 Quality Management (lead partner: LuxMobility; participants: LIST, UNIVLEEDS) (duration: M01-M36)
In order to guarantee a quality assurance process during the overall project, LuxMobility provides a Quality plan in M02 and the Steering Committee will appoint a Quality Manager at LuxMobility. The plan includes deliverable writing procedures, document templates and coding, internal flow of information procedures, communication procedures, information about deliverable submission and the peer review process. The Quality Manager ensures a high level of quality with regard to standard operational procedures to run the use case studies (WP4), compliance to legal standards

and regulations in countries involved and ethical assurance audit as part of the risk assessment (cf. below). This involves aspects such as data quality and privacy, as well as security assurance (confidentiality, integrity and availability) in WP 2. UNIVLEEDS implements and controls the peer review process. LIST contributes to the production of the Project Management plan and Quality Handbook. Task 1.5 delivers D1.1, D1.3 and D1.4.

Task 1.6 Risk Assessment and Management (lead partner: LIST; participants: LuxMobility, UNIVLEEDS) (duration: M01-M36)
The Risk Manager will undertake a risk assessment at M03. The continued monitoring of potential risks and the coordination of contingencies throughout the project implementation (cf. contingency plan) will help reduce the likelihood of risks as well as their impact. LIST mitigates project risks, LuxMobility mitigates operational risks and UNIVLEEDS mitigates risks related to pilot execution. Task 1.6 delivers D1.2.

Participation per Partner

Partner number and short name	WP1 effort
1 - LIST	7.00
2 - ACI	0.50
3 - LuxMobility	6.00
4 - RDS Driving	0.50
5 - ETELÄTÄR	0.50
6 - UNIVLEEDS	1.50
7 - LIV	0.50
8 - UBFC	0.00
UTBM	0.50
9 - ExaMotive S.A.	0.50
10 - UMA	0.50
11 - E-Bus	0.50
12 - EBU	0.50
13 - RDGFI	0.50
Total	19.50

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.1	Project Management Plan and Quality handbook	3 - LuxMobility	Report	Confidential, only for members of the consortium (including the Commission Services)	2
D1.2	Risk Management Plan	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	3

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D1.3	Updated detailed Project Management Plan with a Gantt chart and a Work Breakdown Structure	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D1.4	Final Project Management Plan with Gantt chart and a Work breakdown structure	1 - LIST	Report	Confidential, only for members of the consortium (including the Commission Services)	36

Description of deliverables

D1.1 : Project Management Plan and Quality handbook [2]

D1.1 Project Management Plan and Quality handbook with a gantt chart and a work breakdown structure including a quality plan and communication guidelines are provided (Project guidelines, incl. quality plan and communication rules) (M02) (Task 1.1).

D1.2 : Risk Management Plan [3]

D1.2 Risk Management Plan documents the processes, tools and procedures that will be used to manage and control those events that could have a negative impact on the project implementation (M03) (Task 1.6).

D1.3 : Updated detailed Project Management Plan with a Gantt chart and a Work Breakdown Structure [4]

D1.3 Following the initial preparation of the project, a management plan and work breakdown integrated in the Project quality handbook and mid-term update will be prepared (M18) (Task 1.5).

D1.4 : Final Project Management Plan with Gantt chart and a Work breakdown structure [36]

D1.4 Following the initial and mid-term preparation of the project,a management plan and work breakdown integrated in the Project quality handbook (M36) (Task 1.5).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification

Work package number [9]	WP2	Lead beneficiary [10]	6 - UNIVLEEDS
Work package title	Ethics and Data Protection		
Start month	1	End month	33

Objectives

To ensure compliance to ethical and data protection standards with an Ethical Advisory board
To formulate data management and ethics related policies and procedures inside the project
To ensure that informed consent procedures and data storage policies are followed across the relevant partners
To include in the guidelines of PAsCAL instructions on how to deal with the sensitive user groups (e.g.people with special needs) that will be involved in the project
To formulate guidelines on "what - how - to whom" data collections related to Surveys (WP3), Use Cases (WP4), Capacity building (WP5) and the Pilots (WP6) monitored by a Data Advisory Group

Description of work and role of partners

WP2 - Ethics and Data Protection [Months: 1-33]
UNIVLEEDS, LIST, ACI, LuxMobility, UBFC, UMA
Task 2.1 Ethical Advisory Board (lead participant: UMAN; participants: LIST, LuxMobility) (duration: M01-M33)
An Ethical Advisory Board (EAB) is established which includes relevant independent expertise to monitor the ethical concerns in this project. The EAB will be installed as required to monitor the ethical concerns in PAsCAL. Members will be selected within the Consortium as well as affiliated organisations (e.g. RNIB) by the Steering Committee. The EAB will be participating in the relevant monthly WP leader telephone/web conferences and in the review of the 4-monthly internal activity reports. UMA is the contact point for the EAB members, and coordinates the EAB activities.

Task 2.2 Ethics guideline (lead participant: UMA; participants: LIST, LuxMobility, UBFC) (duration: M01-M04)
The Ethics Handbook provides a context specific ethics-by-design and by-default methodological approach, the implementation of which will be closely monitored by the EAB. The Handbook will:
make available templates of the informed consent forms, information sheets etc.;
templates of permission; templates of notifications/authorizations for the collection and/or processing of the personal data;
other consent documents, if needed or relevant for research around CAV.
The ethics issues raised by each consortium member of the project will be analysed and accordingly measures will be taken to ensure compliance with the ethical standards of H2020, of GDPR and the project consortium. UMAN delivers the handbook with contributions from LIST and UBFC. LuxMobility validates the handbook. Task 2.2 delivers D2.1.

Task 2.3 Data Advisory Board (lead participant: UNIVLEEDS; participants: LIST, LuxMobility, UBFC) (duration: M01-M33)
A Data Advisory Board (DAB) is appointed by the Steering Committee which includes relevant independent expertise to monitor the data collection, storage, handling, analysis and recording activities in this project. A report by the DAB will be submitted with the periodical reports. The DAB will be installed as required to monitor data concerns in PAsCAL. Members will be selected within the Consortium as well as affiliated organisations (e.g. Digital Lëtzebuerg). UNIVLEEDS is the main contact point for the DAB members and coordinates the EAB activities.

Task 2.4 Data management and setup (lead participant: UNIVLEEDS; participants: LIST, ACI, UBFC) (duration: M01-M33)
The PAsCAL project will involve the collection of personal data (Survey data in WP3, use cases in WP4, WP5 and Pilots in WP6), stored in a protected Intranet server, which together with an appointed Data Protection responsible will guarantee the security of the data. The security policy follows three axes: the Intranet is not directly and openly connected to the Internet (Encryption), only allowed equipment can access to the intranet and access rights are delivered based on collaborator's functions and activities (ISO9001). UNIVLEEDS provides the data server and is consulted by LIST, ACI and ETELÄTÄR to match with all needs of data related issues in PAsCAL. Task 2.4 delivers D2.2., D2.4 and D2.6

Task 2.5 Data Protection and Ethics Handbook (lead participant: UNIVLEEDS; participants: LIST, LuxMobility, ACI) (duration: M01-M33)
The Handbook will provide details on:
the procedures for data collection, storage, protection for the wider autonomious vehicle and transport community

retention, transfer, destruction or re-use (including collection methodology, methods of storage and exchange, data structure and preservation, data-merging or exchange plan, commercial exploitation of data sets etc.); details on data safety procedures; confirmation that informed consent has been obtained.
UNIVLEEDS delivers D2.3. LIST and ACI contribute with their expertise on data protection and validate the procedures of D2.3.
UNIVLEEDS delivers D2.5. LIST, LuxMobility and ACI contribute to the development of a European Data and Ethics handbook in the field of autonomous driving, vehicles and usages of humans and data.

Participation per Partner

Partner number and short name	WP2 effort
1 - LIST	5.50
2 - ACI	1.00
3 - LuxMobility	5.50
6 - UNIVLEEDS	6.50
8 - UBFC	1.00
UTBM	1.00
10 - UMA	3.50
Total	24.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D2.1	Ethics Handbook	10 - UMA	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D2.2	Data Management Setup	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Confidential, only for members of the consortium (including the Commission Services)	4
D2.3	Data Protection Handbook	6 - UNIVLEEDS	Report	Confidential, only for members of the consortium (including the Commission Services)	4
D2.4	Intermediate Data Management Plan	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Confidential, only for members of the consortium (including the Commission Services)	18
D2.5	European Data and Ethics handbook in the field of autonomous	6 - UNIVLEEDS	Report	Public	32

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
	driving, vehicles and usages of humans and data				
D2.6	Open Research Data Report	6 - UNIVLEEDS	ORDP: Open Research Data Pilot	Public	32

Description of deliverables

D2.1 : Ethics Handbook [4]

D2.1 Ethics Handbook documents the different templates and required documents to handle ethics (M04) (Task 2.2).

D2.2 : Data Management Setup [4]

D2.2 Data management setup documents the data sets incl. access and encryption, responsibilities, and data infrastructures (M04) (Task 2.4).

D2.3 : Data Protection Handbook [4]

D2.3 Data Protection Handbook describes the data management life cycle for the data to be collected, processed and/or generated by the project (M04) (Task 2.5).

D2.4 : Intermediate Data Management Plan [18]

An intermediate deliverable reporting in relation to the Open Research Data Pilot is provided. It will update the initial DMP with among other (but not limited to): new data changes in consortium policies (e.g. new innovation potential, decision to file for a patent) changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving).

D2.5 : European Data and Ethics handbook in the field of autonomous driving, vehicles and usages of humans and data [32]

D2.4 European Data and Ethics handbook in the field of autonomous driving, vehicles and usages of humans and data. The handbook will include several recommendations in order to address ethical issues and open access to research data (M32) (Task 2.2).

D2.6 : Open Research Data Report [32]

D2.5 A final deliverable reporting in relation to the Open Research Data Pilot is provided (M36) (Task 2.5). It will update the intermediate DMP with among other (but not limited to): new data changes in consortium policies (e.g. new innovation potential, decision to file for a patent) changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	Ethics and Data Protection Boards	10 - UMA	4	Ethics & Data Advisory Board setup and two handbooks available

Work package number [9]	WP3	Lead beneficiary [10]	10 - UMA
Work package title	Comprehensive Assessment of Public Acceptance		
Start month	1	End month	36

Objectives

To develop a multidimensional map of public acceptance for higher levels of CAV
To optimize connected and automated transport solutions for current non-drivers
To assess attitudes towards shared modes of transport and the inclusion of CAV as part of fleets
WP3 contributes mainly to the achievement of OB01, OB02 and OB03 (see Section 1.1).

Description of work and role of partners

WP3 - Comprehensive Assessment of Public Acceptance [Months: 1-36]
UMA, LIST, ACI, LuxMobility, ETELÄTÄR, UNIVLEEDS, UBFC, ExaMotive S.A., E-Bus, EBU
Task 3.1 Creation of inclusive pool of item measures (lead partner: UMAN; participants: LIST, ACI, LuxMobility, RDS Driving, ETELÄTÄR, UNIVLEEDS, ExaMotive S.A., E-Bus, EBU) (duration: M01-M05)
First, an inclusive pool of questionnaire items measuring acceptance and concerns will be created based on previous H2020 projects (Autopilot, CARTRE, CityMobil2), peer reviewed scientific journals (Kyriakidis, Happee, & de Winter, 2015; Nordhoff, van Arem, & Happee, 2016) as well as grey papers from industry and administrations (KPMG, Threlfall, 2018) in cooperation with LIST, LuxMobility and UNIVLEEDS. Second, semi-structured expert interviews are conducted to identify key consequences of different CAV solutions, and missing dimensions of acceptance and concern. Interviewees include representatives of public transport providers (Münchner Verkehrs- und Tarifverbund, external expert), regional planning authorities (Munich city council, external expert), European blind association (EBU, consortium partner), vehicle manufacturers involved in CAV development (EBUS (i.e. Volvo Buses), consortium partner), shared mobility service providers (ExaMotive S.A., consortium partner), automobile clubs (ACI, consortium partner) and driving schools (RDS Driving, consortium partner). Third, using a theory driven, deductive method an initial pool of items covering all relevant aspects of acceptance and concern is developed based on the results of the literature review and the expert interviews (with ETELÄTÄR). The initial item pool is documented in a first version of D3.1.

Task 3.2 Initial assessment of acceptance dimensions and citizen clusters (lead partner: UMA, participants: ACI, ExaMotive S.A., E-Bus) (duration: M05-M12)
The item pool will be administered to a sample of 1,000 participants consisting of a sample of vehicle owners, professional drivers (recruited via ACI), blind and partially-sighted people (recruited by EBU in 4 EBU member states such as Germany, Spain, Slovenia, The Netherlands etc.), shared-fleet users (recruited via Examotive S.A.), users of autonomous public transport and an ad hoc sample from a panel service (e.g. Crowdflower). The database is used to detect redundancies among items, to detect dimensions of acceptance/concern and to form clusters of respondents. The result will deliver insights into relevant dimensions of acceptance and will allow to reduce the item pool for further validation and economic application. It will also inform the simulation studies to be conducted in Task 4.1 and Task 4.2 of WP4. This task updates the item pool in D3.1 and at M10 this task will provide first substantial input to WP4 and WP5.

Task 3.3 Behavioral and experimental validation of assessment instrument (lead partner: UMAN; participants: LIST, ACI, ETELÄTÄR, UNIVLEEDS, ExaMotive S.A.) (duration: M12-M30)
The multiple dimensions of the CAV acceptance is validated using behavioural measures and experimental procedures. First, dimensions of CAV acceptance are related to behavioral measures to control for prominent biases associated with the use of self-report assessment (e.g., lack of introspection, social desirable responding). These include reaction-time based measures to assess attitudes towards CAVs (LIST) and big data related to behavioral vehicle usage (provided by EXAM). Second, we use discrete choice experiments to extract the most relevant aspects of CAV solutions (ETELÄTAR). Experimentally, we will vary the prominence of different consequences of large scale CAV introduction and assess dimension-specific changes in acceptance. We will employ a sample of 1,000 participants recruited via professional portals and provided by ACI and ExaMotive S.A.. Overall, this task will reveal the cognitive-affective components underlying different dimensions of acceptance and provide the key insights needed to design interventions to increase acceptance (WP5) before M18 (with UNIVLEEDS). This task will finalise D3.1 and will describe the final measurement instrument, called CAVA, in D3.3 (M30).

Task 3.4 Multi-dimensional map of public acceptance for higher levels of connectivity and automation in transport (lead partner: UMA; participants: LuxMobility, UNIVLEEDS) (duration: M21-M30)
The final validation step will include a representative sample with 5,000 participants from nine European countries (Austria, Belgium, Bulgaria, France, Germany, Italy, Luxembourg, Spain, UK) recruited with the help of professional panels and local consortium partners to cover a wide range of population size and per capita GDP. The validation will verify the structure of the instrument, including the dimensions of acceptance and citizen clusters, and add the geo-spatial dimension to the multidimensional acceptance map. Care will be taken to ensure partial comparability to previous assessments of acceptance to detect possible changes across time. It will also help to develop the policy form of this instrument to be used by decision makers across Europe in WP8. This task will result in D3.2 (with UNIVLEEDS) and will be an essential input for WP8.

Task 3.5 Assessment tool development (lead partner: LIST; participants: LuxMobility, ETELÄTAR, UNIVLEEDS, UMA) (duration: M26-M36)
The last phase will rely on a user-centered design approach (ISO 9241-10) to ensure the best possible user experience of the tool and to partially configure and administer the survey to a wide array of stakeholders. LIST will adapt the assessment tool Cross Skill™ for those dimensions where accurate self-assessment are relevant. Cross Skill™ allows creating questions items from the multi-dimensional map automatically. The Task will be supported by LuxMobility who has significant experience in UX design and ETELÄTÄR who provides practical insights in usability testing. This task will implement measured defined in D3.1 and produce D3.4.

Participation per Partner

Partner number and short name	WP3 effort
1 - LIST	7.00
2 - ACI	2.00
3 - LuxMobility	3.50
5 - ETELÄTÄR	3.50
6 - UNIVLEEDS	6.50
8 - UBFC	1.00
UTBM	0.50
9 - ExaMotive S.A.	3.50
10 - UMA	10.00
11 - E-Bus	1.00
12 - EBU	4.00
Total	42.50

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D3.1	User-centered recommendations	10 - UMA	Report	Public	18
D3.2	360°Acceptance Map	10 - UMA	Report	Public	30
D3.3	CAVA (Connected and Autonomous Vehicles	10 - UMA	Report	Public	30

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
	Acceptance Assessment Tool)				
D3.4	Cross Skill ™	1 - LIST	Demonstrator	Public	36

Description of deliverables

D3.1 : User-centered recommendations [18]

D3.1 User-centered recommendations documents target-group specific recommendations for optimizing connected and automated solutions for current non-drivers based on the survey and construct validations (M18) (Task 3.1-3.3).

D3.2 : 360°Acceptance Map [30]

D3.2 360°-Acceptance Map delivers a multidimensional map indicating who (defined clusters of people) accepts what (implications of highly connected and automated transport), where (geographically) and why (motivators and barriers to support) - as the result of the five country validation resulting in a (M30) (Task 3.3).

D3.3 : CAVA (Connected and Autonomous Vehicles Acceptance Assessment Tool) [30]

D3.3 CAVA describes a modular Connected and Autonomous Vehicles Acceptance Assessment Tool that research institutes and industry can use to predict how customers adopt and accept different CAV solutions including benchmark values (M30) (Task 3.3).

D3.4 : Cross Skill ™ [36]

D3.4 Cross Skill ™ provides a tool which realises those acceptance dimensions which can be self-assessed, adapted by LIST to PAsCAL needs (M36) (Task 3.5).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS2	Acceptance measure	10 - UMA	10	Report on measure available to give first preliminary input to other WP

Work package number [9]	WP4	Lead beneficiary [10]	8 - UBFC
Work package title	Scenarios Design and Simulation Systems		
Start month	9	End month	22

Objectives

To apply the survey developed in WP3 to participants exposed to CAVs
To collect attitudes, acceptances of participants exposed to CAV contexts (pedestrians, passengers) and user behaviours during the simulated use of CAVs
To optimize connected and automated transport solutions for current non-drivers
To assess and elaborate common issues, approaches and lessons learned across all modes
WP4 contributes to the achievement of OB02 and OB03 (see Section 1.1).

Description of work and role of partners

WP4 - Scenarios Design and Simulation Systems [Months: 9-22]
UBFC, LIST, ACI, UNIVLEEDS, LIV, UMA, RDGFI
Task 4.1 Definition of the simulation experiments (lead partner: UBFC; participants: LIST, ACI, UNIVLEEDS, LIV, UBFC, UMA) (duration: M09-M13)
By integrating the first results of WP3, we will elaborate:
Experimental hypotheses defining the experiment definition and the variables to be tested;
Use cases relevant to the activity planned by the WP3 participants
The associated experimental protocols that will implement the appropriate simulators as well as subjective (attitude and acceptance) and objective (behaviour and physiological parameters) measurement tools.
We will also explore the ethics issues following WP2 guidelines and have them validated by the Ethical Advisory Board in order to ensure the physical and moral integrity of each participant. This task produced a first version of D4.1.

Task 4.2 Development and performing of the simulation experiments (lead partner: UBFC; participants: LIST, ACI, UNIVLEEDS, LIV, RDGFI, UMA) (duration: M12-M20)
Each experiment will engage the adequate simulator(s), for example:
The driving simulator (provided by UBFC) or the PAV simulator (provided by LIV) for those involving drivers to analyse and enhance drivers' behavior in different scenarios
The home study simulator (provided by LIST) will be used to assess driver behaviour and acceptance over a six month trial period. This will follow an initial assessment phase, followed by repeated exposure to a range of scenarios (and variables) at home and a final assessment step. Further, the home study platform to test the impact of a variety of traffic conditions (e.g. dense vs. non-dense, freight vs. passenger, conventional vs. automated traffic, mix, etc.) on "driver" behaviour/reaction.
The virtual reality (VR) platform/VR helmets (provided by UBFC) or the PAV simulator (provided by ULIV) for those involving non-drivers to assess the acceptance of different types of CAVs by vulnerable road users, members of the public, etc.
Some of these simulators will be combined with the cabin layout simulator (provided by UBFC).
We will also have to adapt and/or update the simulators, to model 3D environments, to program new simulation features (road networks, aerial trajectories, pedestrians'/cyclists' behaviours, etc.) and to design dedicated HMIs to provide users with e.g. feedback about the vehicle's behaviour and/or entertainment systems including VR/AR technologies (provided by LIST, UBFC and RDGFI) in order to address the scenarios needs. Several communication channels will be experimented i.e. audio, visual, touchable devices to, for example, support the trial with vulnerable travellers with CAV defined in WP6 or adopt the home study simulator with respect to competency assessment for WP5.
The simulators are the following:
From LIST. Home study platform. This is a distributed platform consisting of a home application and a cloud based server architecture. The studies take place in the end users home with each one installing a client application and a low-cost steering wheel (€200-€300). This was built from scratch at LIST so we can customise it.
From LIV. HELIFLIGHT-R consists of a 12-ft visual dome mounted on a six-degree-of-freedom motion platform. The system utilises general purpose Linux-based computers to drive the simulator from a central Instructor– Operator Station (IOS) PC. The IOS PC is connected to a local network that allows communication with each of the other elements of the system – three image generation (IG) machines that produce the visual environment, one machine to run the reconfigurable instrument panel displays (left and right primary flight displays, backup analogue displays and Head Up

Display), and a machine for the Instructor Station within the dome, which serves a dual purpose by creating the audio environment. In addition, the network is connected to the control interfaces for the control loading and motion systems.
From ETELÄTÄR. Apertum is a smart e-platform offering real-time accessible public transport routeing to vulnerable and non-conventional transport users, such as the elderly, the disabled, pregnant women, parents with a baby stroller, travellers with heavy luggage. It connects these user groups to the public transport systems by building dynamic "bridges" that avoid non-accessible stations or stops from public transport services such as metros, light rails and trams. Apertum is accessible through app or website.
From UBFC. SIMERCOS | Driving Simulator. This driving simulator allows to observe and measure the driver behaviours in many realistic, controlled and repeatable driving situations. It collects a large amount of driving data (speed, acceleration, vehicle position…) and it is generally combined with an embedded eye tracking system. PREVERCOS | Virtual Reality Platform. The virtual reality platform allows to immerse the user in a virtual environment and to set up interactions between the user and this virtual environment. Thus, we can perform some tests that are impossible to realize in the real word. In the PAsCAL project, the VR platform could allow to confronte the user (pedestrian, cyclist…) with any interesting situation including CAVs.

The panel of participants will be recruited by LIST, UBFC and LIV, as well as ACI for vehicle owners.
Once pre-tested, the experiments will take place at UBFC if they engage the driving simulator or the VR platform, at ULIV if they engage the PAV simulator, or will be administered remotely by LIST when they engage the home study simulator.
UNIVLEEDS and UMA will be specifically associated for managing the subjective measures.
This task finalises D4.1 with more concrete description of the implementation and performing the studies.

Task 4.3 Results analysis, lessons learned and cross-fertilisation (lead partner: UNIVLEEDS; participants: LIST, LIV, UBFC, UMA) (duration: M19-M22)
This task will integrate the findings related to the different simulations and simulators use:
Correlating and analysing driver behaviour/reaction under different scenarios;
Analysis of the acceptance of new interfaces integrated in the simulators, including information feedback and entertainment systems.
Writing guidelines describing ways to improve the CAVs design, so they will be useful and acceptable to future real users, and the future drivers' trainings;
Enriching WP3's multidimensional map of public acceptance by:
Adjudicating on research hypotheses in psychology. For example: are the attitudes measured in WP3 in line with users' behaviours observed in WP4? (Theory of cognitive dissonance)
Identifying multidimensional maps of other forms of acceptance and enrich the existing ones;
Testing the ecological validity of WP3 results, i.e. verifying that the attitudes and behaviours identified in WP3 are also observed during the WP4 tests in a simulated environment.
Write guidelines for WP6 pilot specifications (e.g., to design new use cases involving autonomous public transport and to define some variables which deserve to be tested in real conditions).
This task produces D4.2.

Participation per Partner

Partner number and short name	WP4 effort
1 - LIST	13.50
2 - ACI	2.00
6 - UNIVLEEDS	3.50
7 - LIV	6.00
8 - UBFC	1.00
UTBM	28.00
10 - UMA	3.50
13 - RDGFI	7.00
Total	64.50

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D4.1	Scenarios and experimental protocols	8 - UBFC	Report	Public	20
D4.2	Guidelines and recommendations from simulations	6 - UNIVLEEDS	Report	Public	22

Description of deliverables

D4.1 : Scenarios and experimental protocols [20]

D4.1 Scenarios and experimental protocols provides a synthesis of the scenario design and a detailed description of the experimental protocols (M20) (Task 4.1).

D4.2 : Guidelines and recommendations from simulations [22]

D4.2 Guidelines and recommendations from simulations presents the experiments outcomes and recommendations for WP5 and WP6 (M22) (Task 4.3).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS3	Simulators ready for use	8 - UBFC	20	All simulators up and running.

Work package number [9]	WP5	**Lead beneficiary** [10]	2 - ACI
Work package title	Capacity Building, Training and Education		
Start month	10	**End month**	24

Objectives

To investigate new "driver" training needs and certification requirements for new technologies/levels of automation
To understand how CAV users and non-users cognitively perceive and treat situations in CAV
To develop and pre-test training solutions to enhance driver's behaviour in different scenarios
WP5 contributes to the achievement of OB05 and OB07 (see Section 1.1).

Description of work and role of partners

WP5 - Capacity Building, Training and Education [Months: 10-24]
ACI, LIST, LuxMobility, RDS Driving, UMA
Task 5.1 Define the requirements of a CAV environment with specific reference to a road educational environment (lead partner: ACI; participants: RDS Driving, LuxMobility, UMA) (duration: M10-M16)
Basing on the inputs received from WP3 and WP4, the task will assess and define the characteristics of a road educational CAV environment, taking into consideration the different requirements connected to the different levels of automation and to increased degrees of connectivity. UMA transfers the results from WP3 to WP5 and helps to define learning objectives. ACI and RDS Driving will provide the need from a classical driving school environment. ACI will contribute also from the perspective of a safe driving centre and high school students. The task will contribute to D5.1.

Task 5.2 Adopt home study simulator to address road educational issues and implement training and educational scenarios (lead partner: LIST; participants: ACI, RDS Driving) (duration:M12-M24)
In close cooperation with Tasks 5.1 and the input from WP4, through the use of the home study simulator, the task will develop the appropriate simulation environment to be used to assess training needs referred to all categories of road users. This task follows an iterative development approach to implement intermediate feedback from the three following tasks where the solution is progressively tested. This task produces D5.2 and runs iteratively in parallel with the tasks 5.4, 5.5, and 5.6 to improve the home study simulator.

Task 5.3 Derive cognitive models and define competence models (lead partner: LIST, participants: ACI, RDS, UBFC, UMAN) (duration: M13-M20)
This task extends the first version of the cognitive model produced in WP4. LIST observes 25 drivers and defines a cognitive model which describes the cognitive and affective processes and their dependencies during specific driving situations using thinking aloud, electrocardiogram, and eye tracking. UMAN will in addition analyse the video recordings made during the study to cross-validate the outcomes provided by LIST. UMAN will define cognitive requirements, potential cognitive shortcomings and analyse affective reactions. LIST develops with ACI and RDS a competence model (i.e., knowledge, skills and behavioral elements). The model is the basis to develop a new training approach that addresses typical incidents and situations in CAV driving. This task finalises D5.1.
Thanks to the observation data, LIST will build several cognitive and competence models in order to define the skills, knowledge and behavior of the drivers. In addition to the help of content specialist and literature review, the observation of a representative sample of 25 drivers allow us to cover the variation in driving styles and habits (gender, age, nationality, etc.). If not, additional drivers will be recruited. A particular attention will be given to the granularity of the skills and cognitive processes identified, allowing to cover the variation in driving styles and habits. The cognitive model will also take into account the cognitive affective components from WP3 (Task 3.3, e.g. co cognitive dissonance), when the observational studies take place in the simulators.

Task 5.4 Develop and test a specific training programme for trainers in CAV environment (lead partner: ACI; participants: LIST, RDS Driving) (duration: M15-M22)
ACI and RDS design the educational scenarios and detailed interaction tasks between driver and simulation environment, which create D5.2. LIST contributes to the design of the interaction task and validates their consistency with the competence models developed in D5.1. This task will perform the progressive identification of specific needs and characteristics of the training for driving instructors in a CAV environment, taking into consideration the different requirements related to different levels of CAV development. The task will be carried out by bringing together the know-how of 20 qualified driving instructors from each of the two driving schools networks in UK (RDS Driving) and Italy (ACI's Ready2Go). This task contributes to D5.3.

Task 5.5 Develop and test road education modules for drivers in a CAV environment (lead partner: ACI; participants: LIST, RDS Driving, UMA) (duration: M15-M23)
ACI and RDS design the scenarios and detailed interaction tasks between driver and simulation environment, which creates D5.2. LIST contributes to the design of the interaction task and validate their consistency with the competence models developed in D5.1. This task will draw up guidelines for driving schools to teach how to drive in different CAV development environments. To this end, tests will be carried out using driving schools and instructors in five Italian and five English cities. The sessions will be scheduled with 135 drivers in each country to be able to analyze and adapt progressively the results. Parallel test sessions will be conducted at ACI's safe driving centre. UMAN will investigate the impact of education towards user acceptance. This task contributes to D5.3.

Task 5.6 Develop and test a specific road education modules for professional drivers in CAV environment (lead partner: ACI; participants: LIST) (duration: M15-M24)
ACI designs the scenarios and contribute to D5.2. LIST contributes to the design of the interaction task and validate their consistency with the competence models developed in D5.1 Based on lessons learned from the previous tasks, specific tests will be carried out at ACI's safe driving centre with 20 professional drivers to evaluate differences and similarities in road education needs between professional and "ordinary" drivers. This task finalises D5.3.

Participation per Partner

Partner number and short name	WP5 effort
1 - LIST	12.50
2 - ACI	3.50
ACI INFORMATICA	8.00
3 - LuxMobility	2.00
4 - RDS Driving	11.50
10 - UMA	2.50
Total	40.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D5.1	Requirements and competence models for CAV relevant training situations	1 - LIST	Report	Public	20
D5.2	Educational scenarios and tasks for CAV relevant training situations	1 - LIST	Report	Public	24
D5.3	Tested simulation-based training solutions and training modules	2 - ACI	Demonstrator	Public	24

Description of deliverables

D5.1 : Requirements and competence models for CAV relevant training situations [20]

D5.1 Requirements and competence models for CAV relevant training situations documents how training solutions needs to be developed and defines the knowledge and skills to be acquired during training (M20) (Task 5.1 & 5.3).

D5.2 : Educational scenarios and tasks for CAV relevant training situations [24]

D5.2 Educational scenarios and tasks for CAV relevant training situations defines the situations incl. contextual information and the type of interaction between user and home study simulator (M24) (Task 5.2).

D5.3 : Tested simulation-based training solutions and training modules [24]

D5.3 Tested simulation-based training solutions and training modules documents the execution inlc. results of the simulation-based training situations for drivers, driving instructors and certificators, and professional drivers (M24) (Task 5.4-5.6).

Schedule of relevant Milestones

Milestone number[18]	**Milestone title**	**Lead beneficiary**	**Due Date (in months)**	**Means of verification**
MS4	First version of Home Study Simulator incl. scenarios	4 - RDS Driving	18	Simulator ready to be used in v1.0 and learning scenarios implemented

Work package number [9]	WP6	Lead beneficiary [10]	5 - ETELÄTÄR
Work package title	Pilot Implementation		
Start month	16	End month	30

Objectives

- To coordinate all activities related to pilots setup till execution
- To identify, test and validate solutions to enhance driver's behaviour in different scenarios
- To assess and elaborate common issues, approaches and lessons learned across all modes
- To assess the user's acceptance in the presence of CAV 'experience'

WP6 contributes to the achievement of OB02, OB03, OB06 and OB07 (see Section 1.1).

Description of work and role of partners

WP6 - Pilot Implementation [Months: 16-30]
ETELÄTÄR, LIST, ACI, LuxMobility, RDS Driving, UNIVLEEDS, UBFC, ExaMotive S.A., UMA, E-Bus, EBU
WP6 will follow an incremental and iterative approach to validate the solutions developed in WP3, and provide guidelines for further refinement. In addition, the pilots will also provide validation of outcomes in WP5 involving capacity building and training education in a real CAV environment, and validation of simulated behaviour in WP4, based on experimental evidence in real situations. Moreover, the pilots will contribute to further investigate the main factors that influence user acceptance of CAVs. By comparing the knowledge before and after the pilots are conducted, improvements in user acceptance can be quantified to extrapolate further implications for governments and the automotive industry. Qualitative and quantitative data from various sources, such as devices, surveys, interviews and focus groups, will be collected for analysis in WP7.

Task 6.1 Pilot methodology (lead partner: S3I; participants: LuxMobility, UNIVLEEDS, UBFC, UMA, EBU) (duration: M16-M22)
The task will devise a methodology for addressing the requirements and specifications for the selected pilots. This will be used to derive a common set of specifications so that all pilots will be feasible, reliable, on time, and that common issues will be easy to compare across pilots. It will then provide a set of extended specifications, wherever appropriate, so that the results from the selected use cases are balanced and complementary. It will also derive a checklist from the ethics and data privacy handbooks to guide the pilots. The checklist will be tailored to suit the particular characteristics of each use case and the profiles of the end-users involved. Specific attention will be paid to the needs and characteristics of the blind and partially-sighted people, which will be involved in the sub-task 6.3.1.
The evaluation criteria developed in WP7 will be incorporated into the designing to guarantee that all pilots are collecting the required information needed for the evaluation activities. This task provides D6.1.

Task 6.2 Pilot setup (lead partner: ETELÄTÄR; participants: ACI, ExaMotive S.A., UMA, E-Bus) (duration: M19 - M24)
This task will carry out the preparation of the PAsCAL demonstrations and also monitor that the pilots are able to start harmonised and smooth execution phase. Its main activities are:
Baseline analysis will be provided for each of the demonstrations, including the baseline values of the agreed KPIs defined in WP7. Data to calculate the KPIs will come from several sources such as literature review, surveys in WP3, simulations in WP4, and cognitive models in WP5.
Site preparation and tests will ensure that the PAsCAL specific software and hardware components are verified, validated and ready for implementation.
Preparing the public will, in cooperation with WP3 and WP8, undertake wide awareness campaigns in each pilot site in advance the start of the demonstrations period to attract the interest by a large number of users and stakeholders. Such campaigns will be undertaken via a number of channels including local press and media announcements, announcements in relevant local and national authorities, websites and social networks, posters and leaflets at key locations.
Design of pilot dry-run tests and the main pilot studies
This task provides D6.2.

Task 6.3 Pilot running and coordination (lead partner: ETELÄTÄR; participants: LIST, UNIVLEEDS) (duration: M20-M30)
The pilot coordination is to monitor that the demonstrations run smoothly and that the necessary data are being collected. This task will also conduct short pilot dry-run tests in each pilot with a limited number of participants, to verify that all

aspects involved operate smoothly before the demonstrations start. It will also verify that the data are collected according to the requirements of WP7 and that the KPIs can be calculated. After the completion of all pilots this task delivers D6.3.
Sub-task 6.3.1 "High-capacity autonomous bus operations" (lead partner: E-Bus; participants: LIST, LuxMobility, UNIVLEEDS, EBU) (duration: M20-M28)
The pilot will focus on analysing passenger acceptance and attitude towards high-capacity autonomous buses in public transport operations. It will address passenger experience related to in-vehicle security, traffic safety, assistance and handling of emergency situations. The objective will be to firstly define and rank the main concerns of the public transport users linked to different stages of driverless bus operations in the revenue service. Secondly, the aim is to design, test and evaluate a connected in-vehicle-off-board measure mitigating the main concerns. The solution would mainly rely on passenger-triggered alarms. Specific inputs for the scenarios will be defined in collaboration with the public transport authority in Luxembourg, bus manufacturer (Volvo), and public transport operators in Luxembourg, Belgium and Poland. The experiments will be divided into three groups – the first one will focus on passenger experience at bus stops during bus stop docking. The second group will look into passengers' assistance requirements during the trip. A set of different scenarios will be analysed–ranging from the normal operations to the unusual situations occurring while driving (e.g. bus stop skipping) or while dwelling at a bus stop. The latter consist of door issues frequently happening during peak hours (often requiring driver intervention) and problems with disabled people assistance typically linked to bus kneeling or wheelchair ramp operations. The pilot will be initially conducted in Luxembourg (preliminary experiments) with a follow-up in Sweden (final experiments). A high-capacity (12-meter) bus will be used. In the preliminary experiments a serial-production Volvo bus adapted to imitate a driverless vehicle will be tested. The final experiments will rely on the prototype Volvo electric-hybrid autonomous bus that was developed for the two Swedish projects - FFI and KRABAT. In confined and controlled areas the bus will operate without a driver onboard.
Timeline:
T1.1 (M20-M24) Preparation of bus for tests (modification of a serial production bus to imitate an autonomous bus) and design of test scenarios in Luxembourg. Execution of the scenarios in experiments followed by an analysis of passenger's experience and requirements with a prepared bus during various stages of a trip. In particular, the analysis will focus on the following: 1. pre-trip stage, i.e. passenger experience waiting at bus stop during bus stop docking (bus arrival); 2. on-trip stage evaluating passenger's experience in the context of assistance required during the trip in unusual situations. In particular, door issues and related boarding complications will be addressed. Technological solutions mitigating the main observed issues will be specified.
T1.2 (M25-M28) Follow-up in Sweden. The major situations identified in T1.1 will be evaluated using Volvo's 12m autonomous bus (already built). Experiments will be adjusted to evolving capabilities of the bus.

Sub-task 6.3.2 "Autonomous driving training" (lead partner: ACI; participants: LIST, RDS Driving, UMA) (duration: M22-M30)
The pilot will validate the outcomes of WP5 on capacity building, training education in a real CAV environment considering also the different levels of development and implementation. The training modules for trainers, new drivers and professional drivers developed in WP5 will be tested at ACI Vallelunga Safe driving Centre of Lainate, using a rented CAV. The validation tests will follow a randomized controlled trial design comparing trained to untrained drivers. It will be conducted over a period of 5 days on a total of 70 drivers/non drivers and possibly 5 professional drivers. The aim is to confirm in a "real" CAV environment the efficiency of the training solutions developed in the simulated environment in WP5. To this aim, the most challenging situations identified in WP5 will be reproduced on the track and training areas and the outcomes compared to those of WP5. The pilot will also enquire how the driver's behaviour will be modified by the new environment and the new training, if there is a difference in acceptance between a simulated and a real situation, how difficult and stressful it is to accept this change and the eventual differences in acceptance between different categories: new drivers, elderly drivers, "ordinary" drivers or professional drivers
Timeline:
T1.1 (M22-M30) Validation of the outcomes of WP5 in a real CAV environment using a rented CAV at the ACI Vallelunga Safe Driving centre of Lainate, reproducing situations on track the most challenging situations previously identified. The tests will compare trained to untrained drivers following a randomized controlled trial design over a period of 5 days on a total of 70 drivers/non drivers. The tests will also enquire possible drivers' behavioural changes and different acceptance between simulated and real environment.
T1.2 (M25-M30) Validation of the outcomes of WP5 in a real CAV environment using a rented CAV at the ACI Vallelunga Safe Driving centre of Lainate targeted at professional drivers. It will be carried out over a period of 5 days on at least 5 professional drivers. The tests will also enquire possible drivers' behavioural changes and different acceptance between simulated and real environment.
Sub-task 6.3.3 "SMEV - Smart Emergency Response" (lead partner: ETELÄTÄR; participants: UNIVLEEDS) (duration: M20-M28)

The pilot test will be conducted in Madrid (Spain) where SMEV will have been deployed. The study will focus on analysing how emergency vehicle drivers cope with new interactive features of a connected transport environment with SMEV during their missions and identifying issues that CAVs and other road users may face with these connected emergency transport systems; this will allow to explore the mutual acceptance of a connected system by both the emergency drivers and the other road users. The pilot will recruit about 30 emergency drivers and 30 road drivers to participate in different scenarios under real-life traffic conditions. The data collected from this pilot will be processed and analysed in WP7, including measurements from apps, videoing of interaction with HMIs and road users, and interviews with emergency drivers as well as road users (car drivers, pedestrians and cyclists). The methodology defined in D6.1 will be performed and tailored to its own scenarios and specificities. This test will be executed iteratively and will work closely with Madrid Traffic Control Centre and SMEV company. Main activities involved in the test site will be as follows:
Adaptation of the design in T6.1 and T6.2 to a specific framework and initial planning of the pilot at the individual level;
Potential problems will be identified along with mitigation solutions;
Pilot implementation;
Data collection.
Timeline:
T1.1 (M20-M20) Definition of the different scenarios (under real-life traffic conditions) to be investigated, including the conduction of a focus group with the recruited emergency vehicle drivers in order to better identify what is measurable and attainable. Definition of survey questionnaires and conduction of an 'inception meeting' with emergency drivers and other road users to explain the data collection process. This task will partially benefit from the activities conducted in the project Task 6.2 (Pilot setup).
T1.2 (M21-M23) First wave of data collection on: 1. acceptance of SMEV by emergency drivers and road users in the different identified scenarios (through questionnaire survey). 2. SMEV operations (as provided by Madrid Traffic Control Centre and the Etelatar local manager), in order to investigate the emergency drivers acceptance from a technical angle.
T1.3 (M24-M26) Second wave of data collection and focus group with drivers and road users to refine/improve the analysis.
T1.4 (M27-M28) Third wave of data collection

Sub-task 6.3.4 "Shared connected transport" (lead partner: ExaMotive S.A.; participants: LIST) (duration: M20-M28)
This pilot study will focus on assessing attitudes and perception of "drivers" and passengers toward different types of shared connected vehicles which include small- and medium-size passenger cars, sport vehicles, vans, electric vehicles and vehicles with autonomous features, such as autopilot, automatic or guided parking and other autonomous features that would become available and allowed for operation on public roads at the time of this sub-task. The goal is to better understand attitudes and public acceptance to different kinds (by size, by type combustion or electric, by availability of autonomous features) of the shared vehicles and to various associated incentives. This pilot study will allow operators of shared fleets (a) to optimally design and operate fleets of shared vehicles and (b) design well-suited incentive mechanisms to increase public acceptance and improve attitudes towards different kinds of shared vehicles.
Sample size: 100 shared fleet users in Munich, Germany
Timeline:
T1.1 (M20-M21) Analysis of attitudes and perceptions of drivers and passengers towards different types of shared connected vehicles (first wave)
T1.2 (M22-M23) Analysis of attitudes and perceptions (second wave)
T1.3 (M24-M28) Analysis of the public acceptance of the different kind of vehicle, including its evaluation in presence of various incentives.

Sub-task 6.3.5 "Experience of vulnerable travellers with connected transport environment" (lead partner: S3I; participants: ULEE) (duration: M20-M28)
The pilot test will be conducted in Madrid (Spain) where APERTUM has been deployed. Research will focus on the main challenges that people in vulnerable groups are facing with connectivity related technologies, through APERTUM and linked third-party mobile applications, by combining different methodologies with different scenarios. The data collected, such as time efficiency, route choices, avoidance of obstacles, videoing of interaction with HMIs, interviews, and focus groups from this pilot will be processed and analysed in WP7 in order to explore acceptance of connectivity related technologies with these vulnerable groups. This test will be executed iteratively and will work closely with Matrid city council, public transport services, and Madrid Region Disabled Association. Main activities involved in the test site will be as follows:
Adaptation of the design in D6.1 and D6.2 to a specific framework and initial planning of the pilot at the individual level;
Pre-test: initial items in the item pool as defined in WP3 and instruments as defined in D6.1 will be adapted and refined;
Potential problems will be identified along with mitigation solutions;

Pilot implementation;
Data collection;
Sample size: 200 including Apertum users and their corresponding stakeholders.
Timeline:
T1.1 (M20-M20) Conduction of a focus group with representatives of vulnerable users, definition of the scenarios/ variables to be investigated and related survey questionnaire. Conduction of an 'inception meeting' with vulnerable users and representatives of the public transport operators, in order to smooth the future data collection process. This task will partially benefit from the activities conducted in the project Task 6.2 (Pilot setup).
T1.2 (M21-M23) First wave of data collection on: 1. challenges experienced by the users in the different scenarios, through questionnaire survey; 2. technical operations (as provided by the Apertum app and other third-party applications).
T 1.3 (M24-M26) Second wave of data collection and focus group with vulnerable users to deepen the analysis and eventually integrate/modify it.
T1.4 (M27-M28) Third wave of data collection.

Participation per Partner

Partner number and short name	WP6 effort
1 - LIST	3.00
2 - ACI	2.00
ACI INFORMATICA	2.00
3 - LuxMobility	5.00
4 - RDS Driving	1.00
5 - ETELÄTÄR	17.00
6 - UNIVLEEDS	6.00
8 - UBFC	0.50
UTBM	0.50
9 - ExaMotive S.A.	10.50
10 - UMA	2.00
11 - E-Bus	6.00
12 - EBU	1.00
Total	56.50

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D6.1	Pilot handbook for pilot managers	5 - ETELÄTÄR	Report	Public	22
D6.2	Pilot Setup	5 - ETELÄTÄR	Report	Public	24
D6.3	Pilot implementation and evaluation	5 - ETELÄTÄR	Report	Public	30

Description of deliverables

D6.1 : Pilot handbook for pilot managers [22]

D6.1 Pilot Handbook for Pilot Managers provides common design, methodology, requirements, guidelines and background information for piloting with a thorough checklist of ethics and data protection defined in WP1 and WP2 across all pilots and their individual domain. It will be updated during the course of the pilots (M22) (Task 6.1).

D6.2 : Pilot Setup [24]

D6.2 Pilot Setup documents the results of the baseline analysis, the description of the pilots, campaigns and the design of the pilot runs (M24) (Task 6.2).

D6.3 : Pilot implementation and evaluation [30]

D6.3 Pilot implementation and evaluation documents the execution and the results of the pilots (M30) (Task 6.3).

Schedule of relevant Milestones

Milestone number[18]	**Milestone title**	**Lead beneficiary**	**Due Date (in months)**	**Means of verification**
MS5	Pilot sites setup	5 - ETELÄTÄR	20	Report showing that there are no technical and management issues at each test site.

Work package number [9]	WP7	Lead beneficiary [10]	6 - UNIVLEEDS
Work package title	Impact Assessment		
Start month	3	End month	32

Objectives

- To provide guidelines for defining impact areas and pathways
- To derive key performance indicators (KPIs) from existing projects tailored to suit the impact areas
- To bring together the results from all the previous WPs and carry out a systematic and detailed analysis of the behaviour and acceptance data from the pilots
- To assess the potential impacts of various levels of user acceptance on CAVs, and support decision makers in considering the pros and cons of future CAV solutions

WP7 contributes to the achievement of OB04 and OB07 (see Section 1.1).

Description of work and role of partners

WP7 - Impact Assessment [Months: 3-32]
UNIVLEEDS, LIST, ACI, LuxMobility, RDS Driving, ETELÄTÄR, LIV, ExaMotive S.A., UMA, EBU
Task 7.1 Impact areas and pathways (lead partner: LuxMobility; participants: LIST, UNIVLEEDS, UMA, EBU) (duration: M03-M06)
This task aims to lay the basis for filling in the impact assessment framework to be developed in T7.2. Impact areas will be specified and impact paths defined. Input is the initial user acceptance analysis from WP3 (Task 3.2) and the impact assessment framework developed by the trilateral group on impact assessment and the CARTRE deliverables. Gaps will be defined for which further literature study is needed. The knowledge base under development in the ARCADE CSA newly-funded by H2020 will also provide information. This task produced D7.1.
Task 7.2 Assessment framework for public acceptance of CAV (lead partner: UMA; participants: LuxMobility, UNIVLEEDS, LIST) (duration: M05-M08)
Taking into account the range of solutions, each having various levels of scale, maturity, adaptability etc. as well as each innovations potentially being assessed by different 'drivers', this task will establish a multi-disciplinary approach for the evaluation at two levels.
Firstly the user acceptance indicators derived from the existing studies (e.g. AUTOPILOT, L3PILOT and CARTRE) will be used by UNIVLEEDS for the analysis of collected data from all the previous WPs, in particular WP6. These indicators will be used in T7.3 to generate results which are the 'direct' or 'immediate' impact of the PAsCAL's solutions such as the level of acceptance, frequency of use, willingness to use and attitudes of people towards CAVs (UMAN).
A second set of KPIs will be defined, led by LIST, supported by LuxMobility, UNIVLEEDS and to evaluate wider and broader impacts of the PAsCAL's potential such as mobility in general, quality of life, future urban transport planning, business potential, job creation, aging society etc. These KPIs will be used in T7.4 (and other tasks whereas appropriate). This task produces D7.2.
Task 7.3 Integrated data analysis (lead partner: UNIVLEEDS; participants: ACI, RDS Driving, ETELÄTÄR, ExaMotive S.A., EBU) (duration: M25-M32)
This task will analyse and conclude on the drivers' level of acceptance of CAVs based on their responses to attitudinal questions and also based on the observed behaviours in the trials in WP6. More specifically, using the data collected from on-board loggers, apps and responses to pre-trip and post-trip questionnaires in WP6, this task will carry out a systematic and detailed analysis of public acceptance and user behaviour in a range of complex operating environments, especially as regards any problems inside and outside the autonomous vehicle, connectivity of transport systems with emphasis on vulnerable road users.
The analysis will be done separately per users' category, age, gender, willingness to pay and mobility need. Users' preferences for future services and future use of CAVs and the stakeholders' acceptance, opinions and willingness to use the vehicles will be studied. This task produces D7.3.
Task 7.4 Proliferation modelling and evaluation (lead partner: UNIVLEEDS; participants: LIST, ETELÄTÄR) (duration: M27-M32)
A system dynamics based model will be developed to quantify the long-term impact that different forms (e.g. levels and rates) of user acceptance will have on the technological advances of CAVs. This modelling tool will be built on a CAV diffusion/proliferation model being developed by UNIVLEEDS in the on-going project AUTOPILOT. Based on the results from the previous task (simulated and empirical evidence) and using user acceptance indicators as control parameters, a number of scenarios for impact paths and areas will be developed to assess the important contributory

variables for enabling a successful transition to connected and highly automated vehicles and transport systems, and eventually to full automation. This task produces D7.4.
Results from the modelling and evaluation will serve as evidence for recommendation and guidelines for uptake of CAVs and feed into the Guide2Autonomy framework in WP8.

Participation per Partner

Partner number and short name	WP7 effort
1 - LIST	3.50
2 - ACI	2.00
3 - LuxMobility	2.50
4 - RDS Driving	2.00
5 - ETELÄTÄR	4.50
6 - UNIVLEEDS	13.00
7 - LIV	2.00
9 - ExaMotive S.A.	1.00
10 - UMA	4.50
12 - EBU	1.00
Total	36.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D7.1	Impact areas and paths	3 - LuxMobility	Report	Public	6
D7.2	Impact indicators	10 - UMA	Report	Public	8
D7.3	Data analysis of user acceptance from trials and simulations	6 - UNIVLEEDS	Report	Public	32
D7.4	Long term impact analysis with a system-dynamics model	6 - UNIVLEEDS	Report	Public	32

Description of deliverables

D7.1 : Impact areas and paths [6]

D7.1 Impact areas and paths documents the basics for the impact assessment framework (M06) (Task 7.1).

D7.2 : Impact indicators [8]

D7.2 Impact indicators documents the user acceptance indicators from PAsCAL and other projects as well as broader potential impact factors related to PAsCAL's outcomes (M08) (Task 7.2).

D7.3 : Data analysis of user acceptance from trials and simulations [32]

D7.3 Data analysis of user acceptance from trials and simulations provides a holistic view on all the analysis results from all studies conducted during the PAsCAL project (M32) (Task 7.3).

D7.4 : Long term impact analysis with a system-dynamics model [32]

D7.4 Long term impact analysis with a system-dynamics model specifies a systems dynamics model which supports a successful implementation of CAV and transport scenarios (M32) (Task 7.4).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS6	Recommendation and Guidelines	6 - UNIVLEEDS	30	Rec. and Guidelines ready to be delivered to WP8

Work package number [9]	WP8	Lead beneficiary [10]	3 - LuxMobility
Work package title	Guide2Autonomy, Policy Recommendation and Guidelines		
Start month	12	End month	33

Objectives

● To develop a set of guides and recommendations (about 100) that allow the industry, public authorities and other relevant stakeholders an improved understanding of the public awareness and the requirements and needs of different types of users in relation to CAV.
● To provide know how to integrate more efficiently the "user" and wider citizen interests when moving towards higher levels of connectivity and automation in all modes and mobility services.
● To define the structure and access to the Guide2Autonomy (G2A) as a European reference for CAV, driver behaviour, public awareness, and user acceptance.
● To implement an open data approach internet-based PAsCAL's G2A.
WP8 contributes to the achievement of OB07 (see Section 1.1).

Description of work and role of partners

WP8 - Guide2Autonomy, Policy Recommendation and Guidelines [Months: 12-33]
LuxMobility, LIST, ACI, RDS Driving, ETELÄTÄR, UNIVLEEDS, LIV, UMA, EBU, RDGFI
The different stakeholder guides, recommendations and packed research findings will be fitted in the G2A (Task 8.1), and will be produced in the tasks 8.2 to 8.5. The recommendations and guidelines are co-developed with and presented to each stakeholder (i.e. policy-makers, industry, user representative organisation, researches, etc.) who find targeted guidance and/or recommendation needed to integrate the public acceptance and public awareness topic into their strategic, tactical and operation management regarding innovation and CAV research.
Each of those tasks respond to one of the main CAV and Public awareness and user acceptance topics:
Task 8.2 Public strategies for integrating CAV in present public policies (e.g. land development, health, transport planning, mobility, etc.) assuring the public interest;
Task 8.3 Innovative approaches relating to the integration of public acceptance and user awareness in the design of new CAV technologies and infrastructure hardware;
Task 8.4 Public acceptance and user awareness in CAV ICT developments (software)
Task 8.5 Management and business models in CAV, placing the CAV user at the centre / CAV business case for the local economy and public interest.
Each of the content tasks (T8.2 till T8.5) will produce about 25 recommendations fitted in the different "Public Acceptance" and "User awareness" policy fields on the basis of the findings of the earlier WPs, analysis of the cases.

Task 8.1 Defining and developing the Guide2Autonomy Organisation and Administration (leader: LuxMobility; participants: LIST, ACI, ETELÄTÄR, RDGFI, UNIVLEEDS) (duration: M12-M30)
This first task develops the essential frame of the G2A in which the guides and recommendations fit. The frame constitutes of identified dimensions based on the key performance indicators (KPI's) developed in WP7 (target groups i.e. industry, public authority, user representative organisation), mode, specific CAV development (ICT innovation, infrastructure, etc.) (led by LIST)
The internet-based software in which the recommendations will be developed by LUXM. As innovation in CAV is rapid, the set of recommendations, as well as the G2A framework will be modular. New guides and recommendations in the field of public acceptance and awareness regarding CAV can be added beyond the project life time. This task also includes the operational management of WP8 and coordination between tasks in order to avoid overlaps and coherence between outputs. In this task will be produced D8.1 and D8.2

Task 8.2 Enhancement of public acceptance factors into current policy and regulatory framework (leader: ACI; participants: UMA, UNIVLEEDS, RDS Driving, LIST, ETELÄTÄR) (duration: M18-M33)
Subtask 8.2.1. Identification and specification of the key areas (M18-24)
The task identifies key public policies, developments and regulatory areas related to the implementation of autonomous vehicles and connected systems studied in PAsCAL (i.e Sustainable Urban Mobility Plans, Spatial planning, Economic policies, health, social inclusion of vulnerable citizens, and road safety policies, e.g. VISION 0, Duurzaam Veilig (Sustainable Save). Based on the results of previous WPs and related European practices (at least 10) it specifies the main policy and regulation issues that may positively influence the acceptance of new technologies and those which may constitute barriers, with a view to safeguard the general public interest.

Subtask 8.2.2. Public strategies, guides and recommendations (M30-33)
For each identified key policy and regulatory area on the basis of the PAsCAL findings in the earlier WP's, guides and recommendations will be developed (at least 25) which facilitate the adoption or the adaptation of these policies towards an enhanced balance between public interest and public acceptance and CAV innovations. This could be the needs for changes in the current road rules to establish the coexistence of "current" and CAV vehicles up to the adaptation of public insurance regulation, certifications requirements for using CAV incl. potential business models, as well as guidance on how to steer CAV research as to avoid spatial dispersion.

Task 8.3 Innovative approaches relating to the integration of public acceptance and user awareness in the design of new CAV technologies and infrastructure (leader: UNIVLEEDS; participants: UMA, LIST, LIV, UBFC) (duration: M18-M33)
This task specifically looks at the incorporation of user acceptance into the design of new CAV services and infrastructure.
Subtask 8.3.1. Identification and specification of the key areas (M18-24)
This subtask will identify key areas in new services and infrastructure initiatives that relate to the autonomous vehicles and connected systems studied in PasCal. It will then specify acceptance factors (selected from PAsCAL findings in previous WPs in particular WP3) which represent usage motives and perceived barriers as well as the attitudes toward the respective technology. Individual factors (e.g. age, gender, technology generation, needs and demands) will also be considered so that guides and recommendations for new CAV technologies and infrastructure are holistic, comprehensive and fair, and made specifically for different users and social groups.
Subtask 8.3.2. CAV technologies and infrastructure, guides and recommendations on the integration of the public awareness and user acceptance (M30-33)
This subtask will look at innovative measures (based on the aforementioned factors) which can increase the familiarity, the knowledge, and information depth about a new CAV technology, and thus reduce the perceived risk of the technology. It will then develop guides and recommendations (at least 25) to allow for an effective and practically-oriented transfer of acceptance research into advanced stages (e.g. concept and design) of the development of new CAV technologies and infrastructure. The G2A recommendations will also include the formulation of the requirements for a user-centered design process.

Task 8.4 Public acceptance and user awareness in CAV ICT developments (leader: ETELÄTÄR; participants: UNIVLEEDS, UBFC, UMA) (duration: M18-M33)
CAV ICT software tools (e.g. apps, platforms) with focus on user-specific factors and HMI development are the focus. This task will use the relevant PasCal findings to form relevant recommendations focused on HMI development and implementation.
Subtask 8.4.1. Identification and specification of the key areas (M18-24)
This subtask will identify key areas in ICT technologies (e.g. IoT, big data analytics, AI) that relate to the topic of automation and higher connectivity of vehicles and the transport system. It will analyse ICT software-related factors which measure levels of Human-Machine Interfaces (HMI), communication security, data privacy, trust, data sharing and so on.
Subtask 8.4.2. CAV ICT developments, guides and recommendations on the integration of the public awareness and user acceptance (M30-33)
In this subtask, we will look at the PAsCAL findings related to user acceptance of ICT technologies (software), as well as other relevant ICT CAV European and international research. These will be translated into relevant guides and recommendations (at least 25 plus at least 10 learning practices) aimed at increasing user acceptance of autonomous vehicles and connected transport. The G2A recommendations will also include the formulation of requirements necessary for a user-centered design process in the early stages (e.g. concept and design) of future CAV ICT development.

Task 8.5 Management of CAV developments placing user interest at the centre and stimulating local economy (leader: LuxMobility; participants: RDGFI, ETELÄTÄR, UMA, RDS Driving, EBU) (duration: M18-M33)
Subtask 8.5.1 Identification of the key areas (M18-24)
General management of CAV research and technology developments are in general following the technical advancement within their company, lacking "outside" insights on how the integration of increased public awareness and user acceptance could improve their products and developed services. In this first task 8.5.1 we will identify possible new management, service provision and operational management activities to change. Activities and procedures that can be implemented to allow for a better take-up of public awareness and user acceptance.
Subtask 8.5.2 Improved management of CAV developments, guides and recommendations on the integration of the public awareness and user acceptance (M30-33)

On the basis of information of the earlier PAsCAL WP's, guides and tools, benchmark tools will be developed that will help the different CAV managers and 3rd party stakeholders improve their CAV development management models, including the wider public management models for the reinforcement of the local economy. This will also include the identification of future funding solutions. These guides and recommendations will allow any CAV development manager/ promoter improve the take-up of any "public acceptance" and "user awareness" and create more efficient services.

Task 8.6 Filling PAsCAL's guides and recommendation in the G2A (leader: LIST; participants: LuxMobility, ACI, ETELÄTÄR, UNIVLEEDS, RDGFI, EBU) (duration: M33)
The preceding tasks dealt with a specific CAV, public awareness and acceptance themes. Each of them was validated by an expert consultation. In this task, a second expert consultation will validate the PAsCAL policy recommendation and guides. This consultation workshop will be organised with external experts on impact assessment and user acceptance during large industry oriented and CAV events (in coordination with WP9). The aim is to do this in coordination with the ARCADE CSA.
After validation, the 100 recommendations and guidelines will be fitted into the G2A. Ease-of-use, chatbot included, and maintainability of the framework will be tested with 3 representatives from each stakeholder group (e.g. industry, policy makers, interest groups, associations, etc.). This task produces D8.3.

Participation per Partner

Partner number and short name	WP8 effort
1 - LIST	4.50
2 - ACI	3.50
3 - LuxMobility	6.50
4 - RDS Driving	3.50
5 - ETELÄTÄR	4.50
6 - UNIVLEEDS	5.50
7 - LIV	2.00
10 - UMA	2.00
12 - EBU	1.00
13 - RDGFI	7.00
Total	40.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D8.1	Common issues, approaches and lessons learned across all modes for Industry and Public Authorities	3 - LuxMobility	Report	Public	24
D8.2	Guide2Autonomy	3 - LuxMobility	Websites, patents filling, etc.	Public	24

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D8.3	Filled Guide2Autonomy	1 - LIST	Websites, patents filling, etc.	Public	33

Description of deliverables

D8.1 : Common issues, approaches and lessons learned across all modes for Industry and Public Authorities [24]

D8.1 Common issues, approaches and lessons learned across all modes for Industry and Public Authorities identifies the key areas related to public awareness and user acceptance in CAV in relation to public policies, infrastructure, technology, ICT and management (M24) (Task 8.1).

D8.2 : Guide2Autonomy [24]

D8.2 Guide2Autonomy translates the G2A framework into an online open access tool (M24) (Task 8.1).

D8.3 : Filled Guide2Autonomy [33]

D8.3 Filled Guide2Autonomy consists of the online G2A filled with the 100 recommendations and guides (M33) (Task 8.6).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS7	Development of the Guide2Autonomy Framework based on PAsCAL's KPI's	3 - LuxMobility	28	Online Tool accessible for public
MS8	100 Recommendations and guides for public authorities, industry and other stakeholders validated	3 - LuxMobility	33	100 Recommendation and guide classified as "validated"

Work package number [9]	WP9	Lead beneficiary [10]	13 - RDGFI
Work package title	Outreach		
Start month	1	End month	36

Objectives

● To make the results of the project known to the appropriate user communities and stakeholders across Europe and beyond, by designing and carrying out the dissemination and communication activities
● To provide a clear picture of the market conditions and expectations favouring the definition and set in motion of effective commercialisation and replication plans based on solid business models and business plans.
WP9 contributes to the dissemination and exploitation of the measures of success of OB03, OB04, OB05, OB06, OB7 (see Section 1.1).

Description of work and role of partners

WP9 - Outreach [Months: 1-36]
RDGFI, LIST, ACI, LuxMobility, RDS Driving, ETELÄTÄR, UNIVLEEDS, LIV, UBFC, ExaMotive S.A., UMA, E-Bus, EBU
Task 9.1 Promotion of results (lead partner: ACI; participants: All) (duration: M01-M36)
This task will develop, review and update the Plan for Promotion of Results (PPR, D9.1 at M2) for the project to ensure maximum visibility and impact of the project outcomes. This dissemination plan will be composed by two main promotional elements: Public results dissemination and communication channels.
Public results dissemination: ACI will lead the dissemination towards the targeted stakeholder groups using the dissemination channels and network by putting forward:
Articles, papers and publications in national and international scientific, professional and institutional journals and conferences (please refer to Section 2.2 for proposed items) via open access peer-reviewed papers resulting from the project and included in an institutional repository. The publications will be aimed at a wide range of audiences, including policy-makers, relevant CAV institutional and industrial stakeholders and academic experts to stimulate high quality research. These dissemination activities could also be supported by the distribution of leaflets and posters in relevant events.
Local training sessions will be organized where involvement of users (simulation experiments and demo cases) are in place, as well as workshops and informative sessions in which local partners will invite local stakeholders and policy makers. Demo cases themselves can be the object and the location of the workshops. Depending on the preferences of the partners, local workshops can also be replaced by webinars.
Promotion and presentation of PAsCAL's results at national and international events and CAV industry professional events (see Section 2.2).
Provision of relevant content for continuous project evolution awareness, that will facilitate the creation of a community interested in the research on CAV user acceptance.
Communication: RDGFI will lead the elaboration and implementation of communication strategy defining the channels, tools and measures to be used by PAsCAL to reach out to the widest range of involved stakeholders and support the promotion and deployment of project results. This task will be responsible, among others, for delivering the following channels:
PAsCAL visual design and communication material: Well-defined and effective visual identity package for the project, including a project logo, colours, typeface, imagery and photography, templates for presentations and promotion, as well as newsletters and a website eye-catcher, allowing any targeted audience to immediately spot the project presence and contribution through the various channels and forms of communication. In addition, marketing material such as posters, leaflets, brochures and videos will be produced during the project, with several releases showing the project evolution.
Web-based channels: An initial basic website will be established in M03. This website will be further developed into a web-based platform designed for external communication and dissemination. This will include providing public access to the project documents such as reports, presentations and newsletters. Also PAsCAL's social media profiles (Twitter, LinkedIn, ResearchGate) will be set up.
The Plan for Dissemination of Results will be implemented during all project duration and beyond. The Dissemination Leader (ACI) and all partners will ensure that all relevant information is disseminated during the project, but also after it is completed. This task produces D9.1 and D9.2.

Task 9.2 Exploitation (lead partner: RDGFI; participants: All) (duration: M06-M36)

To ensure PAsCAL reaches the expected market impact and maximises the potential of its innovation, project results need to be analysed in a holistic market-oriented way. Several analysis should be performed: i) characterise the markets, the stakeholders and their expectations and needs, ii) assess the outstanding features of our exploitable results providing us a market competitive advantage, iii) assess, discern and propose business models capable of empowering the commercial and technical offerings, iv) manage, protect and find agreements on the exploitable results, v) set forward dedicated plans for commercialization and market uptake for each exploitable result developing the appropriate business models. Whenever needed and available the team may also rely on the EC services to support us with e.g. patenting, standardization, exploitation strategies, business plan and risk analysis.
The TRL of each exploitable result will be monitored, assessed and updated throughout the project lifetime to ensure that the maturity level of each result reaches the target for exploitation.
Moreover, consortium partners have experience in the application of different results identification methodologies e.g. '10 Types of Innovation' methodology' or the 'Business Models canvas", and therefore results extracted from different exercises can be compared and complement.
Particular attention will be paid to the definition of business opportunities related to:
The pilots executed in WP6. For example, business model for CAV in shared fleets, for tools developed for vulnerable travellers with CAVs and for emergency vehicle drivers, or for offering of CAV driving training packages.
Results obtained in WP8 about public acceptance, placing the CAV user at the centre and CAV business case for the local economy and public interest.
In detail the exploitation activities will be performed in the following way:
During the first months of the project, efforts will be focused on the Market, Competitors and Stakeholders Analysis that will allow placing PAsCAL overall offer in the correct market context and segment.
Once the first versions of project's results (i.e., measures, models, and first design of the simulators scenarios and pilots) are available (M15) consortium partners will better understand the actual added value and therefore the Identification of the Project's Value Propositions will be performed.
Next, these value propositions will be exploited into PAsCAL's Business Models. These preliminary business models should be validated in two directions: Competitors' Analysis and Financial Viability. Depending on this validation results, business models will be either discarded (if unviable) or finalized.
IPR Protection and Agreements will be therefore defined for those final business models, together with the final Sustainability plan including Commercialization (financial plan), Replication and Market Uptake.

Task 9.3 Liaising with other relevant RDI projects and also other initiatives at European context (lead partner: LuxMobility; participants: LIST, All) (duration: M01-M36)
The PasCal project will liaise with other relevant RDI project, notably the other projects selected under the same call and other initiatives in the European Context.

Participation per Partner

Partner number and short name	WP9 effort
1 - LIST	4.00
2 - ACI	7.00
3 - LuxMobility	3.50
4 - RDS Driving	1.50
5 - ETELÄTÄR	2.50
6 - UNIVLEEDS	3.50
7 - LIV	1.00
8 - UBFC	0.50
UTBM	1.00
9 - ExaMotive S.A.	1.00
10 - UMA	1.50
11 - E-Bus	1.00

Partner number and short name	WP9 effort
12 - EBU	0.50
13 - RDGFI	9.50
Total	38.00

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D9.1	Plan for promotion of results	2 - ACI	Report	Public	2
D9.2	Communication material and Website	13 - RDGFI	Websites, patents filling, etc.	Public	4
D9.3	Preliminary exploitation framework	13 - RDGFI	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D9.4	Final exploitation framework	13 - RDGFI	Report	Confidential, only for members of the consortium (including the Commission Services)	36

Description of deliverables

D9.1 : Plan for promotion of results [2]

D9.1 Plan for Promotion of Results documents the public results dissemination activities and defines the communication channels for the project (M02) (Task 9.1).

D9.2 : Communication material and Website [4]

D9.2 Communication Material and Website documents the visual identity package, the posters, leaflets, brochures and videos as well as newsletters and the website purpose and structure (M04) (Task 9.1).

D9.3 : Preliminary exploitation framework [18]

D9.3 Preliminary exploitation framework documents the market, competitors and stakeholder analysis and business models (M18) (Task 9.2).

D9.4 : Final exploitation framework [36]

D9.4 Final exploitation framework documents final business models, IPR and sustainability plan (M36) (Task 9.2).

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS8	100 Recommendations and guides for public	3 - LuxMobility	33	100 Recommendation and guide classified as “validated”

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
	authorities, industry and other stakeholders validated			
MS9	Preliminary results available for exploitation planning	2 - ACI	15	measures, models (WP3), and first design of the simulators scenarios (WP4) and pilots (WP6) available

Work package number [9]	WP10	**Lead beneficiary** [10]	1 - LIST
Work package title	Ethics requirements		
Start month	1	**End month**	36

Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

Description of work and role of partners

WP10 - Ethics requirements [Months: 1-36]
LIST
This work package sets out the 'ethics requirements' that the project must comply with.

List of deliverables

Deliverable Number[14]	Deliverable Title	Lead beneficiary	Type[15]	Dissemination level[16]	Due Date (in months)[17]
D10.1	H - Requirement No. 3	1 - LIST	Ethics	Confidential, only for members of the consortium (including the Commission Services)	3

Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D10.1 : H - Requirement No. 3 [3]

- Templates of the informed consent forms and information sheets (in language and terms intelligible to the participants) must be submitted in a deliverable and kept on file.

Schedule of relevant Milestones

Milestone number[18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification

1.3.4. WT4 List of milestones

Milestone number[18]	Milestone title	WP number[9]	Lead beneficiary	Due Date (in months)[17]	Means of verification
MS1	Ethics and Data Protection Boards	WP2	10 - UMA	4	Ethics & Data Advisory Board setup and two handbooks available
MS2	Acceptance measure	WP3	10 - UMA	10	Report on measure available to give first preliminary input to other WP
MS3	Simulators ready for use	WP4	8 - UBFC	20	All simulators up and running.
MS4	First version of Home Study Simulator incl. scenarios	WP5	4 - RDS Driving	18	Simulator ready to be used in v1.0 and learning scenarios implemented
MS5	Pilot sites setup	WP6	5 - ETELÄTÄR	20	Report showing that there are no technical and management issues at each test site.
MS6	Recommendation and Guidelines	WP7	6 - UNIVLEEDS	30	Rec. and Guidelines ready to be delivered to WP8
MS7	Development of the Guide2Autonomy Framework based on PAsCAL's KPI's	WP8	3 - LuxMobility	28	Online Tool accessible for public
MS8	100 Recommendations and guides for public authorities, industry and other stakeholders validated	WP8, WP9	3 - LuxMobility	33	100 Recommendation and guide classified as "validated"
MS9	Preliminary results available for exploitation planning	WP9	2 - ACI	15	measures, models (WP3), and first design of the simulators scenarios (WP4) and pilots (WP6) available

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	A partner leaves the consortium (Low likelihood).	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9	The members of the consortium will find a replacement with existing contacts they have
2	A partner does not perform according to the agreed work plan and/or budget (Low likelihood).	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9	Close monitoring of work progress using project indicators and budget consumption support the project coordinator. Identify non-active partners. It will be given a chance to non-active partners to recover and, on the other hand, reported to the EC quarterly management report. If no improvement can be seen, in the worst case the will be asked to leave the consortium by the Steering Committee.
3	Collected data are not of high quality enough (Medium likelihood).	WP1, WP2, WP3, WP4, WP5, WP6, WP7, WP8, WP9	Continuously follow and analyse collected data in order to ensure quality. A specific task is provided in WP2 for this purpose.
4	Experimental biases, which are defined as a set of unwanted variables (Low likelihood)	WP4	Write a rigorous experimental protocol considering all the combined variables.
5	Results cannot be generalised in their entirety due to the differences between simulators (Medium likelihood)	WP4	Establish a common protocol for all simulators.
6	Not enough participants for simulations and pilots studies (Medium likelihood)	WP5, WP6	Both work packages have dedicated task for scenario planning and study design and setup. Milestones are defined early enough to check whether additional measure are necessary. The consortium members involved have excellent contacts to the different stakeholder groups. A substantial amount of funding is available to ensure their participants with regard to mobility and incentives.
7	A pilot study is not conducted (Medium likelihood)	WP6	Two tasks will work out a pilot methodology to be applied to all pilots; a pilot setup identifies risks before launching them.

1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Total Person/Months per Participant
1 - LIST	7	5.50	7	13.50	12.50	3	3.50	4.50	4		60.50
2 - ACI	0.50	1	2	2	3.50	2	2	3.50	7		23.50
· ACI INFORMATICA	0	0	0	0	8	2	0	0	0	0	10
3 - LuxMobility	6	5.50	3.50	0	2	5	2.50	6.50	3.50		34.50
4 - RDS Driving	0.50	0	0	0	11.50	1	2	3.50	1.50		20
5 - ETELÄTÄR	0.50	0	3.50	0	0	17	4.50	4.50	2.50		32.50
6 - UNIVLEEDS	1.50	6.50	6.50	3.50	0	6	13	5.50	3.50		46
7 - LIV	0.50	0	0	6	0	0	2	2	1		11.50
8 - UBFC	0	1	1	1	0	0.50	0	0	0.50		4
· UTBM	0.50	1	0.50	28	0	0.50	0	0	1	0	31.50
9 - ExaMotive S.A.	0.50	0	3.50	0	0	10.50	1	0	1		16.50
10 - UMA	0.50	3.50	10	3.50	2.50	2	4.50	2	1.50		30
11 - E-Bus	0.50	0	1	0	0	6	0	0	1		8.50
12 - EBU	0.50	0	4	0	0	1	1	1	0.50		8
13 - RDGFI	0.50	0	0	7	0	0	0	7	9.50		24
Total Person/Months	19.50	24	42.50	64.50	40	56.50	36	40	38		361

1.3.7. WT7 Tentative schedule of project reviews

Review number [19]	Tentative timing	Planned venue of review	Comments, if any
RV1	18	Brussels	
RV2	36	Brussels (TBC)	

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

R	Document, report
DEM	Demonstrator, pilot, prototype
DEC	Websites, patent fillings, videos, etc.
OTHER	
ETHICS	Ethics requirement
ORDP	Open Research Data Pilot
DATA	data sets, microdata, etc.

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

PU	Public
CO	Confidential, only for members of the consortium (including the Commission Services)
EU-RES	Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
EU-CON	Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
EU-SEC	Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number:MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

VA	if virtual access,
TA-uc	if trans-national access with access costs declared on the basis of unit cost,
TA-ac	if trans-national access with access costs declared as actual costs, and
TA-cb	if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.

HORIZON 2020
Call H2020-MG-2018-2019-2020
(2018-2020 Mobility for Growth)
MG-3-3-2018

PAsCAL

Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes

GA number 815098

Annex 1 Part B

Table History of Changes

Description of changes	Date
Additions in part “1.2 Relation to the work programme”	24/01/2019
Additions in part “Progress beyond state of the art” > “Address human factors through simulators”	24/01/2019
Additions in part “Progress beyond state of the art” > “Extend the understanding of public acceptance” and “Overall Methodology” > “Training and Education”	24/01/2019
Additions in part “Stakeholders support”	24/01/2019
Additions in part “2.1 Expected Impacts” for each impact.	24/01/2019
Additions in part “IM02 - Contribute to improved levels of safety and security in all modes of transport, in line with the Transport White Paper 2011 (e.g. Vision Zero)”	24/01/2019
Additions in part “IM03 - Contribute to the possible reduction of cost for industry and public authorities through an improved understanding of requirements and needs of different types of "drivers"/users in the context of connectivity and automation in all modes of transport”	24/01/2019
Additions in part “IM05 - Enhance driver awareness and behaviour in a range of complex / urban operating environments”	24/01/2019
Additions in part “Exploitation strategy”	24/01/2019
Additions in WP4 “Scenarios Design and Simulation Systems”	24/01/2019
Additions in WP5, part “Task 5.3 Derive cognitive models and define competence models	24/01/2019
Additions in WP6 “Pilot Implementation”.	24/01/2019

Inclusion of an extra deliverable, D2.4 at Month 33	24/01/2019
One additional deliverable D6.3 has been added, as being the final output of Task 6.1. In addition as Task 6.1 being the coordinating task of the WP to extent its timing from M22 to M30). Also 1,5 additional MM has been attributed to LuxMobility.	11/01/2019
(Included in Section 4.1) Role and relevance in the project of the University of Liverpool's	24/01/2019
Section 4.2 has been updated with subcontracting (coming from other costs)	24/01/2019
A detailed Project Management Plan has been added to WP1 (enlarging the initial foreseen management and quality handbook)	24/01/2019
Done. A Task 9.3 has been included in WP9 for the liaising and connecting to other relevant RDI and other initiatives	29/01/2019
In correspondence with the explanation in the "Comment table" the implication of Partners 13 EBU has been updated.	29/01/2019
Some small mistakes and corrections have been added to the text (indicated in Red)	29/01/2019

Table of Contents

Abstract

The 36-month PAsCAL project will create the Guide2Autonomy, a novel framework that will improve the understanding of the implications of Connected and Autonomous Vehicles on society as well as educate their future drivers, passengers and those who will have to share the road with them. It will help public and private decision makers navigate the unchartered waters of the transition to a new form of personal mobility. PAsCAL will make use of a strongly interdisciplinary mix of tools from both human and technological sciences, to capture the public's acceptance and attitude, analyse and assess their concerns, model and simulate realistic scenarios for hands-on practices, and validate its findings in a number of real-world trials. The association to the consortium of special categories of users, such as the blind or partially-sighted persons, of a leading maker of autonomous vehicles, and of service providers with a global outreach of millions of members and several thousand customers across the EU will ensure results consistency, taking into account major obstacles/barriers that may hinder the social acceptance of CAVs and will allow their exploitation in new business services and applications.

1. Excellence

According to The Economist[1], in the 1890s, big cities around the world were grappling with growing volumes of horse manure and urine and the rotting bodies of thousands of dead horses and the spread of disease. By comparison, cars seemed clean and hygienic, a key reason why they were adopted so quickly in the 20th century. "Cars replaced something that was in many ways far worse," says Donald Shoup of the University of California at Los Angeles. "But because of bad planning, they had unintended consequences."

Today's champions of CAVs promote a similarly optimistic vision of the future. They believe that CAVs will offer all the advantages of cars without the drawbacks. GM's boss, Mary Barra, likes to talk of "zero crashes, zero emissions and zero congestion." Justin Erlich, head of policy for AVs at Uber, says that "If the 20th century was about cars giving us independence, the 21st will be about autonomous vehicles giving us independence from cars". Others remind us of how CAVs will offer freedom and independence to people who cannot drive cars: the very old, the very young and the disabled.

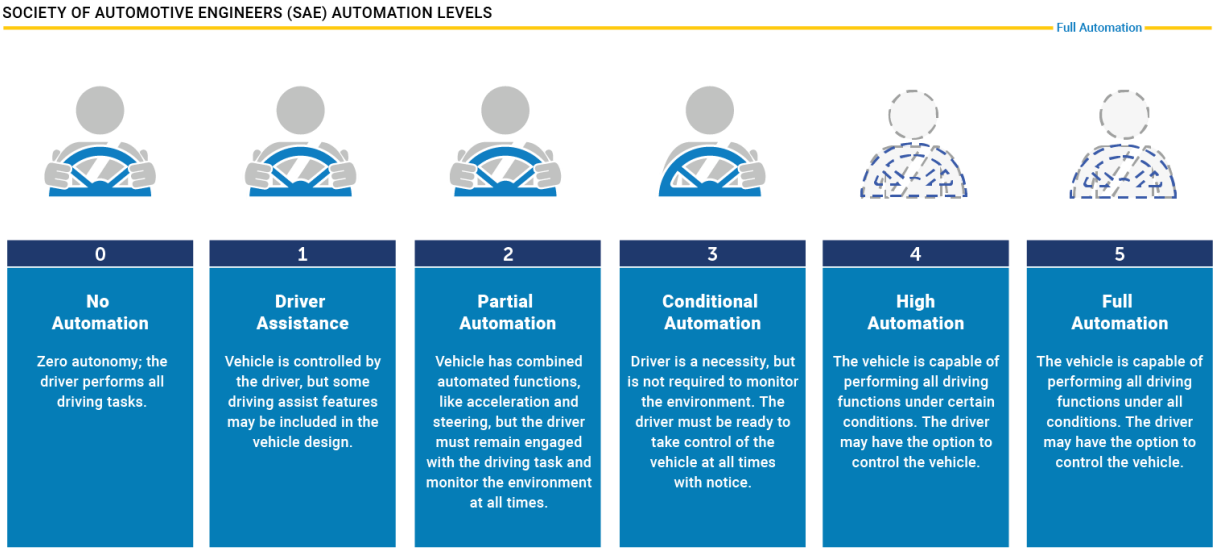


Figure 1: SAE Automation Levels (Source: NHTSA)

Despite this optimism, CAVs, like cars, could have unintended consequences, too[2]. The partial automation of levels 2 and 3 (See Figure 1) can be unsafe, because drivers are still required to pay attention even when they have handed over control of the vehicle, which they find hard to do. The driver of a level 2 Tesla Model S

[1] Reinventing wheels. Autonomous vehicles are just around the corner. (2018, March 1). *The Economist*.
[2] For a detailed analysis of those risks see the JRC report by Raposo et al.: Alonso Raposo, M., Ciuffo, B., Makridis, M. and Thiel, C., The r-evolution of driving: from Connected Vehicles to Coordinated Automated Road Transport (C-ART), Part I: Framework for a safe & efficient Coordinated Automated Road Transport (C-ART) system, EUR 28575 EN, doi:10.2760/225671

was killed when his vehicle hit a lorry in May 2016; investigators found that despite warnings from the car, he failed to keep an eye on the road. Videos from the accident that lead to the death of Elaine Herzberg, the first human casualty of a CAV, showed that the backup human driver was not looking at the road in the moments preceding the collision. As for congestion, if robotaxis are cheap and fast, people will want to use them more. The nightmare scenario, says William Riggs of the University of San Francisco, is that "we create another form of congestion – it just happens to be automated congestion." Nor is it granted that CAVs will automatically lead to a freer and more independent mobility. In authoritarian societies, AVs could be a powerful tool of social control. Access to some places may be restricted to certain riders or robotaxi networks, just as some online services are "walled gardens" or cannot be accessed on all devices. AVs could be seen as an Orwellian technology, an instrument of surveillance and social control. Protesters might object by standing in front of AVs and blocking traffic. That could lead to calls for AV lanes to be fenced off, "thus making city streets even more inhospitable to non-motorists than they already are", says Brian Ladd, author of "Autophobia", a history of opposition to cars.

Faced with this profound dilemmas, the humans at the centre of this rapidly changing and uncertain mobility future are increasingly feeling doubtful and fearful. A survey by Advocates for Highway and Auto Safety, a consumer lobby, found that 64% of Americans were worried about sharing the road with AVs. In another survey, by the Pew Research Centre, 56% of Americans said they would not ride in a self-driving vehicle (see Figure 2).

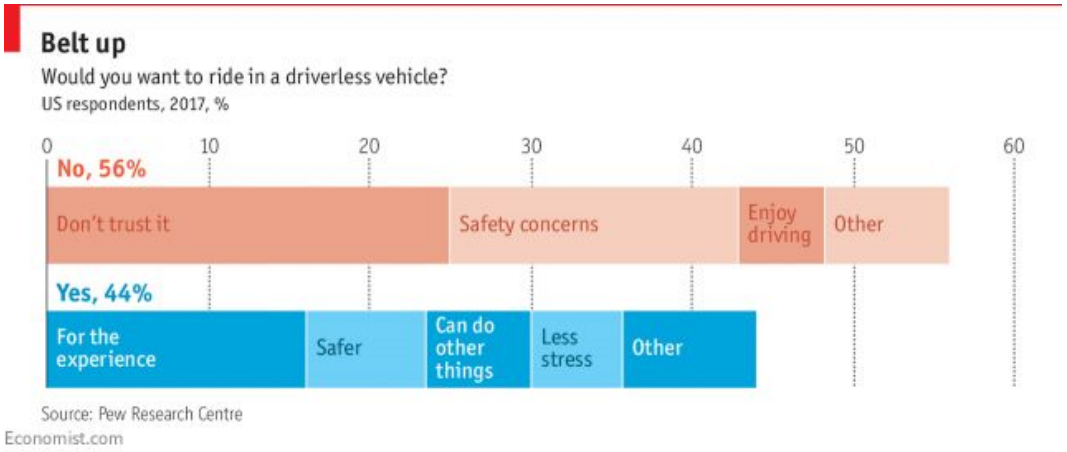


Figure 2: PEW Research Centre survey on driverless vehicles (Source: The Economist)

For CAVs to achieve public acceptance it becomes vital to understand on the one hand their new functionalities and technical limitations, and on the other hand the driver behaviour and attitude patterns toward transport automation. Related to this, the transition phases in going from manual to fully automated driving must also be understood, forecasted and the potential impacts assessed. All of these aspects should improve understanding and therefore lead to a better human control and acceptance through the formation of procedures, rules and monitoring mechanisms for the adoption of CAVs.

Confronted with this challenge, the focus of PAsCAL, which draws inspiration from the French mathematician and inventor that championed the scientific method[3], is to create the **Guide2Autonomy**, a comprehensive framework that will allow to better understand the implications of CAVs on society, to educate their future drivers, passengers and those who will have to share the road with them, and to help public and private decision makers navigate the unchartered waters of the transition to a new form of personal mobility.

1.1 Objectives

To tackle the aforementioned challenges and draw the attention towards the "soft" human component in the CAVs development, the PAsCAL consortium has identified ***seven*** user-centric objectives as described below.

[3] See https://en.wikipedia.org/wiki/Blaise_Pascal

OB01 - Develop a Europe-wide multidimensional map of public acceptance for higher levels of connectivity and automation in transport and for different user groups, including current non-drivers, travelling alone on CAVs: An extensive array of psychological tools will be used, from direct interviews to subtle reaction-time based measures, to develop and validate a measure for public acceptance that builds on established models on the one hand (e.g., TAM extensions[4,5]), and recent developments in attitude research[6] on the other. Acceptance will then be measured in large representative samples across Europe. Interviews and survey will be accessible and designed for varying abilities. This map will be complemented with a comprehensive measurement instrument and a self-assessment tool.

Measure of Success: A map (i.e., *360-Acceptance Map*) indicates **who** (defined clusters of people) accepts **what** (implications of highly connected and automated transport), **where** (geographically) and **why** (motivators and barriers to support). The measurement instrument (i.e. *CAVA*) as well as *Cross Skill*™ is made accessible to the public.

OB02 - Optimize and validate connected and automated transport solutions for current non-drivers: We address known and novel barriers for current non-drivers (e.g. the elderly, blind and partially-sighted people) by using simulations and discrete choice experiments, validated in real-world pilots. The sensitivity to re-designs, education treatments, varying framings and bundles of solutions will be compared with respect to their impact on acceptance. Results will be specific to target groups and regions.

Measure of Success: One simulator and one VR platform used, and two pilots conducted to derive target-group specific guidelines for optimizing connected and automated solutions for current non-drivers.

OB03 - Analyse driver's behaviour in different scenarios: This analysis will be performed by developing and validating a novel multi-simulator environment that can be used to assess known and future issues for drivers that will emerge from the rapid acceleration of the CAV technology. Five pilots will learn from the simulation-based studies in order to run studies in more realistic settings.

Measure of Success: Valid and reliable data on driver's behaviour in simulated CAV environments: Two simulators for assessing driver's behavior under different traffic conditions as well as one simulator for observing driver's behavior under training conditions, both in a controlled lab environment. Five pilots addressing different user group <-> mode <-> usage.

OB04 - Identify impact factors and their interdependencies which reflect identified issues and lessons learned across all modes: The surveys, simulator studies, pilots and the large data sets available from the partners (e.g. ExaMotive S.A., ETELÄTÄR, UNIVLEEDS) will span a wide range of valuable data sets and also insights about user acceptance and behavior related phenomena. PAsCAL will cross-validate the findings and analyse the public acceptance and user behaviour in a range of complex operating environments, especially as regards any problems inside and outside the autonomous vehicle, connectivity of transport systems with emphasis on vulnerable road users.

Measure of Success: Derived impact indicators and their dependencies across different user group <-> mode <-> usage.

OB05 - Investigate new "driver" training needs and certification requirements for new technologies/levels of automation: A list of training and education solutions will be defined with the help of the instructors of RDS Driving and of ACI's Ready2Go Safe Driving Centers and will be tested and validated in PAsCAL's multi-simulator environment (see OB03), as well as in training-related pilots on test tracks. Training programmes will be developed to enable both new and experienced drivers to cope with up to level 4 CAVs. The data analysis will reveal guidelines as well as certification requirements for future training programmes on CAVs.

[4] Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204

[5] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478. doi:10.2307/30036540

[6] Vogel, T., & Wänke, M. (2016). *Attitudes and attitude change, 2nd ed*. New York, NY: Routledge/Taylor & Francis Group

Measure of Success: One training simulator. Training programmes for trainers, drivers and professional drivers. Guidelines for certification adoptable across the EU.
OB06 - Assess attitudes towards shared modes of transport and the inclusion of CAV as part of fleets: Starting from models of technology acceptance[7,8], we will develop an instrument to measure the acceptance of CAVs by fleet customers and managers. The measure will be validated with samples of current fleet users and presumable opponents (e.g. owned-vehicle users) as well as the inclusion of existing big data sets from the partners. ***Measure of Success***: A specific CAV acceptance measurement instrument, as part of CAVA (see OB01), that research and industry can use to predict how customers adopt and accept different shared modes of transport and fleets that include CAVs.
OB07 - Evaluate the short-term and long-term impacts of PAsCAL solutions, develop guidelines and recommendations on common issues, approaches and lessons learned across all transport modes for different private and public stakeholders: We will provide private and public stakeholders with a set of guidelines and recommendations regarding potential CAV user groups, CAV simulations, pedestrian behaviour towards CAVs, the influence of CAVs on shared public space, the organisation of CAV awareness campaigns, requirements for urban living labs including CAVs, the ideal composition of CAV working groups and the necessity of thematic workshops. ***Measure of Success***: A so-called *Guide2Autonomy* framework that supports public and private decision makers in designing, deploying and regulating CAV-related services, made accessible via a Web portal.

1.2 Relation to the work programme

This proposal relates to programme topic *MG-3-3-2018: "Driver" behaviour and acceptance of connected, cooperative and automated transport*.

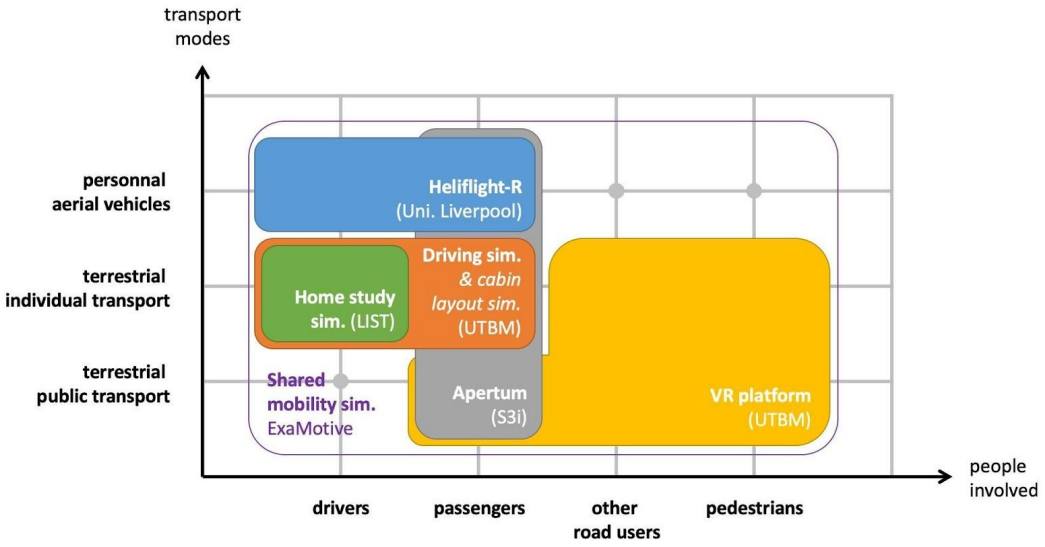
The "soft" human component struggling with the evolution towards increasing levels of connectivity and automation will be identified with a multi-level approach, including:

1. An EU-wide online survey covering 5,000 users in 9 countries;
2. An array of psychological evaluation tools;
3. A novel multi-simulation environment integrating six simulators covering drivers of different types of vehicles/modes and current non-drivers moving in a wide array of operating environments and conditions;
4. A number of tests/trials/demonstrations such as High-capacity autonomous bus operations in Luxembourg and Sweden, autonomous driving training in ACI's Lainate (Milan) test track, SMart Emergency Vehicles in Madrid, shared connected transport solutions in Munich and the UK, and the experience of vulnerable travellers with a connected transport environment in Madrid.

The multi-simulation environment means a cluster of simulation systems addressing the different transports modes (public and individual, terrestrial and aerial) and people involved (drivers, passengers, other road users, pedestrians…). Some of these systems are able to simulate different transport modes in the same virtual environment (=shared space), in a same time (i.e. autonomous bus and traditional car sharing the same road) or along a multimodal trip.

[7] Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204

[8] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478. doi:10.2307/30036540



CLUSTER OF SIMULATION SYSTEMS FOR PASCAL PROJECT

The particular focus of PAsCAL will be driven by specific categories of users represented in the partnership, such as CAV makers (Volvo Buses through E-Bus), people with disabilities (at EBU and UNIVLEEDS), and service providers with a direct interest in developing new services and businesses based on the results of our work, such as a driving school (RDS Driving), a national Automobile Club (ACI) with its Safe Driving Centre and insurance company, and a multinational car sharing operator (ExaMotive S.A.).

This proposal will address ***six*** of the scopes listed in the work programme, as indicated below:

SC01 - Assess public acceptance across Europe for higher levels of connectivity and automation by running a series of psychological methods described in the Methodology section to assess spontaneous uninformed and informed aspects of acceptance and to design acceptance increasing guidelines (**linked to OB01, OB04**).
SC02 - Public acceptance of different user groups, including current non-drivers: A special focus is put on blind and partially-sighted persons as well as elderly people by involving them strongly in the development of a measure of acceptance as well as assessing their behavior in the context of autonomous bus operations (**linked to OB02**).
SC03 - Perform simulations, correlate and analyse driver behaviour/reaction under different scenarios: A multi-simulation environment will allow different transport modes meeting in a variety of shared spaces to be connected, simulated and tested. This will be used to measure the behaviour of different target groups of drivers and non-drivers across modes and operating conditions. Appropriate mitigation solutions will be defined with the help of professional driving instructors and tested in the simulated environment and real-world trials (**linked to OB03**).
SC07 - Assess and elaborate common issues, approaches and lessons learned across all transport modes: PAsCAL will develop a set of guidelines for public authorities, such as national and local regulators and for businesses such as driving schools, insurances, car sharing providers, etc. (**linked to OB07**)
SC09 - Investigate new "driver" training needs and certification requirements: Utilising the extensive experience of 1,400+ RED driving instructors and of ACI's Ready2Go Safe Driving Centre instructors, training programmes are developed and tested to enable all drivers to cope with up to SAE level 4 CAVs. A form of graduated licensing will be explored in which drivers can progress from the basic licence to one endorsed with additional skills needed for up to level 4 vehicles. Once a training regime was clarified, a test regime using virtual training and testing for the higher levels of licensing is to be considered. ACI's Road Safety department will cooperate in assessing new training needs, including an analysis of the new

certification requirements and other legal aspects and on the effects of the increased levels of connectivity and automation on employment and skills (**linked to OB05**).
SC11 - Assess attitudes towards shared modes of transport and the inclusion of CAVs as part of fleets: Leveraging ExaMotive S.A.'s international user base and large scale car sharing network (reaching most of the major European cities with a combined fleet of several thousand vehicles), a set of typical usage scenarios will be defined and used to set up a number of simulations and trials involving different types of shared connected vehicles including vehicles with autonomous features. The goal is to better understand attitudes towards and public acceptance of different kinds (by size, by type combustion or electric, by availability of autonomous features) of the shared vehicles and of various associated incentives (**linked to OB06**).

1.3 Concept and methodology

1.3.1 Concept

PAsCAL proposes a holistic user-centric "Guide2Autonomy" (G2A) aimed at accelerating the user-friendly evolution of connected, cooperative, and automated vehicles and transport systems. It will address all issues relating to the role of humans within the system, ranging from real-time driving control to long-term training needs for jobs.

More specifically, PAsCAL will not only focus on user acceptance and user behavior in or near a CAV, but also will assess the impact of highly connected and autonomous transport on people's safety, privacy, well-being and quality of life. The Guide2Autonomy is a comprehensive framework comprised of novel tools to close the distance between users and CAV technology, ensuring that human behaviour and public acceptance are thoroughly studied and understood. This framework comprises several interconnected elements:

- A ***platform*** on which a diverse range of users from all transport sectors can identify their concerns, provide feedback, and share lessons learned.
- A ***simulation*** environment in which research questions and hypotheses derived from the issues are properly designed, studied, and verified.
- A ***training and education*** programme in which new "driving" needs and certification requirements for different levels of automation are identified and tested by both experienced and new drivers.
- Real-world ***case studies*** to validate the proposed research using trials and demonstrations.
- An ***impact assessment*** model for all stakeholders in the value chain to evaluate policies, strategies and innovations that improve user acceptance of connected and autonomous vehicles and transport systems.
- A ***solution-packaging*** tool containing detailed guidelines for new initiatives and business models that will allow human components to keep pace with the rate of technological advancement in the CAV evolution.

The Guide2Autonomy concept is illustrated in Figure 3.

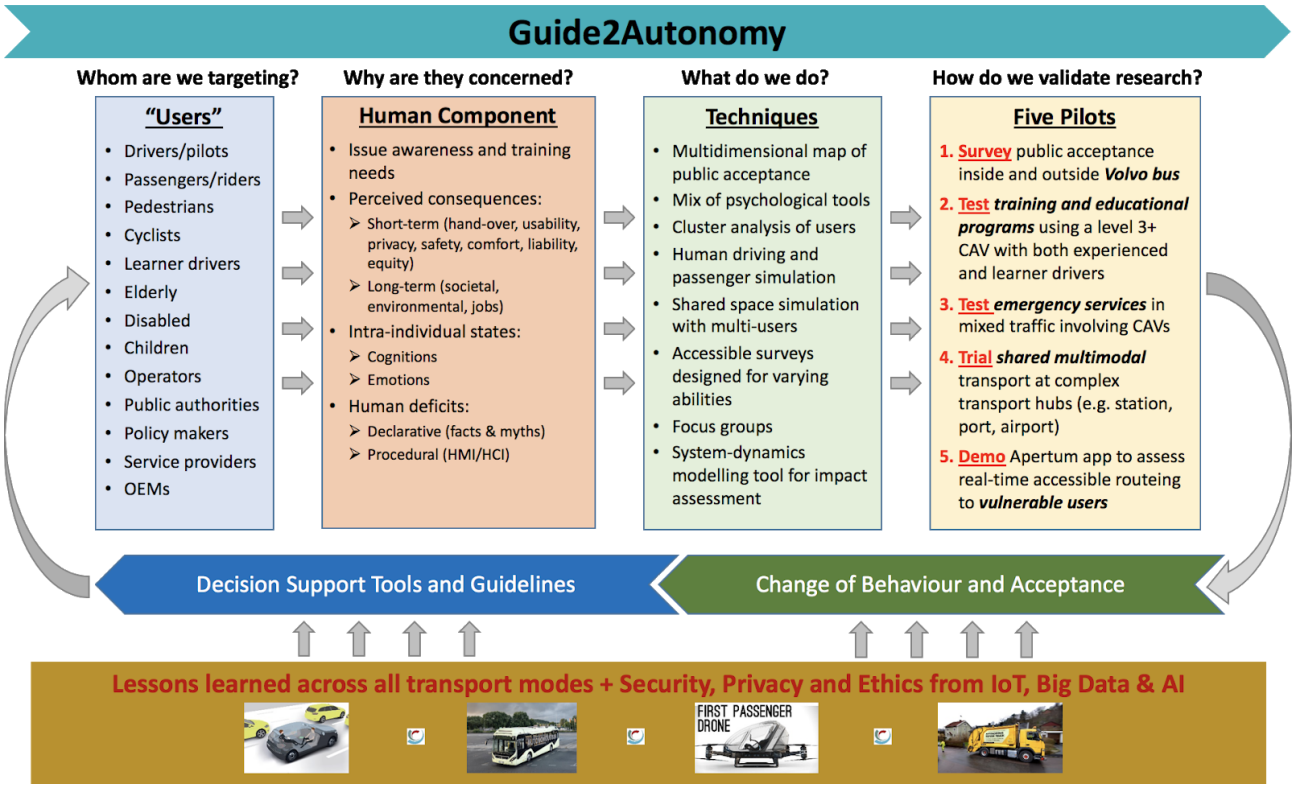


Figure 3: Overall Concept of the Guide2Autonomy

Whom are we targeting?

PAsCAL will target a wide range of user groups to get a good representation of social characteristics, and "driver" behaviour and acceptance of CAVs across Europe. An initial list of users includes drivers (private or professional, experienced or new, road or non-road), passengers and those who will have to share the space with them (e.g. pedestrians, cyclists), including vulnerable groups (e.g. the elderly, the disabled).

For current non-drivers, PAsCAL is particularly interested to study blind or partially-sighted people. Through its project partners such as the European Blind Union (EBU) and UNIVLEEDS, PAsCAL will engage these people in all tasks starting from data protection and initial acceptance assessment to pilot trials, impact evaluation and recommendations. They will play an important role in the Guide2Autonomy framework.

The initial list also includes all stakeholders in the value chain of CAVs such as traffic operators, public authorities, policy makers, service providers and OEMs to ensure that public acceptance and user awareness are integrated as early as possible in the design of new CAV technologies and developments.

Why are they concerned?

The various "user" groups differ with regard to the ways in which they would interact with CAVs, and how their lives, well-being, employment situation etc. would be affected by CAV usage and dissemination. Crucially, acceptance is affected by these consequences, and even more so by the *subjective consequences* which might diverge from a realistic view. PAsCAL will carry out an analysis on the intra-individual factors affecting "driver" behaviour and public acceptance of CAVs. An initial analysis of the psychological and technology acceptance literature indicates that these factors comprise issue awareness, perceived short-term consequences (e.g. usability or privacy), long-term consequences (e.g. job situation, environmental changes), declarative (what CAVs can and cannot do) and procedural knowledge (how to use a CAV) about the CAV, and lastly psychological states not only including introspectable and expressable thoughts about CAVs, but also spontaneous affective reactions (e.g. felt enthusiasm, ambivalence or fears). This list will be revised and

extended to reflect the concerns of the users identified in the project, and to determine the weight of each factor in determining overall acceptance and willingness to use.

What do we do?

PAsCAL will develop a number of innovative tools to better understand the implications of CAVs on society, to educate the future drivers and non-drivers, and to design effective recommendations and guidelines for guiding people to autonomy. These will include psychological tools, cluster analysis of user characteristics, human driving and passenger simulation, real world pilots, shared space simulation with multi-users, accessible surveys designed for varying abilities, focus groups, stakeholders hands-on workshops, and system-dynamics modelling tools.

How do we validate research?

PAsCAL will carry out ***five*** real-world trials to validate its research findings. These pilots were selected with consideration of different users involved, in particular the current non-drivers:

1. "High-capacity autonomous bus operations": analyse passenger acceptance and attitude towards high-capacity autonomous buses in public transport operations, and (wherever appropriate) assess other road users who have to share the road space with the bus.
2. "Autonomous driving training": validate the programmes on capacity building, training and education in a real CAV environment considering the different levels of development and implementation.
3. "SMEV - Smart Emergency Response": analyse how emergency vehicles can best operate in a CAV environment, in terms of journey time, safety and disruption to general traffic.
4. "Shared connected transport": assess attitudes and perception of "drivers" and passengers toward different types of shared connected vehicles with different autonomous features.
5. "Experience of vulnerable travellers with connected transport environment": focus on the main challenges that people in vulnerable groups are facing with connectivity-related technologies.

PAsCAL is an ambitious research and innovation project with carefully-identified methodologies and approaches, and well-planned implementation. PAsCAL will study various social groups, in particular non-drivers who are insufficiently addressed in the previous and ongoing CAV projects. Equipped with all needed background knowledge and well-balanced skills, the PAsCAL consortium believes that the project will fulfill all its objectives with accurate and reliable scientific findings which will be used to deliver a detailed, evidence-based assessment of real "driver" behaviour in connected and highly automated or autonomous vehicles.

Interdisciplinary considerations

The PAsCAL project is proposed by a strongly interdisciplinary consortium including a European association of disabled people, a leading manufacturer of trucks and buses which is testing an high-capacity autonomous bus[9], a multinational car sharing company operating several thousand vehicles in most major EU cities, centres of excellence for R&I in disciplines such as psychology, sociology, behavioural economics, data science, augmented and virtual reality and of course connected and autonomous transport (road, rails and aviation), large and small innovative IT companies, a driving school with 1,400+ instructors and 80,000 yearly customers, a national Automobile Club with more than a million members and two safe driving centres, and a consultancy firm specialized in mobility issues.

Stakeholders support

The PAsCAL project is also strongly supported by relevant stakeholders interested in meeting citizen's needs. Consequently, understanding road users' perspective and attitudes and degree of acceptance of the new technologies is of the utmost importance and part of their mission. A sample of the stakeholders which expressed their interest in the project is indicated in the table below. They belong to different categories,

[9] Volvo Buses. (2018, 06 18). *Pioneering Automation: Volvo demonstrates autonomous bus | Volvo Buses*. Retrieved from Volvo Buses Web site: https://www.volvobuses.com/en-en/news/2018/jun/pioneering-automation-volvo-demonstrates-autonomous-bus.html

representing different groups, skills and interests. Therefore, their contribution will be different in relation to their specific characteristics and interests. Some of them will actively support PAsCAL by cooperating to the activities in their respective domains of competence i.e. Sara Assicurazioni, Fondazione Caracciolo and Arriva Italia Srl, others will follow the project's development providing informed advice and opinions.

Group	Name	Description
Ministries	Ministry of Infrastructure and transport – Road Safety Directorate (IT)	The Directorate is responsible for adoption and implementation of the national road safety plan and operational programs, accident prevention and road safety, information and education campaigns; Institutional communication, approval of traffic regulation and control devices for offenses and road signs; legislation and approval in the field of road restraint systems; road traffic regulation and coordination of the relevant road police services; use and protection of roads; international activity in the areas of competence; disputes relating to road traffic; national coordination and implementation of the information technology and Intelligent Transport System (ITS).
	Ministry of Economic Development - Directorate for Electronic, Broadcasting and Postal Services (IT)	The Directorate is responsible for the regulation of the electronic communication sectors for public and private use and the adoption of administrative directives, for the regulation of technical standards and for the protection of security and integrity of electronic communication networks and for comparative studies on the evolution of electronic communication services.
	Ministry of Economy (LUX)	The Ministry of the Economy (Ministère de l'Economie) is responsible for all issues relating to Luxembourg's economic interests: general economic policy; business, technology and innovation policy; promotion, development and diversification of the economy; foreign trade; energy policy; quality policy; intellectual property; competition policy (legislation, market regulations and oversight, etc.); policy on the legal protection of consumers.
	Ministry for Sustainable Development and Infrastructure (LUX)	The Ministry of Sustainable Development and Infrastructure has responsibilities in matters of land use planning, environment, transports, public works and public procurement contracts.
	CCAV - Centre for Connected and Autonomous Vehicles (UK)	It is a joint unit of two UK Government Ministries, the Department for Business, Energy and Industrial Strategy and the Department for Transport. Established in 2015, by working closely with industry, academia and regulators, it aims to make the UK a premier development location for CAVs. This will contribute to economic growth and help industry to develop safe, efficient systems to move goods and help people get around.

Local Authorities	Landeshauptstadt Muenchen – Referat fuer Stadtplanung und Bauordnung (DE)	The city of Munich Department is responsible for urban planning. Within the "Perspective Munich" framework it develops initiatives for future land and transport planning.
	Ayuntamiento de Madrid – DG de Sostenibilidad y Control Ambiental (ES)	The General Directorate of Sustainability and Environmental Control of the city of Madrid has competences on planning and promoting sustainability, air quality, energy and climate change, mobility, environmental education, environmental control and discipline and on authorizations, inspection and control.
	Pays de Montbéliard Agglomeration (FR)	Born in 1959 and progressively enlarged, since 2017 it is an administrative entity joining 72 municipalities and 142,000 inhabitants in an area of 450 km². Its competences range from economic development to environment mobility and urban planning.
International Associations	STA - Smart Transportation Alliance(BE)	Founded in 2014, it is a non- profit global collaborative association for transportation infrastructure innovation across modes and the Smart City. A platform for knowledge management, STA's mission is to lead and support activities improving methods, technologies and standards associated to transport infrastructures.
	FIA - Federation International de L'Automobile – FIA Region I (FR)	A non-profit world organisation and an international association gathering national Automobile Clubs, Automobile Associations, Touring Clubs, and national Federations for motoring and motor sport, it was founded in 1904 and enjoys consultative status with the U.N. It promotes safe, sustainable and accessible mobility for all road users across the world.
Public Transport Operators	MVV Muenchner Verkehrs- und Tarifverbund GmbH (DE)	MVV is one of the largest public transport associations in Germany. It gathers the Free State of Bavaria, the state capital Munich, the eight administrative districts surrounding the city and more than 40 transport companies operating regional railway and busses, S- and U-Bahn, tram and inner-city busses assuring horizontal and vertical coordination of the partners and a variety of mobility services to citizens.
	Arriva Italia Srl (IT)	It is the Italian Holding of the Arriva-DB Group. Established in 2002, it now owns about 5% of the Italian passengers public transport services providing both urban and inter urban and the connecting services to Turin and Milan airports. It currently manages a portfolio of 9 operating companies, public transport services for around 100milion buses/km a year, 2500 vehicles and 3500 employees.
Insurance	Sara Assicurazioni (IT)	Since 70 years ACI's insurance company provides all forms of insurance and reinsurance of automobile risks in general as well as everything related to personal, familiar and financial security of the individuals and their family.

Clusters	Pole Véhicule du Futur	It is a cluster dedicated since 2005 to enhancing synergies through industrial, academic and training actors in the domain of future vehicles and mobility. It brings together 380 members belonging to the spheres of industry, research and economic intelligence in the Alsace and Franche-Comté regions.
Foundations	Fondazione Filippo Caracciolo	ACI's Study center is an independent, non-profit institute aiming at promoting studies and research in the sectors of transport, road safety and sustainable mobility, offering a variety of data, analyses, research tools and consultancy. It hosts the Observatory "Moving with Intelligence" which brings together Ministries and public and private stakeholders of mobility issues.

Measures taken for public/societal engagement

A special focus of the PAsCAL project will be the impact of CAVs on disabled people, which are represented in the consortium through EBU and personnel of UNIVLEEDS. For disabled people there are likely to be a range of responses in relation to the acceptance of CAVs. Firstly, they might be some considerable enthusiasm, at the prospect offered by CAVs to enable those who are not currently permitted to drive to enjoy the advantages offered by personal motorised mobility. However, it is evident that for these groups these advantages could only be offered at SAE level 5 automation; and even then, this is not a given. Secondly, for some disabled people there might be serious concerns as to whether CAVs will be physically accessible (e.g. by removing seats to make space for a wheelchair). Will these vehicles be designed in a physically accessible way, and will there be scope to incorporate adaptation? A further concern in relation to automation is what this will imply for availability of staffing in the transport system. Many disabled people rely on the support of transport staff – taxi and private hire drivers, bus drivers and railway assistance staff. The concern is that AVs will lead to a massive reduction in that. There are also potentially mixed feelings in relation to how disabled people might interact with CAVs as non-users. It could, for instance, mean that moving about as a pedestrian and crossing streets becomes very much easier, as the CAV will be much better at detecting them. On the other hand, it could mean that moving about as a pedestrian begins to feel more vulnerable, as traffic lights and road markings, no longer necessary for regulating traffic movements, are removed. The proportion of disabled people in the population is on the increase, so it will be important to seek to capture the views of disabled research participants. In order to pursue these issues, we will liaise closely, with the help of EBU, with representatives from the disability communities, such as the European Disability Forum and some of the main disability representation organisations at the member state level (such as the Royal National Institute of Blind People, Scope, Mencap etc.).

As an end user association, ACI will make extensive use of all its wide range of activities to involve citizens and maximize PAsCAL's efforts. Some activities will involve them directly in the project: through surveys, training at Ready2Go's driving schools and safe driving centres, road education in schools, etc. Other activities will be part of the dissemination strategy to spread as much as possible news and results of the project: from publications of articles and news to the organisation/participation of events or workshops, from the involvement of ACI's local offices and of the stakeholders networks to which ACI belongs to direct contacts to public authorities and decision-makers.

LIST will work in the framework of its membership of the stakeholders committee of the Franco-German-Luxembourgish cooperation on automated and connected driving, where the "Impact and effects of automated and connected driving", including "Assessment of the perception of automation functions, both from CAV drivers and other road users than CAV" and "Assessment of CAV drivers'

perception related to use and value of time" have been identified as Key Thematic Areas[10], to acquire input for PAsCAL and inform the regulators in the three countries of the lessons learned in the project.

1.3.2 Project Positioning

Technology readiness levels (TRL) before and after the project for technologies and innovation solutions of PAsCAL are ranging from TRL2 to TRL9 and presented in Figure 4 below. The trajectory of the blue arrows indicates the initial (at project kick-off) and final (at project end) TRL of each technology/innovation solution delivered by PAsCAL. They are:

1. *Prototypes of HMIs in simulator* aim to provide users with e.g. feedback about the vehicle's behaviour.
2. *Flight simulator* is a reconfigurable simulator for flight dynamics engineering and training applications.
3. *Virtual Reality (VR) platform* allows to immerse the user in a virtual environment and to set up interactions between the user and this virtual environment.
4. *Driving simulator* allows observing and measuring the driver's behaviours in many realistic, controlled and repeatable driving situations.
5. *RDS Driving Cognitive Training Product* includes video and CGI (Cognitively Guided Instruction) content for trainers in CAV environment.
6. *ACI's Ready2Go Method* is a high quality driving school network, offering innovative education programme in compliance with the ISO (International Organization for Standardization) standards.
7. *Home Study simulator* is a distributed platform consisting of a home application and a cloud based server architecture.
8. *Autonomous bus* is an prototype autonomous 12-metre bus designed by Volvo.
9. *Cross Skill* ™ allows for competency assessment questionnaires (self-assessment or assessment by others) to be generated based on competency profiles.
10. *SMEV (Smart Emergency Response)* is an ITS Cooperative System which analyses how emergency vehicles can best operate in a CAV environment.
11. *Apertum* is a free app that provides public transport routing to non-conventional public transport users (elderly, disabled, pregnant women, etc.).

[10] Bundesministerium für Verkehr und digitale Infrastruktur, Ministére de la transition écologique et solidaire, Le Gouvernement du Grand-Duché de Luxembourg. (2018, May 8). *Franco-German-Luxemburgish cooperation on automated and connected driving. Concept for the Cross-border Digital Test Bed.* Retrieved from: https://meco.gouvernement.lu/fr/publications/brochure-livre/cross-border-digital/concept-cross-bordrer.html

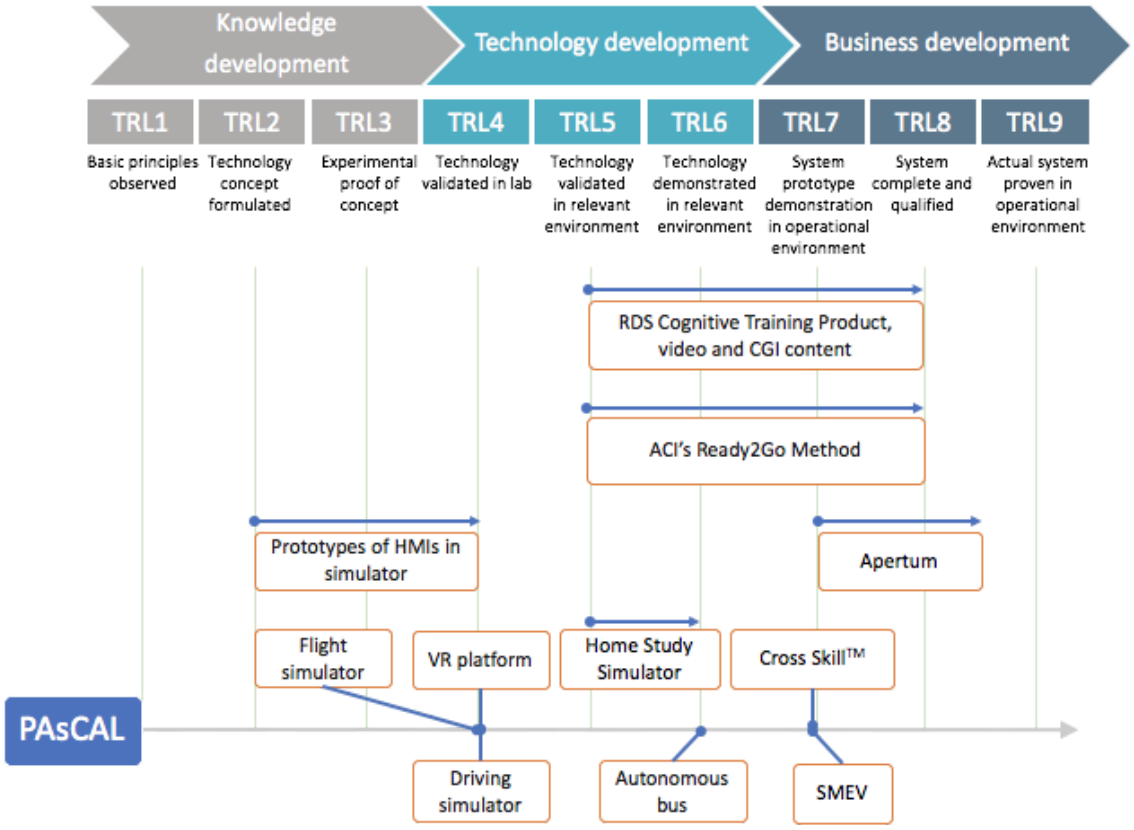


Figure 4: PAsCAL's positioning on the TRL scale

1.3.3 National/international R&I activities linked to the project

AUTOPILOT (AUTOmated driving Progressed by Internet Of Things) carries out European large-scale pilots of autonomous driving supported by IoT-based automated services. The pilots involve various types of CAV driven by thousands of users. AUTOPILOT uses data collected from its pilots to assess different aspects of user experience and acceptance such as ease of use, trust, mental workload, and situation awareness. However, AUTOPILOT mainly focuses on "hard" technological advances and the users directly involved in the pilots. PAsCAL will take a major step towards the involvement from the general public and "users" in different social groups, and use the valuable data and knowledge generated by AUTOPILOT to research wider public acceptance of automation, "driver"/vehicle interaction and ethical decision making. AUTOPILOT, together with L3PILOT and CARTRE, is included in the dissemination network of the UK CCAV programme. *Common partners: UNIVLEEDS*
CARTRE (Coordination of Automated Road Transport Deployment for Europe) is an H2020 coordination and support action, aiming to accelerate development and deployment of automated road transport. It creates a knowledgebase of all European activities, supports current activities, sets up a platform for sharing and re-using data and experiences from different automated road transport systems. It actively supports Field Operational Tests (FOTs) and pilots carried out at National and European levels. In the FOT-Net Data coordination and support action, a data sharing framework has been developed and a catalogue of data-sets from FOTs. CARTRE and FOT-Net Data provide knowledge on European, national and international projects which may serve as a source of experiences and data-set on which PAsCAL can build. Data from other projects may be used to serve a baseline and for informing simulations about "normal" driving behaviour. This will enable the project to make use of existing expertise, and allows the project to go beyond the state-of-the-art. The work performed in CARTRE, which will follow up in the recently approved ARCADE CSA, is also setting the basis for the current undergoing review on the STRIA CAT

Roadmap and the project is instrumental for the EU-Japan-US trilateral cooperation on CAVs. *Common partners: UNIVLEEDS*
COEXIST is a European project (May 2017 – April 2020) which aims at preparing the transition phase during which automated and conventional vehicles will co-exist on cities' roads. PAsCAL will exchange data and lessons learned thanks to existing cooperation agreements between partners of the two projects.
ELECTRIFIC (Enabling seamless electromobility through smart vehicle-grid integration) is a H2020 Research and Innovation Action providing ICT solutions for all stakeholders in the electromobility ecosystem in order to make it sustainable. In order to reach it, the active involvement of all actors is key, being achievable thanks to: The definition of incentive programmes (psychological analysis of EV drivers behaviour including charging preferences), provision of decision-making supporting tools (EV routing mobile app, smart charger, charging fleet scheduler) and identification of sustainable business models for all actors targeting a Win-Win approach. PAsCAL will capitalize on the experience obtained by ELECTRIFIC in both behavioural analysis and user-centric technical developments. *Common partners: RDGFI NV, UMA*
ELVITEN (Electrified L-category Vehicles Integrated into Transport and Electricity Networks) is a H2020 Innovation Action aiming to boost the usage (sharing or ownership) by private and professional users of all categories of EL-Vs (Electric L-Category Vehicles such as bicycles, scooters, tricycles and quadricycles). ELVITEN will carry out one-year long demonstrations with more than 380 EL-Vs of all categories to collect users' experiences with connected transport systems. Some of the EL-Vs (e.g. powered two wheelers) are provided by a PAsCAL partner. PAsCAL will assess lessons learned from ELVITEN, in particular, and develop more user-friendly HMI, faster processing and easier-to-use of real-time information and data exchange. *Common partners: ETELÄTÄR, UNIVLEEDS*
interACT (Designing cooperative interaction of automated vehicles with other road users in mixed traffic environments) is a H2020 RIA working towards the safe integration of AVs into mixed traffic environments. In order to do so, interACT will analyse todays' human-human interaction strategies, and implement and evaluate solutions for safe, cooperative, and intuitive interactions between AVs and both their on-board driver and other traffic participants. PAsCAL will liaise through UNIVLEEDS to exchange results and lessons learned. *Common partners: UNIVLEEDS*
KRABAT is part of the Swedish government's joint programme entitled "Next-generation travel and transport", financed partly by Vinnova through Drive Sweden. It investigates how self-driving, electric and shared vehicles will revolutionise the way citizens move around in cities. The hypothesis is that if these technologies and concepts are deployed in a sensible way and with a societally framed system's perspective, it will have a substantial potential impact, not only on the environment and traffic safety, but also on traffic efficiency and costs. The objective of the project is to provide opportunities to citizens in Gothenburg and Stockholm to experience tomorrow's mobility, and to learn from these experiences in order to enable Sweden to move on towards a broader, full-scale implementation. PAsCAL will cooperate with KRABAT through E-Bus interaction with Volvo Buses to exchange the lessons learned in the pilots using Volvo's high-capacity autonomous bus.
L3PILOT (Piloting Automated Driving on European Roads) is a large (68 M€) H2020 project with the aim to create a standardised Europe-wide piloting environment for automated driving; coordinate activities across the piloting community to acquire the required data for evaluation; pilot, test and evaluate automated driving functions; and innovate and promote automated driving for wider awareness and market introduction. PAsCAL will cooperate with L3PILOT to exchange data and lessons learned. *Common partners: UNIVLEEDS*
The FP7 project **myCopter** investigated the likely enabling technologies required for personal aerial vehicles (PAV) to be widely used. This included the development and delivery of a training programme for so-called 'flight-naive pilots'. One of the key aspects of this exercise was to understand how current training

methods work across different transport modes and to take the best elements of these for PAV use. Further, it required the design of HMI suitable for use in a PAV that would be familiar to car drivers but would be usable in an aviation context. *Common partners: LIV*
In UK EPSRC project no. GR/R84795/01 **Prospective SkyGuides: Developing Guidelines for Future Vision Aids** a novel approach to HMI and guidance algorithm design was adopted by combining a theory of movement guidance in the natural world from Ecological Psychology and aerospace flight mechanics. This led to U.S. Patent US8065044 B2 Vehicle Guidance System being awarded. The principles involved can be used in HMI design agnostic of the mode of transport. *Common partners: LIV*
SMEV (Smart Emergency Vehicles) is an ITS Cooperative System that changes the way of addressing emergency responses in the Smart and Connected City. Resorting to geo-location and not to devices installed in traffic lights, SMEV provides an open path to emergency services by i) clearing junctions from disturbing traffic, and ii) reorganising traffic dynamics in real time in the area surrounding the route to an incident. SMEV provides real-life data to analyse the modification of 'usual' traffic lights patterns resulting in 'unconventional' routes proposed to the emergency vehicle driver. In that context, it would be very useful to monitor the driver's reaction, who would be invited to follow routes that do not match his previous experiences, and compare the trips/routes carried out with SMEV and without SMEV in a pilot city. SMEV can also be used to assess HMIs on emergency vehicles. *SMEV's ownership: ETELÄTÄR*
The Transport Systems Catapult recently announced **a new project dealing with automated journeys by sea**[11]. Further details will be announced soon, but the TSC anticipates that they will be working together with a number of major UK organisations, from government, industry and academia, to develop a fully autonomous passenger ferry that will provide a new service linking sections of the southern English coast. What will be new when it comes to this project is the harnessing of the technology to create unmanned vessels that can move people and freight. This means that as well as adapting technology, the project will also need to consider the regulatory changes required, the business cases that would support such a service and the scale of the expected positive impacts in terms of alleviating road congestion and reducing environmental harm. Several PAsCAL participants have established cooperations with the TSC and will liaise with them to exchange data and lessons learned across the different modes.

1.3.4 Overall Methodology

The overall approach of PAsCAL is working on the one hand towards the enhancement of technologies and innovation solutions, and on the other hand on the development of the Guide2Autonomy framework, providing knowledge, research findings validated by simulations and real-world trials, recommendations and support for public authorities, industry, user organisations and everyone who wants to be informed about CAVs driver behaviour and user acceptance of CAVs. The Guide2Autonomy framework is implemented as an interactive web-page, whose distinctive features include user feedback and live forums, up-to-date simulation outcomes, tailored training and education programmes, findings from real cases, online impact assessment, and a live G2A handbook. A mock-up of the website is illustrated in Figure 5.

PAsCAL proposes an innovative methodology which brings together a set of effective tools (e.g. survey, simulation, training and real-world trials) to address, in a user-centric way, all the main challenges arising from the need to enhance driver behaviour and public acceptance of CAVs, as described below.

[11] See https://ts.catapult.org.uk/2018/08/01/automated-transport-by-water-an-untapped-potential/

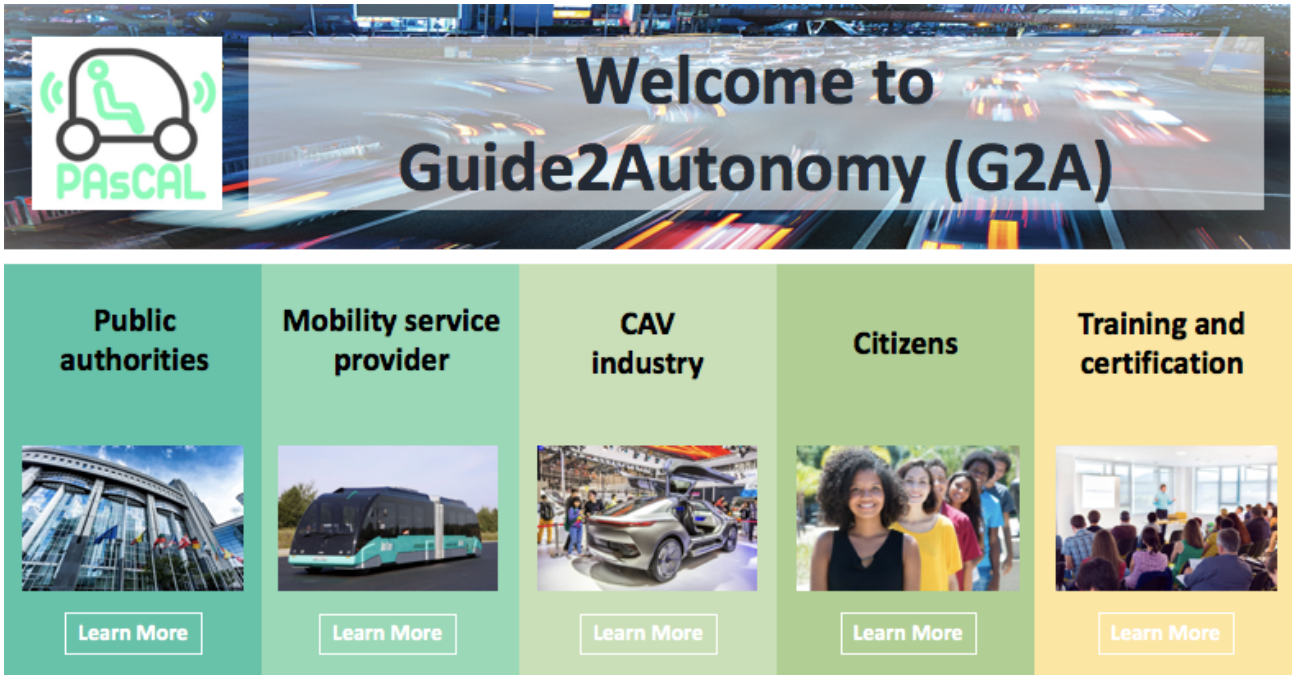


Figure 5: A mock-up of the G2A website

Measure of public acceptance

The basis of the Guide2Autonomy is a profound understanding of public acceptance of CAVs and the way in which it can be improved. PAsCAL will use several ways in which this understanding will be developed. The first is to gain insight on the ideas and concerns of a wide public in Europe. This will be done via large-scale questionnaires and experiments with a large variety of users. Special care will be taken that not only users are involved who are car drivers interested in technology, but users who are representative of the European population, with specific attention to minority groups and those who currently experience some issues with their mobility. By developing a tool that is able to measure user acceptance in a standardized way, PAsCAL will empower users and organisations to determine the impact of their solutions and discussions on CAV acceptance. The measure will be validated by a range of experiments and intervention studies. Users can also use the tool to measure, in a more quantitative way, their own acceptance. Gaining knowledge on user acceptance will result in constructing a multi-dimensional mapping of CAV acceptance. This methodological approach aims at addressing stated intention to use CAV, and the factors which influence intention to use CAV in four phases (see Figure 6).

Phase 1 (Preparatory Work) aims at identifying potential factors (i.e. motivators, barriers, and knowledge) underlying CAV acceptance and willingness to use CAVs. This phase involves an extensive review of scientific and grey literature, and relevant outputs from other EU- and nationally- funded projects (e.g. AUTOPILOT, CARTRE, L3PILOT). Semi-standardized interviews with all project partners as well as interviews with proponents and opponents of the automated and integrated mobility will serve for identifying lacking dimensions.

Phase 2 (Exploratory Study) will then formulate an item pool by integrating previous survey items, and the construction of new items. The item pool will be pilot-tested and formulated in English, Italian, and German. It will be administered to a sample of current vehicle owners, shared fleet users, and users of public transport (N = 1000). Items will then be checked for redundancies by means of exploratory factor analysis. This analysis will yield a reduced item pool to make up an initial measure of multiple dimensions of acceptance.

Phase 3 (Experimental Validation) will validate this measure by its convergence with other measures. First, we will relate the dimensions to measures that do not require introspection or imagination, these are discrete choice experiments. Choices will be represented by use of mock-up scenarios, requiring participants to choose between different CAV solutions and their implied consequences (e.g., social or moral dilemma scenarios). Second, we will assess convergence with implicit attitude measures. Reaction-time based measures, in particular, will be used to assess attitudes unaffected by ad hoc deliberations and desirable responding. Dimensions corresponding with these measures are also more likely to drive willingness to

accept CAVs under a variety of natural conditions, including time constraints and spontaneous behaviors. Third, the survey measure will be related to behavioral data from current road users.

In **Phase 4 (Representative Survey)**, a survey measure will be cleaned to keep the reliable and valid items. The reformulated version will be translated to further European languages (Bulgarian, French, Spanish), and administered to a large sample (N = 5000) from nine European countries. Confirmatory factor analysis will be used to verify the multiple dimensions underlying CAV acceptance and willingness to use. Cluster analyses will then be used to identify different road user clusters as characterized by their scores on different dimensions.

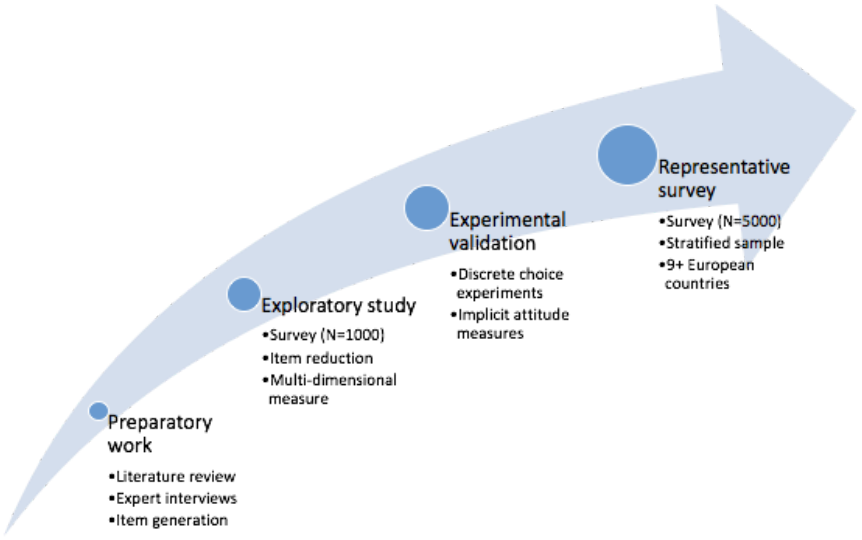
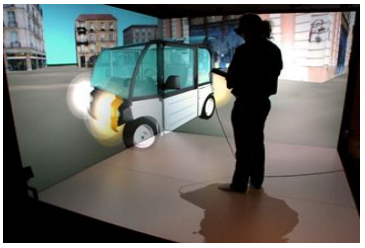


Figure 6: Methodological approach for measuring public acceptance

Measure of human behaviour

To provide potential users with an immersive experience of CAV operation and study their awareness and behaviour in complex environments in which real driving is practically difficult (or unsafe) to operate (e.g. technology failures, collison), PAsCAL will adapt several advanced simulators which are not only able to test the behaviour of the driver but also the acceptance of other users such as other passengers, pedestrians and cyclists. New forms of mobility for people and goods are being developed and tested in many H2020 projects. Future transport systems shaped by advances in technology and changing attitudes towards different forms of transport will not only be ground-based. A particularly exciting direction for future development is the use of aerial CAVs to provide air mobility in a safe and convenient way, acceptable by the public and compatible with the existing transport infrastructure and services. PAsCAL's simulation tools are summarised below:

• **Driving Simulator** allows observing and measuring the driver's behaviours in many realistic, controlled and repeatable driving situations. It collects a large amount of driving data (speed, acceleration, vehicle position, …) and it is generally combined with an embedded eye-tracking system that allows to monitor the driver's attention and other behavioural parameters.	
• **Cabin Layout Simulator** originally allows to evaluate and validate a vehicle layout in terms of postures, driver's or passenger's ingress and egress of the vehicle, hand reach of commands, etc. Moreover, this tool allows conducting experiments to evaluate the use of an atypical vehicle according to dimensions, number and placement of seats, HMI location, etc.	

• **Virtual Reality Platform** allows to immerse the user in a virtual environment and to set up interactions between the user and this virtual environment. Thus, we can perform some tests we could not realize in the real word. The VR platform could allow confronting the user (pedestrian, cyclist, …) with any interesting situation including CAVs. Communication channels (e.g. *audio*, *visual*, and *touchable devices*) will also be experimented.	
• **HELIFLIGHT-R Flight Simulator** utilises the baseline commuter scenario use case and automated vehicle model created in the FP7 myCopter project. Participants are provided with an overview of proposed flying CAV operation and asked for their views on a range of topics e.g. noise, privacy, safety, etc. They then 'fly' in the simulated vehicle and its environment as per the envisaged scenarios. A debrief session will also be conducted with participants to see if and how their views have changed having experienced CAVs in (simulated) operation.	
• **Home Study Platform** is a distributed platform consisting of a home application and a cloud based server architecture. The studies take place in the end users' home with each one installing a client application and a low-cost steering wheel. Users can experience the scenarios over a longer period of time in their own home.	

Training and Education

Based on the understanding of user acceptance issues, the next step will be to look into ways to familiarise users with automated driving by developing training and education. Both the role of formal training in driving schools as well as education of the general public will be addressed. Professional drivers' training will be taken into account as well. The activities described above provide an insight in the needs of users, given the fast changing developments in transport automation, and a flexible way of training will be developed, also making use of the aforementioned home-simulation environment in order to derive cognitive behaviour models and competence models for driver re-engaging in a CAV. The training developed will be tried out and assessed (Figure 7 & 8). Also the business models needed to roll out a training program will be investigated as well as the need for modifications/adaptations of the existing training prescriptions and/or rules of behavior on roads.


Figure 7: Training at the RDS Driving driving school

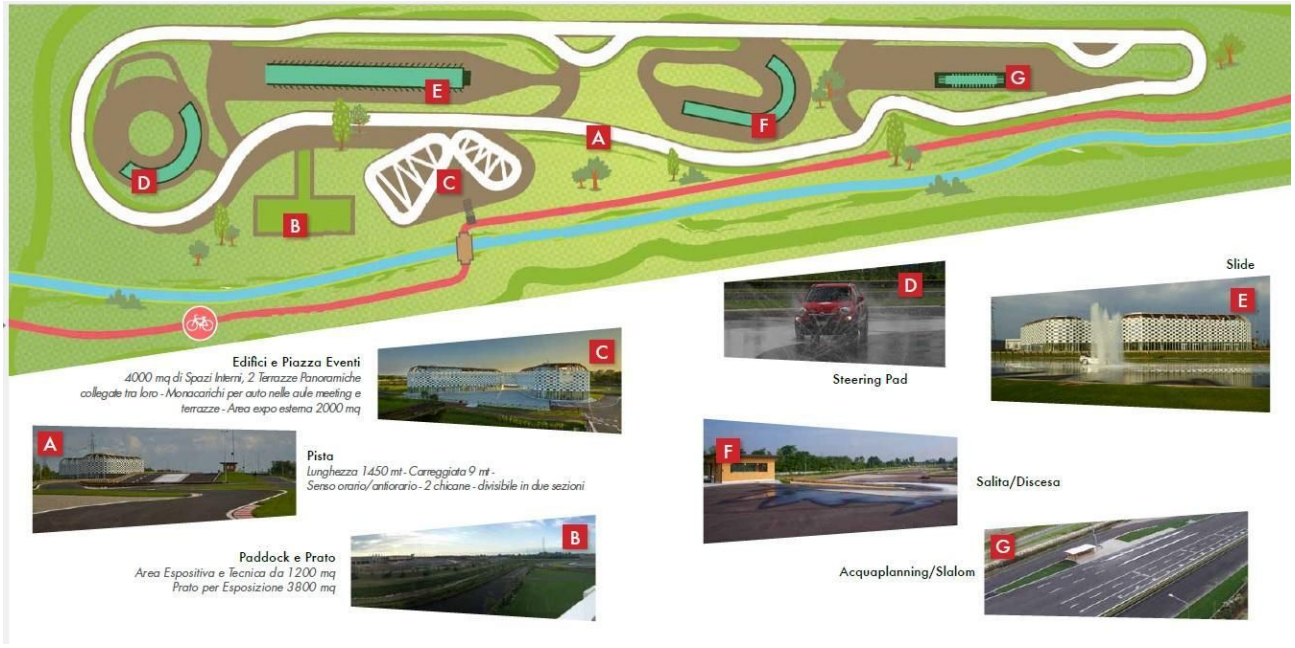


Figure 8: An example of training infrastructure that will be used in PAsCAL (Source: ACI)

The use of the simulators in WP4 goes hand in hand with the observation of drivers' behavior in a CAV. In particular the simulator of UBFC provides an immersive environment, which can be controlled fully by the researchers. The stable condition in the empirical studies reveal more valid and reliable observations in order to understand the knowledge and skills gaps of a driver using a CAV. In addition, the home study simulator provided by LIST will complement the UBFC simulator findings with additional behavioral patterns of the driver in different critical or difficult driving situations.

Knowing which knowledge and skills gaps exist are a precondition to develop a new training programme and learning scenarios in WP5. In order to be able to develop a new training with learning objectives with ACI and RDS Driving, PasCAL has first to identify a precise competence model with an appropriate level of granularity using the results of the simulator studies. The model is then used to define tasks that a learner (i.e. CAV drivers) has to accomplished in the new training. Finally, the new training programme is evaluated with a large number for trainers, drivers and professionals. Finally, the "Autonomous Driving training" Pilot will also assess if and how the driver's behaviour will be modified in a real CAV environment, if there is a difference in acceptance between a simulated and a real situation and if and how stressful it may be to cope with these changes.

The results will lead to a set of guidelines for competent authorities to increase safety of all users, i.e., by better educating future drivers of CAV.

Validation of acceptance and human behaviour in real-world pilots

While the activities described above are mainly using the gathering of opinions, needs and challenges, and providing virtual experiences, the next step is to validate the findings in several real-world pilots.

Five different pilots are planned, covering a wide range of possible scenarios, as summarised in the table below:

Use Cases	Target Groups	Transport Modes	Validation of	Measures	Means of Validation	Locations
High-capacity autonomous bus operations	Passengers, the driver and all other	Bus	Design of in-vehicle CAV HMIs	Safety, comfort, interaction	Survey Interview	Luxembourg Gothenburg

	road users in the demo		Service design			
Autonomous driving training	New and experienced drivers including professionals	Car (L3+)	Learning programmes	Adaptation, trust, competence	Survey Driving tests	Lainate (Milan)
SMEV - Smart Emergency Response	Emergency Drivers, Road users	Fire engine Police car Ambulance	Traffic management in case of emergency	Safety, comfort, interaction, connectivity	Survey Interview	Madrid
Shared connected transport	Shared fleet operators; vehicle drivers, Passengers	Shared connected vehicles (city car, sport, vans), electric vehicles	Network performance for shared connected transport	Data privacy, connectivity	Survey Interview	Munich
Experience of vulnerable travellers with connected transport environment	Disabled, elderly, pregnant women, travellers with heavy luggage, parents with a baby stroller	Metro, Light rail, Bus	Design of connected transport involving autonomous vehicles for vulnerable users	Information accuracy, connectivity reliability, friendly interface	Survey Interview Focus group	Madrid

Pilot One: "High-capacity autonomous bus operations"

This pilot will study the use of automated high-capacity autonomous buses from the perspective of the passengers, the driver and the other road users sharing the street with the bus. Passengers are a very diverse group, also with special needs for (human) support. The pilot will run in collaboration with a bus manufacturer (Volvo) and public transport operators in Luxembourg and Sweden. A high-capacity (12 meter) prototype autonomous bus will be used.

Pilot Two: "Autonomous driving training"

In this pilot the training described in the previous section will be assessed through the use of a L3+ CAV in the "protected" and equipped environment of the Lainate safe driving centre. 70 drivers will test the most critical situations and the solutions previously identified. Moreover, the pilot will assess if there is difference in acceptance of CAVs between a simulated and a real situation (Figure 9).

Figure 9: CAVs and road safety

Pilot Three: "SMEV - Smart Emergency Response"

In this pilot the functioning of emergency vehicles will be investigated by using SMEV, a ITS Cooperative System which provides free corridors and routes for emergency vehicles at any time during missions by clearing junctions from disruptive traffic and reorganising traffic dynamics surrounding the route in real time. Both reactions from road users, who will be confronted with these vehicles and the drivers of these vehicles will be studied.

Pilot Four: "Shared connected transport"

Road maps on automation (such as the ERTRAC roadmap) put quite some emphasis on shared mobility. However, still little is known about the attitudes towards future sharing schemes. This pilot will study attitudes and perception of "drivers" and passengers toward different kinds of shared connected vehicles including small- and medium-size passenger cars, sport vehicles, vans, electric vehicles and vehicles with autonomous features. This study will allow operators of shared fleets to optimally design and operate fleets of shared vehicles and design well-suited incentive mechanisms to increase public acceptance and improve attitudes towards different kinds of shared vehicles.

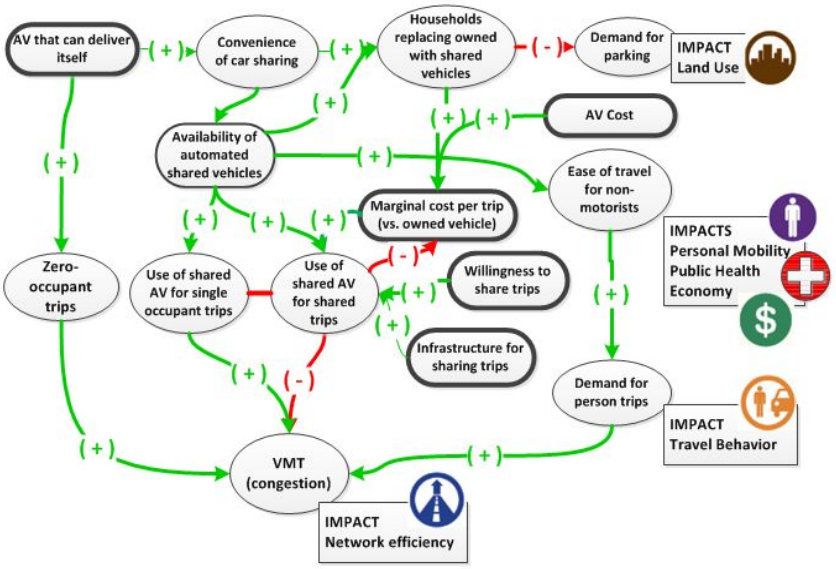
Pilot Five: "Experience of vulnerable travellers with connected transport environment"

In this pilot the focus will be on vulnerable travellers, such as the elderly, pregnant women, disabled, travellers with heavy luggage, and parents with a baby stroller. Use will be made of the Apertum app that advises travellers real-time on the best ways to proceed and possible obstacles that may be encountered. This app has already been extensively tested in Spain, but in this pilot the new challenges of an automated transport environment will be addressed (Figure 10).

Figure 10: Vulnerable travellers in an automated public transport environment

Bringing the knowledge on user acceptance together and developing guidelines

The data from all activities described above will be analysed and the results integrated in order to build a multi-dimensional and evidence-based picture of user acceptance that forms the basis of the development of the Guide2Autonomy (G2A). Impacts of acceptance on the development of automated transport will be determined, and system dynamic models built in order to be able to quantify the long-term impact that different forms (e.g. levels and rates) of user acceptance will have on the technological advances of CAVs. Key performance indicators will be defined that can measure change in



public acceptance and the relation with societal impacts (Figure 11).

Figure 11: Societal impact of CAVs

All these activities are finally brought together in the Guide2Autonomy (G2A), providing a rich set of recommendations, tools, and insights for a variety of stakeholder groups. The G2A will be presented and assessed with stakeholders.

To carry out these activities in an effective and collaborative way, PAsCAL adapts the FESTA V-process methodology framework which has been used in many reference projects such as L3PILOT, AUTOPILOT and ELVITEN..

Figure 12: The Guide2Autonomy

Gender Dimension

Empirical research within the PAsCAL project will be conducted following the Guidelines provided in Horizon 2020's "Gendered Innovations" project. Better gender integration sparks creativity and encourages innovation by opening new perspectives, questions, and ideas for solving the major challenges that the EU has to face. To ensure gender equality and produce better quality research findings, equal consideration will be given to the life patterns, biological differences, needs and interests of both women and men. PAsCAL will promote equal opportunities between men and women in the implementation of their activities. We are committed to look after gender equality in terms of salaries, social needs and job opportunities. In line with our company's ethical and moral commitments, any sort of discrimination against women will be avoided and, anyhow, rectified by our company's leadership.

Thus, sex and gender analysis is of theoretical importance for the study of CAV acceptance and usage. Across objectives, therefore, a special focus will be devoted to the role of sex and psychological gender. Based on information system research[12] [13], it is expected that women may be less likely to accept CAVs due to lower levels of technology acceptance in general, or different factors will drive acceptance depending on gender. In this vein, the project seeks to identify gender-related concerns and barriers as well as preferred HMI modes. As a consequence, we anticipate possibilities to increase acceptance in women by gendered campaigning (e.g., gendered language) and gendered user interface design. In this vein, the project may help overcoming current inequalities in vehicle use (including under-representations of females in male-dominated occupations; cf. driving instructors [ACI/RDS Driving] or emergency doctors [SMEV]). Sex and gender will be considered at the different stages of the process: a) materials (e.g., acquisition materials, instructions, items) will be construed to ensure bias-free language; b) throughout studies, care will be taken to run participant samples balanced on the sex dimension, c) data will be analyzed for sex and gender differences, d) reports will include the sex dimension (both for significant differences and for null findings), and will be used to e) create gendered materials (e.g., survey forms, campaign materials) where applicable.

[12] Ong, C. S., & Lai, J. Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in human behavior*, *22*(5), 816-829

[13] Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS quarterly*, 115-139

1.4 Ambition

The overall ambition of PAsCAL is to ensure that the adoption of the CAV technology is socially acceptable throughout its long journey towards full automation (i.e. driverless). This ambition is characterised by regular and frequent interactions between users' feedback and extensive simulation and human factors research, without which the CAV technology will either compromise safety or fail to reach market due to lack of enthusiasm and hence customer demand.

1.4.1 Progress beyond state of the art

The key elements of PAsCAL that are beyond the state of the art are the following:

1. A user-centric approach to CAVs;
2. Addressing human factors through simulators;
3. Exploring CAV acceptance in simulated environments
4. Extending the understanding of public acceptance
5. Addressing all transport modes
6. Considering the human driver and the occupants

A user-centric approach to CAVs

Existing CAV development is driver-centric and mainly focuses on V2V (Vehicle-to-Vehicle) and V2I (Vehicle-to-Infrastructure). For example, a CAV is kept informed of the status of traffic lights when it approaches the junction. Other important users at the site such as pedestrians and cyclists are out of the loop. This is an example of fragmented characteristics of the current CAV initiatives. PAsCAL is designed to be truly user-centric and to get human behaviour and public acceptance into all the stages of the CAV technological development, in particular the earlier stage, in order to better enforce and widespread use of the technological innovations. A particular attention will be paid to non-drivers' reactions and user experience regarding the vehicles behaviour. For example, recent researches (e.g. Koo, Kwac, Ju et al., 2015[14]) underline the challenge of designing automation to better understand how the automation interacts with the human operator, and how the system's operational information could be delivered to the operator. In this context, the *feedback* from the CAV is required to keep the non-driver up-to-date, but is not sufficient. A *feedforward* is also necessary, in order to provide information to non-drivers ahead of the event, as a component of trust, understanding and performance. Another researches are focused on the factors which explain the CAV acceptance (i.e. perceived risk, locus of control, perceived ease of use, etc.) (Choi and Ji, 2015[15]). PAsCAL project aims to continue this line of researches by designing and testing the best *feed/forwardbacks* to provide to the non-drivers.

Address human factors through simulators

Current traffic and vehicle simulation is focused on better management of traffic networks (e.g. shorter journey time, fewer stops, higher throughputs) (Codecá et al., 2017). Coupling with pedestrian modelling presently only serves the purpose of balancing different user needs. PAsCAL will take a major step forward by humanising both simulators so that various human factors, HMI requirements and resultant user behaviours of both drivers and occupants can be systematically addressed.

Presently, simulation is mainly carried out in laboratories. Through PasCAL a home-study platform will be provided (Faye et al., 2017), this follows on from work in the FNR funded MADSAV project. Although customisation is required the platform allows for many variations in terms of layout, obstacles and trials depending on the project requirements. Each home is equipped with software and a low-cost steering wheel and data is collected and stored on remote servers. Participants can additionally be provided with a logbook

[14] Koo, J., Kwac, J., Ju, W., Steinert, M., Leifer, L., & Nass, C. (2015). Why did my car just do that? Explaining semi-autonomous driving actions to improve driver understanding, trust, and performance. *International Journal on Interactive Design and Manufacturing*, *9*(4), 269–275

[15] Jong Kyu Choi, & Yong Gu Ji. (2015). Investigating the Importance of Trust on Adopting an Autonomous Vehicle. International Journal of Human-Computer Interaction, 31(10), 692–702.

to note down any issues they experienced so that these can be taken into account when analysing the data Normally each participant undergoes some training and familiarisation steps prior to undertake the actual trials. This will be also used to test participants in undertaking a variety of CAV tasks over a longer period of time in their own homes. This will allow the PAsCAL project to collect more data over a longer period of time regarding human-factors issues, rather than as is present practice relying purely on laboratory-based studies. In symbiose the PAsCal Laboratory simulators will complete this home-study platform by providing more controlled and repeatable conditions, and addressing various populations inside and outside the vehicle.

Presently the human factors are for each type of CAV is considered separately. PAsCAL will consider in an integrated manner the human factors of a multi-modal transport systems. One additional mode that will be considered is personal air travel. High fidelity modelling and flight simulation have long been considered by the aerospace industry[16] to be an essential prerequisite to any aircraft programme. Simulations are used to ensure confidence in the decision-making process during aircraft design and development, including performance and handling qualities estimation, control law development, aircraft dynamic loads analysis, and the creation of a realistic piloted simulation environment. These learnings will feed the other PasCal simulations.

The ability to evaluate/optimise concepts with high confidence and stimulate realistic pilot behaviour whilst reducing risk is central to the value-add that simulators bring. Pilots can train to operate aircraft proficiently and safely and industry can design with lower risk. A recent example of this approach is in the de-risking of the UK F-35B Lightning II carrier landings on HMS Queen Elizabeth prior to the actual sea trials[17]. In the context of personal aerial vehicles, flight simulation techniques have been used to investigate how users might be trained to fly such vehicles[18] and have been used for focus group assessments of such vehicles[19]. However, these assessments were conducted on single vehicle simulations. PAsCAL will investigate how the results reported in these studies change when the aerial vehicle is considered to be one node among many multi-modal connected vehicles.

Explore CAV acceptance in simulated environments

The project has different testing stages that explore CAV acceptance in simulated environments. A key requirement to test user attitude and acceptance of CAVs is that the simulation environment must be modular and customisable, supporting the implementation of new CAV services, urban environments with specific designs, multiple users and supporting the inclusion of different hardware components (mobile devices) in a short time. Virtual Reality headsets constantly improve and provide higher-resolution screens, a wider field of view and built-in eye tracking sensors (FOVE, 7Invensun, Tobii, Apple VR headset) which altogether can be used to measure user attitude towards CAV in highly immersive, virtual 3D environments. To the best of our knowledge, the transferrable and scalable simulation environment with multi-tier hierarchical architecture proposed in PAsCAL has not previously been designed for CAVs and connected transport. However, its methodology and data infrastructure required are technologically viable, and are being tested in other H2020 projects in which some PAsCAL partners are involved (e.g. UNIVLEEDS). In this aspect the project is both state-of-the-art and ambitious, whilst having achievable goals.

Extend the understanding of public acceptance

The project will extend the state-of-the-art regarding knowledge of public acceptance of many issues (e.g. safety, security, equity, affordability) involved with the adoption of CAV technology. While previous research identified various aspects that contribute to the acceptance of higher level CAVs (e.g., Nordhoff et al., 2016)[20], these factors have been studied in isolation, with a focus on the in-vehicle road user. The very few investigations exploring multiple dimensions and their inter-relations suffer from very selective samples.

[16] https://www.roboticsbusinessreview.com/news/boeing-completes-first-flight-of-autonomous-passenger-airplane/
[17] https://doi.org/10.1016/j.oceaneng.2018.12.024
[18] 10.1007/s13272-017-0255-2
[19] http://www.mycopter.eu/fileadmin/mycopter_user_upload/files/Downloads/PublicDeliverables/myCopter_D7_3_public.pdf
[20] Nordhoff, S., Van Arem, B., & Happee, R. (2016). Conceptual model to explain, predict, and improve user acceptance of driverless podlike vehicles. *Transportation Research Record: Journal of the Transportation Research Board*, (2602), 60-67

Specifically, previous large-N investigations (Kyriakidis et al., 2015[21]; Nordhoff et al., 2018[22]) used easy-to-access ad hoc samples, restricting the study population to highly educated, English-speaking respondents. Such homogeneous samples lead to an underestimation of the number of independent dimensions, and bias the acceptance prevalence on several dimensions (e.g., overestimating acceptance of financial efforts; underestimating fears of job loss). The present study takes care to represent the levels of socio-demographic variables (including gender, education, and socio-economic backgrounds), and to address a wide range of road users regarding role and special needs (e.g., vehicle owners, pedestrians, shared fleet users, professional drivers; blind and partially-sighted users). Moreover, surveys will be administered in mother tongue. As a consequence, this will be the first study to enable a generalization of results across a *wide range of road users* from different countries. Moreover, previous survey research lacks validation, and therefore it is unclear if the introspected answers converge with objective measures (cf. Kyriakidis et al., 2015; Nordhoff et al., 2018). Here, we present *dimensions of CAV acceptance that are validated in a multi-method approach, including objective measures*.

The project aims for an integrated and easy-to-use tool for CAV acceptance. This will advance our understanding in two major ways. First, we will advance the understanding by integrating, within the same set of studies, hitherto unconnected measures for stated acceptance for different solutions, roles and acceptance dimensions. We will further integrate behavioral measures of acceptance, validating possibly distorted self-reports. Only such an integrated and validated measure based on a diverse range of citizens will allow to a) generalize results across user groups and countries, b) to track the development over time and to c) determine each factors' weight on CAV acceptance. Second, the project will provide an easy-to-use tool to practitioners. This will facilitate the continued understanding of how CAV acceptance evolves.

Address all transport modes

Although the project primarily targets road-based transport modes, the methodology to be used as well as many of the corresponding results will be transferable to other transport modes such as by rail, air and sea. PAsCAL will investigate and discover the common issues, approaches and lessons to be learned across all transport modes. One example case study within PAsCAL is autonomous personal aerial vehicles (PAVs). This transport mode, commonly referred to as eVTOL (electric vertical take-off and landing) is set to revolutionise the transport system of tomorrow and change urban mobility forever. This vision of an aerial cityscape has stimulated a substantial body of research aimed at designing and testing PAVs as well as how to safely and effectively integrate them into ground-based infrastructure[23]. In fact the consortium has already included expertise from this sector (UNIVLEEDS/LIV).

Consider human driver and occupants

Results from the PAsCAL project will help to ensure that safety for human driver and occupants (and equivalently important users such as pedestrians, cyclists) is maintained and enhanced.

Understand CAV related competences and provide training

PAsCAL activities related to road education and training will help understand if and how the rules of road traffic must be modified and adapted with reference both to the transition phase and to the definitive adoption of CAVs. The studies using different simulators will provide insights of CAV drivers behavior and provide first cognitive models and competence models to define new training programmes. The recommendations that will be forthcoming will be submitted to the competent authorities that will thus that will have valid indications on how to intervene to ensure road safety to all users.

[21] Kyriakidis, M., Happee, R., & de Winter, J. C. (2015). Public opinion on automated driving: Results of an international questionnaire among 5000 respondents. *Transportation research part F: traffic psychology and behaviour*, *32*, 127-140

[22] Nordhoff, S., de Winter, J., Kyriakidis, M., van Arem, B., & Happee, R. (2018). Acceptance of Driverless Vehicles: Results from a Large Cross-National Questionnaire Study. *Journal of Advanced Transportation*, *2018*

[23] https://thefutureoftransportconference.com/en/stream-1.php

1.4.2 Innovation potential, new products, services or businesses

1. We anticipate novel large-scale objectives in the domain of public campaigning and education. Public campaigning will no longer be a holistic mass media approach. With the human in focus, it will have to be customized to the different motivators, needs and concerns resulting from human diversity. At the same time, the user-cluster approach will result in customized technology development. While the development of CAVs (e.g., HMIs) does already build on human cognitive underpinnings, the present research will advance CAV design adapted to diversity of cognitive (motivational and emotional) underpinnings.
2. In the field of road education and training, the project will explore a virtually unknown terrain. Considering the absence of common European rules related to these topics and the slowness of regulatory compliance compared to the speed of technological evolution, there are currently no specific common "rules" dedicated to road education. The most advanced and cutting-edge driving schools networks such as RED Driving Schools and ACI's Ready2Go tend to adopt fairly similar methods though in different countries. They provide specific courses aimed at meeting the national regulations on the requirements for obtaining the driving license to which they add technical-practical modules dedicated to useful and necessary topics to become "safe drivers" i.e eco-driving, defensive driving, refreshment-safe driving courses. State-of-the-art driving schools consider the use of level 2 vehicles, the most advanced Safe driving Centres actually use level 2 vehicles. But in practice, no one has had a real opportunity to experiment or use higher levels of automation and what this entails from the point of view of education or profession. PAsCAL will therefore be a pioneer in the subject, it will allow on the one hand to develop an initial set of educational modules and programmes complementing those already existing and which can be adopted by driving schools. This could lead to the development of new and different business models and new professionalism from the driving schools that will adopt these modules. Both RED Driving School and ACI will work on such a concept, developing one or more additional modules which will include cognitive training on advanced driver aids as well as awareness of the issues surrounding sharing the road with fully autonomous vehicles.
3. In the context of insurance activities, there is widespread uncertainty about the evolution of the coming years, both about the legislative and regulatory compliance needs that will emerge, as well as about the insurance products proposed to the market and which will have to be modified and adapted to the new CAV environment. In particular, the most important questions and profiles insurance companies have to take into consideration are: 1) authorization to traffic, 2) processing of personal data created by vehicles and infrastructures and connected with each other, 3) responsibility for traffic accidents, 4) insurance of the particular traffic situation (transition period/full CAV situation). These profiles involve various stakeholders: 1) the car maker, together with the designer and the author of the software, 2) the owner or user of the vehicle, 3) the managers and distributors of the data, 4) the managers and developers of ITS systems and infrastructures, 5) insurance and other service providers such as spare parts suppliers and assistance suppliers (TSP). Two more considerations are necessary: 1) currently, the main cause of accidents is human error, it is therefore assumed that the advent of CAVs will lead to a reduction of the accidents, but "human error" can always be present in the form of errors of construction or in the software, malfunctioning of connections, failure to update the software, vulnerability to hacking ... And these errors will lead to (fewer but) catastrophic accidents. 2) The experience gained with other autonomous vehicles, such as trains and airplanes, is not always usable due to some substantial differences in context: in these vehicles there is always the presence of a potential driver and there are redundant systems, trains and airplanes traffic is preordained in geographical and temporal terms. On the contrary, cars move according to the needs of the moment and in variable ways and in non-preordained contexts. PAsCAL's activities will shed new light on all these concerns, allowing insurance experts, in particular ACI's insurance company, Sara Assicurazioni, which will cooperate in the Project, to interact in a more informed way to policy makers about regulatory need and eventually develop products able to grant safety to citizens.

4. ExaMotive S.A. wants to understand the attitude of the customers of its car sharing service towards CAVs and how the introduction of progressive levels of automation, such as autonomous valet parking, could enable new business models and reduce the barriers towards the use of the service.

2. Impact

2.1 Expected Impacts

2.1.1 PAsCAL's contribution to the expected impacts mentioned in the work programme under topic MG-3-3-2019

IM01: Support the integration of higher levels of connectivity and automation in transport

According to a recent study by JRC[24], the new market for automated and connected vehicles is expected to grow exponentially and large economic benefits are expected, with for instance revenues exceeding EUR 620 billion by 2025 for the EU automotive industry and EUR 180 billion for the EU electronic sector. Despite this optimism, the penetration of connectivity and automation in transport is still insufficient. In 2016 the European Commission launched its European Strategy on Cooperative Intelligent Transport Systems (C-ITS), systems that allow vehicles to "talk" to each other, and to the transport infrastructure, to allow for a wide-scale commercial deployment of C-ITS as of 2019. Despite this initiative, several factors such as market fragmentation, security and data protection issues, the lack of a common legal framework and the increasing complexity of cooperating at international level are slowing down the pace of adoption of the technology. With respect to automation, the Transport Research Innovation Monitoring and Information System of the European Commission TRIMIS underlines how "although a number of pilot demonstrations of CAT technologies are taking place in Europe, there is still a need to test the technological readiness, reliability and safety of automated transport functions in complex traffic situations at large scale. Key issues to be addressed include the performance of automated transport technologies, a regulatory framework which supports the fast introduction of these technologies, acceptable levels of cybersecurity, as well as new business models[25]." In a recent strategy paper[26] the European Commission reminds us that "automated vehicles are not yet ready to operate without human supervision… regulatory changes will have to follow in order to build a harmonised, complete and future-proof framework for automation. For Europe to remain competitive and foster employment, it will be essential that the key technologies, services and infrastructure are developed and produced in Europe and that the necessary regulatory framework is in place… The disruptive effect of driverless mobility on the labour market will have to be addressed, particularly the need for skilling and reskilling (e.g. professional drivers would initially gain freedom to perform additional tasks but could in the long-term no longer be needed in the vehicles)."

Through its Guide2Autonomy, PAsCAL will deliver: 1) A thorough assessment of public acceptance for higher levels of connectivity and automation in transport, 2) guidelines for optimizing connected and automated solutions for current non-drivers, 3) An acceptance measurement for the inclusion of CAVs in shared fleets and 4) A framework that supports decision makers and policy makers when defining and implementing CAV technologies and services.

These results will help European makers and suppliers of CAVs to identify and overcome barriers to adoption and to design better vehicles (e.g. HMIs) and CAV-based services (CAV ride sharing, CAV training, CAV insurance, etc.) enlarge the potential demand for CAV trips to current non-drivers, such as the very young, the very old and the disabled, encourage the use of shared fleets as a vehicle to promote CAV penetration and help regulators converge more rapidly towards the needed regulatory framework.

Measures: (1) 30 emergency drivers and 30 road drivers involved in real-life trials; (2) > 10 junctions linked with the emergency vehicle.

[24] An analysis of possible socio-economic effects of a Cooperative, Connected and Automated Mobility (CCAM) in Europe. JRC, 2018
[25] See https://trimis.ec.europa.eu/stria-roadmaps/cooperative-connected-and-automated-transport
[26] On the road to automated mobility: An EU strategy for mobility of the future. Brussels, 17.5.2018 COM(2018) 283 final

IM02 - Contribute to improved levels of safety and security in all modes of transport, in line with the Transport White Paper 2011 (e.g. Vision Zero)

As reported by JRC[27] in 2015, more than 26,000 people died and nearly 1.5 million people were injured on the roads of the European Union. Worldwide, there were 1.25 million of road traffic deaths in 2013. The EU aims to move close to zero fatalities by 2050. An intermediate target is set to halve road casualties by 2020 with regard to 2010 figures. Despite a steady improvement in this aspect, recent statistics have shown a slowdown in reducing road fatalities in Europe[28] and even an increase in road deaths in the US since 2014[29]. This is probably due to the growing driver distraction caused by smartphones and other connected devices. Human error plays a part in 94% of traffic incidents, an area that the deployment of driverless vehicles could improve[30]. Therefore, reducing or eliminating human errors with the support of automated and connected technologies would be an effective way of tackling the road safety problem. As we discussed in Section 1, the partial automation of levels 2 and 3 can be unsafe, though, because drivers are still required to pay attention even when they have handed over control of the vehicle, which they find hard to do. The final report of the GEAR 2020 High Level Group insists therefore that the level of the driver's attention required for the safe transfer of control between vehicle and driver is of particular importance for vehicles with drivers (levels 2, 3 and some levels 4 that still require a driver). For driverless vehicles (level 4 vehicles for limited traffic conditions/level 5 vehicles for all traffic conditions), internal HMI (with the driver) is less important but external HMI (with others) is more important[31].

As underlined by the Transport Systems Catapult[32], similar conclusions can be made for other modes. Last year, Maritime UK published a UK Industry Code of Practice for Maritime Autonomous Surface Ships (MASS), following hot on the heels of the similar code of practice for connected and autonomous road-based vehicles that was published by the Department for Transport in 2015 – and including many of the same considerations regarding levels of autonomy, vehicle types and areas of operation. As with road and air accidents, the majority of safety incidents at sea are caused by human error, though those occurring at sea tend to be less often reported since, fortunately, their impact tends to be economic (in terms of damaged or delayed goods) rather than necessarily involving injury or loss of life.

At the heart of the PAsCAL innovations lies the safety and security in all modes of connected and automated transport. In line with the 'zero-vision' on road safety set out in the Transport White Paper 2011, PAsCAL will research , develop and test several safety-specific innovations such as cooperative systems optimised by safety criteria for all (in particular vulnerable users), a comprehensive strategy for people's safety inside and outside AVs (e.g. autonomous bus), training and education of all road users to improve awareness of surrounding environments where autonomous vehicles are present, and particular needs of vulnerable users (e.g. pedestrians, cyclists, children, elderly) through safer infrastructure and vehicle technologies.

PAsCAL pays great attention to common issues, approaches and lessons learned across all transport modes, in the context of automated and connected transport, such as regulatory safety frameworks (e.g. the Global Safety Information Exchange initiative), information tools needed to ensure safety, security and environmental protection in all transport modes, safety certification and maintenance process for safety critical components, as well as improvement of the collection, quality, exchange and analysis of data to develop a evidence-based assessment methodology for real "driver" behaviour as part of the PAsCAL's Guide2Automony framework.

Also, PAsCAL will provide valid and reliable data on driver's behaviour in simulated CAV environments, and a list of mitigation solutions, which will include guidelines for HMI design, defined with the help of the instructors of ACI and RDS Driving and validated in simulation as well as in test tracks. Training programmes will be developed to enable both new and experienced drivers to cope with up to level 4 CAVs. A form of graduated licensing will be explored in which drivers can progress from the basic licence to one

[27] Alonso Raposo, M., Ciuffo, B., Makridis, M. and Thiel, C., The r-evolution of driving: from Connected Vehicles to Coordinated Automated Road Transport (C-ART), Part I: Framework for a safe & efficient Coordinated Automated Road Transport (C-ART) system, EUR 28575 EN, doi:10.2760/225671
[28] See http://europa.eu/rapid/press-release_IP-16-863_en.htm
[29] Self-driving cars will profoundly change the way people live. (2018, March 1). *The Economist*
[30] Commission's report on Saving Lives: Boosting Car Safety in the EU, COM(2016) 787
[31] GEAR 2030. High Level Group on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union. FINAL REPORT - 2017
[32] See https://ts.catapult.org.uk/2018/08/01/automated-transport-by-water-an-untapped-potential/

endorsed with additional skills needed for CAVs. This solutions will be mainly developed for road vehicles but will be tested in simulation for other modes. An example is the HELIFLIGHT-R Flight Simulator which will design and test CAV operation in urban environments, in particular places where flying CAVs would need to be integrated with ground-based transport systems (e.g. multi-modal hubs). By working together throughout the whole simulation process from design to trial, PAsCAL will contribute to improved levels of safety and security in both modes, and set an example for the integration with other transport modes.

Measures: (1) Reduced number of harsh brakes and manoeuvres when emergency vehicles approaching from 10% at the end of the project into up to 80% by 2040 with this features integrating in the European car fleet. ; (2) reduced number of stop-and-go events by the emergency vehicle drivers reducing up to 5% at the end of the project up to 40% by 2040 based on the estimate that half of the stop-and-go events relate to emergency vehicle - vehicle encounters.

IM03 - Contribute to the possible reduction of cost for industry and public authorities through an improved understanding of requirements and needs of different types of "drivers"/users in the context of connectivity and automation in all modes of transport

Existing CAV development is driver-centric and mainly focuses on V2V (Vehicle-to-Vehicle) and V2I (Vehicle-to-Infrastructure).

PAsCAL will investigate “drivers”/users needs working with a wide range of user groups, including drivers (private or professional, experienced or new, road or non-road), passengers and those who will have to share the road with them (e.g. pedestrians, cyclists), and vulnerable groups (e.g. the elderly, people with disabilities). For current non-drivers, PAsCAL is particularly interested to study blind or partially-sighted people. Based on this study, PAsCAL will propose an “acceptance-by-design” approach which will result in substantial cost savings. It will have a direct impact on the design of the recently presented high capacity autonomous bus by Volvo, with special regard to how the service on-board will be designed. This will translate into an accelerated development of the service.

Understanding requirements from different types of users will facilitate the analysis of commonalities for solutions development (industry) and services provision (public authorities). This will allow to actually reduce the cost of these deliveries due to solutions high replicability and usability. On top of them we are aware of the fact that certain customization will be always required for specific groups. In these cases, the PAsCAL concept of “acceptance-by-design” abovementioned will be adopted in order to ensure that customized solutions are accepted from users from the beginning, avoiding extra costs due to wrong perception of user needs. This will translate into an accelerated development of tools and services.

The same will apply to the introduction of an increasing number of CAVs into the shared fleet of ExaMotive S.A.. This matter is of particular importance because most market analyses show that the massive take up of CAVs will happen first and foremost within shared fleets, where higher vehicle utilization will help amortizing higher CAV costs faster. No more walking needed to pick up a vehicle. The outreach of the fleet vehicles located on the streets is no more limited by walking distance (500-700 meters) which will allow increasing fleet utilization for up to 70% even in suburbs. At this point the difference between car sharing, ride sharing and ride hailing will disappear leading to the combined market opportunity of over $300 billion by 2025[33],[34]. CAV fleets can generate profit of $14,000 over three years per vehicle which is almost an order of magnitude higher what OEMs currently make on selling new cars[35]. In addition to revolutionizing the transportation industry CAVs will transform the way people work, consume information, entertain and interact. All these is groundbreaking, but requires brand new business models, processes and ecosystems. The work carried by PAsCAL will help understanding key underlying factors, from both the user and the shared mobility operator perspectives, and help designing efficient strategies for introduction of CAVs in the shared fleets.

Measures: (1) 30 emergency drivers and 30 road drivers involved in real-life trials; (2) about 50-100 participants for online surveys; (3) smoothed speed from reduced stop and go events, reduced fuel

[33] Ride Hailing Market by Service Type - Global Forecast to 2025, Research and Markets, December 2017
[34] Car Sharing Market worth over $11bn by 2024, Global Market Insights, January 2018
[35] Rethinking Mobility, The Goldman Sachs Group, May 2017

consumption and air pollution.

IM04 - Contribute to a better user acceptance of innovative, cooperative, connected and highly automated transport systems

A survey by Advocates for Highway and Auto Safety mentioned in Section 1 found that 64% of Americans were worried about sharing the road with AVs. In another survey, by the Pew Research Centre, 56% of Americans said they would not ride in a self-driving vehicle. Surveys administered in Europe by the GEAR 2030 High-Level-Group are slightly more optimistic, showing that a majority of Europeans citizens have a good acceptance of driverless cars with 58% willing to take a ride in a driverless vehicle[36]. However, as the latest accidents in the United States have shown, in order for automated mobility to gain societal acceptance only the highest safety and security standards will suffice. New risks such as overreliance on, and misuse of, technology should be addressed. New questions such as the level of infrastructure support for driverless vehicles and how this infrastructure should interact with the vehicles should be tackled. Ethical issues related to transferring the responsibility of driving to vehicles must also be addressed. This includes our expectations for how a vehicle should react when an accident cannot be avoided and criteria used to determine vehicle's decision. Linked to this we need to ask ourselves who is liable when a driverless vehicle is involved in an accident[37]. These issues are particularly addressed as a major concern by insurance companies whose "world" will be largely revolutionized by the new mobility modes. The paradox of CAV innovation, in fact, consists not so much in its applicability on a technical, engineering or technological level as in its absolute inconsistency with the legislative systems actually in force in all countries, no matter if of civil or common law.

PAsCAL will: 1) create a robust scientific methodology to understand present and future issues in CAV acceptance and apply it to several thousands people in 9 countries 2) develop scenarios and simulated environments where it will be possible to test the effectiveness of different measures to mitigate those issues 3) run awareness campaign through its network of partners and stakeholders to inform citizens of the opportunities and the limits of CAV technology 4) contribute to issues that can indirectly influence user acceptance such as safety of CAVs and the legal framework in which they should be operated.

Measures: Increased awareness of up to 40% of the number of citizens reached with the PasCal awareness campaign (up from a present average of awareness of 50% to 90%) and an increased acceptance of 58% up to 70% of the participants who have improved acceptance to connected transport environments.

IM05 - Enhance driver awareness and behaviour in a range of complex / urban operating environments

As mentioned under IM02, PAsCAL will provide valid and reliable data on driver's behaviour in a range of simulated CAV environments, and a list of mitigation solutions, which will include guidelines for HMI design. These solutions will be defined with the help of the instructors of ACI and RDS Driving and tested and validated in simulation as well as in test tracks, reproducing different operating environments. Training programmes will be developed to enable both new and experienced drivers to cope with up to level 4 CAVs. A form of graduated licensing will be explored in which drivers can progress from the basic licence to one endorsed with additional skills needed for CAVs.

PAsCAL will allow to evaluate and elaborate proposals and recommendations on how road education rules and possibly also the traffic regulation shall be modified and adapted, during the transition phase, in which traditional vehicles and vehicles at different levels of automation will coexist, and in the next one of full automation. Once examined and adopted by competent authorities, these programmes will innovate the road education requirements. Moreover, the development of common standards for interoperability of vehicles will very likely result in a progressive uniformity of traffic rules, the recommendations and guidelines developed within the project will therefore also contribute to the development of common and uniform rules of behavior on the road.

[36] World Economic Forum, Self-driving vehicles in an urban context, January 2016
[37] On the road to automated mobility: An EU strategy for mobility of the future. Brussels, 17.5.2018 COM(2018) 283 final

Development of Training programmes for new and experienced drivers

RDS Driving will develop training programmes for drivers of vehicles up to CAV level 4. For new learners this will be incorporated into the structured in-car training program, enhanced by video content which can be viewed online. RDS Driving will work with the UK DVSA, the department responsible for the content of the driving test syllabus in the UK, giving its advice on the CAV training content. The DVSA will also have access to the results of any other projects in this field. Note the DVSA is also responsible for the content of the syllabus for the training course for Driving Instructors, and examinations to achieve qualification.

The training of learners in complex / urban environments is commonplace in the UK, the majority of RDS Driving training takes place in cities and on busy roads. Learners are permitted to be trained on Motorways in the UK. There is also opportunity to work with specific vehicle manufacturer(s) to provide video training content for using a particular vehicle with CAV functionality. Example if you did that now would be driving in a vehicle eg a Lexus with automated lane control - how it works, what are the uses of it, how you can monitor it, when can it go wrong and how etc. That could be used for all new / existing drivers of that model.

Pascal project can liaise with manufacturers on recommendations for HMI, example Volvo, that needs expanding on – how would this work so that recommendations get put into practice.

RDS Driving will adapt the training course for its Driving Instructors, introducing new material enabling them to train learners in the new content. That will be rolled out with a series of workshops and video and written content. RDS Driving will advise the DVSA on changes it needs to make to the UK rules on training Driving Instructors, and the extent to which CAV training needs to be mandatory.

In the UK the DVSA also has a role in advising on Road Traffic Laws. RDS Driving will work with them explaining any findings from the project that may be useful in re-interpreting existing laws to take account of CAVs.

Graduated licensing

The Pascal project will ensure that feedback and recommendations are broken down into CAV level (2,3,4), and also by automation type (lane control, enhanced cruise control, full steering, automatic breaking as examples). That will make it easier to look at how graduated licensing would be structured, defining the natural steps in each level of graduation and developing training programmes for each licence. Again the DVSA in the UK will get input on this from other projects in addition to Pascal.

Measures: (1) 30 emergency drivers and 30 road drivers involved in real-life trials; (2) about 50- 100 participants for online surveys.

2.1.2 PAsCAL's contribution to substantial impacts not mentioned in the work programme

PAsCAL will contribute to the other following impacts:

1. It will accelerate the perspective of inclusive mobility e.g. of disabled persons, by involving them directly in the assessment of the users' needs and in drawing guidelines for how to design CAVs (e.g. HMIs) and CAV user experience in a way that better answers to their specific needs.The proportion of disabled people in the population is on the increase, so it will be important to seek to capture the views of disabled research participants.
2. It will contribute directly to the competitiveness of different EU enterprises (vehicle makers, car sharing providers, driving schools) helping them to accelerate the design of their products and increase their ability to satisfy the needs of the market. This is a most important element since the disruption in the mobility market risks to weaken the competitive advantage of EU mobility providers as compared to their competitors from other continents.
3. It will create direct market opportunities for driving schools to sell CAV training and e-training modules, and if it will manage to convince the national authorities to adopt new certifications for CAV "driving" could contribute to the creation of new jobs in the the training and certification sector.

2.1.3 Barriers/obstacles, and framework conditions that may determine whether and to what extent the expected impacts will be achieved

Ultimately the impact of PAsCAL will be correlated to the penetration of CAVs in society, which is a problem influenced by several factors. Despite many studies forecast a rapid penetration of AVs, and all the major vehicle makers have recently jumped onboard the CAV bandwagon, we have seen how difficult it is to shift to new forms of propulsion and how many enthusiastic forecasts have been regularly followed by disappointing results.

If the main technological barriers have been overcome in a relatively quick fashion, several non technological factors such as social acceptance, market fragmentation, security and data protection issues, the lack of a common legal framework, the increasing complexity of cooperating at international level etc. are slowing down the pace of adoption of CAVs. Their solution will largely depend by the ability of the CAV providers to refrain from putting on the market solutions that are unable to guarantee the adequate level of safety, or from using ambiguous terminology such as "autopilot" and by the ability of national regulators to respect the delicate balance between allowing enough testing for the technology to evolve without endangering the other road (or rail/water/sky) users. It will also depend on the evolution of the international political environment with respect to trade regulation and attitudes to cooperation.

2.2 Measures to maximise impact

The project dissemination and communication and exploitation activities delivered by the consortium and its value chain participants are structured in such a way as to align the project within a strategic innovation context and to make the project outcomes scalable and replicable. These activities will be complemented by actions towards implementation of Open Data strategies and knowledge sharing. Considering that the technical solutions of the project will reach TRLs ranging from 4 to 9, follow-on activities and supporting actions will be planned as part of the project to ensure the large-scale and impact potential of PAsCAL results. All measures maximizing impact will start at the beginning of the project and will continue throughout the project and beyond.

2.2.1 Dissemination of results

Dissemination activities will focus around Guide2Authonomy developed solutions: the scientific fields related to Connected and Autonomous Vehicles, their technical characteristics, utilization of guidelines and recommendations by public authorities, psychological reaction of individuals to them for public awareness (both while driving but also when interacting with them in the same environment) and educational programmes for high CAV adoption, and address specific target groups and metrics accordingly, via a continuously updated dissemination plan that will be implemented. Not all target groups can be addressed in the same manner and therefore different dissemination channels will be set up.

Dissemination target groups

Targeting dissemination activities to specific groups of stakeholders is a key factor for the success of a project. The dissemination plan used in PAsCAL identifies the target groups and overall strategies and objectives to be taken into account for the communication and dissemination activities.

Target	Who	Dissemination focus
CAV related industry	CAV makers, software designer, infrastructures, ITS and data managers, insurance companies, driving schools	Information on acceptance of CAVs and new HMIs, guidelines for user experience, enhanced simulators, training modules, G2A
General "users" public	Citizens, drivers, non-drivers, cyclists, shared modality users	Information on what CAVs are, how they "work", how they will impact on everyday life, G2A

Policy makers	National / local decision makers who influence the legislative and regulatory framework	Information on CAV acceptance, knowledge, recommendations and guidelines on needs, parameters, policy papers, G2A
Public authorities	National / local authorities managing parts or the whole transport system	Information on CAV acceptance, needs, technical parameters, recommendations and guidelines, policy papers, G2A
Public transport operators	Fleet operators who will be influenced by CAV implementation	Information on CAV acceptance, impacts on business model, jobs, G2A
Scientific community	University and research	Research reports and papers to further develop (integrated) IT, technical, economic and psychological approaches for advancing the subject of CAV user acceptance, G2A, synergies across EU and national projects (clustering)
Stakeholder associations	All stakeholder associations related to or interested in CAV evolution and implementation. May be part of some other target groups, the message will be adapted to a wider audience	The message will be customized coherently with the group to which the associations belongs, the outreach will be multiplied, G2A
Vulnerable users	Elderly, pedestrians, disabled	Information on what CAVs are, how they "work", how they will impact on everyday life, if and how they take care of specific needs, how to take advantage of them, G2A

Dissemination activities, communication channels and metrics

Dissemination activities of all project partners will be tracked and continuously structured according to the dissemination plan coordinated by the Dissemination Manager. This includes templates to gather all contributions of the project partners, reminders and progress reports to raise the awareness of dissemination and to provide an overview of achieved results.

The following table summarizes the communication channels that will be used for the project promotion, partners that will make use of them, and an initial set of indicative dissemination and communication KPIs. These KPIs are used to measure the success of communication and dissemination activities, oriented to target groups and via the identified communication channels. KPIs may undergo a further modification during the execution of the project, as new feedback, opportunities and criteria maximizing the impact of the project may rise.

Channel	Content	Contributing partners	Main features and/or indicative example	KPI
Website	Description of project, objectives, partners, results, news and event, publications	All	Regularly updated, interactive, links to partners' and other relevant websites/blogs	at least 1 post/ news per month
Social networks	News/events	All	Twitter, LinkedIn, Facebook	100 followers x SN, at least 2

				posts/month
Brochures and posters	Description of project, objectives, partners, results	All	Initial brochure + initial poster + updates. Translation in partners' language. Distributed at events, meetings, workshops,..	Distributed in at least 20 events
Videos	Description of project, objectives, real demo experiences	RDGFI NV, ACI, pilots' partners	1 initial explanatory video 1 video x pilot	6
Press releases	Targeted, in relation to events, pilots, research findings	all	All partners will issue an initial press release, dedicated press releases will be issued by the competent partner/s according to specific occasions	24
Articles	Description of project, objectives, problems faced, impacts, advancement and results, interviews	ACI, EBU, E-Bus, ExaMotive S.A., RDGFI NV, LIST, LuxMobility	In newspapers and magazines to which partners have direct or indirect access i.e. ACI's OndaVerde bimonthly magazine, TTS Italia newsletter, Luxembourg's general press, magazines specialising in EU research (EU Researcher, etc.), automotive press	18
Scientific publications	Targeted articles, papers and posters in peer-reviewed conferences and journals	E-Bus, ExaMotive S.A., LIST, LuxMobility, UBFC, UNIVLEEDS, LIV, UMA	ICTTP, IEEE Transactions on ITS, Transportation Research Parts A-F, Computers in Human Behavior, Human Factors, International Journal of Human-Computer Interaction, Transport Policy, TRB, Accident Analysis & Prevention, Journal of Transport Geography	18
Policy papers	Description of project, results, guidelines and recommendations	ACI, EBU, LIST, LuxMobility, UMA	Submitted to EC representatives /national/local governments, at high level round tables, political/institutional conferences, ETSC	6
Organisation of events	Conferences, workshops, webinars, seminars, lessons	all	Examples: ACI's "Conference on Traffic", "Try the Autonomous Drive Day" at Safe Driving Centres, Luxembourg Automotive Day, European Mobility Week	1x pilot + 4 + 1 final event
Participation to events	Conferences, workshops, webinars, seminars, lessons	all	Transport Research Arena (Connected & Automated Transport (CAD) stream), Intelligent Transport Conference, EUCAR conference, ITS world congress - ITS Europe - ATEC-ITS	10 targeted to general public or institutions + 8 to scientific industry

Liaison activities	Establish and develop synergies with Associations, initiatives, projects, clusters at EU and national level	all	FIA/ European automobile clubs, Driver training bodies, Ertico Network, UK Department of Transport, Driving Instructors Association of America, Madrid Region Disabled Association, Madrid Traffic Control Centre, UITP, clustering with other EU- and nationally-funded projects in the field (5G-MOBIX, ARCADE, AUTOPILOT, CCAV projects, COEXIST, interACT, L3PILOT, KRABAT,...)	at least 3 x partner
University education	Research findings and projects results at lecture and seminar units, B.Sc, M.Sc and PhD theses, lectures and academic events	LIST, UBFC, UNIVLEEDS, LIV, UMA	UNIVLEEDS's Open and Distance Learning (ODL) Programme offering "the soft side of CAV", UMA'S M.Sc. Psychology: Work, Economy and Society, LIST/UNI.LU MobiLab seminar	at least

Worth mentioning is the PAsCAL Open Access approach. Removing legal, commercial and technological barriers to access scientific information, the research process becomes more efficient and the research results more visible. For a detailed description of the PAsCAL Open Access approach please refer to section 2.2.3 Data Management.

Individual dissemination plans

In this section, partners provide further details about the activities summarized in the previous table.

LIST will release 2 Posters, 4 conference publications and 2 Journal publications on educational technologies of CAV related education and training, related competence and cognitive models; 1 blueprint on competence model structure; 3 presentations at industrials fairs related to mobility and CAV. It will aim at publishing 1 article in the press specialized in EU research and 2 articles/reportages in the national press in Luxembourg (RTL, Land, Letzebuerger Gemengen, etc.). Regular updates on the project will be presented by LIST's representatives at meetings of the Inter Ministerial Committee on Intelligent Mobility and of the stakeholders committee in the Franco-German-Luxembourgish cooperation on connected and automated vehicles.

ACI: will promote the project using all its channels targeted a) at the general public (i.e. website, online magazine L'Automobile, Local offices publications) or b) at specific targets (i.e. on-line magazine OndaVerde targeted at Public Authorities, on-line Legal Review on Traffic) on a regular basis. Towards the end of the project ACI will dedicate its yearly Conference on Traffic (target EU and italian policy-makers) to the project and its results. Organisation of 1 or more "Try the Autonomous Drive Day" at one of the Safe driving Centres, eventually in connection with the Pilot, including workshop and video. Presentation of the project at selected events. Liaison activities with national/international Organisations or Associations ACI is part of (i.e. FIA, TTS Italia, ETSC, Ertico)

LuxMobility will present 3 scientific contributions to targeted conferences in Europe (TRA, EWGT or the heart conference) and beyond (TRB in Washington DC or WCTR). The outcome of WP8, "Guide2Automony, Policy Recommendation and Guidelines", that LuxMobility leads will be presented & disseminated through the IMS network. IMS (Inspiring More Sustainability) is a Luxembourgish national NGO, financed mostly by the ministry of sustainable development, responsible for promoting best environmental & mobility practises to private companies in Luxembourg. The main findings will also be generalised and synthesized in order to be included in the Mobility Management training course in Luxembourg. This training, the first of its kind in Luxembourg is a conjoint collaboration between ACL

(Automobile Club Luxembourg) and the University of Luxembourg. LuxMobility is associated to this training as an "Innovative content provider".

RDS Driving will promote PAsCAL through various UK National Driver Training bodies that we are affiliated to. This will reach a large share of the 40,000 registered driving instructors in the UK. In addition, RDS Driving will also inform the Driver and Vehicle Standard Agency UK (DVSA) governing body covering Driver Training of our participation and the project aims.

ETELÄTÄR will organise events in the pilot site (Madrid) around project milestone MS6.1, engaging with local authorities and relevant stakeholders such as the Madrid Region Disabled Association and Madrid Traffic Control Centre

UNIVLEEDS envisages that PAsCAL will provide a rich source of dissemination material which can be targeted at both the national and international policy level as well as scientific outlets. Knowledge will be disseminated to our national policy makers via targeted seminars, to students via teaching activities and PhD supervision, and to other stakeholders via technical publications. Academic publications will also be submitted to journals (e.g. IEEE Transactions on ITS, Transportation Research Series, Human Factors, Transport Policy etc.). Dissemination will also occur via conferences (e.g. TRB, ITS Congresses, ICTTP).

LIV will promote the outputs/outcomes of the project via its Virtual Engineering Centre. (VEC, http://www.virtualengineeringcentre.com/). The VEC was developed in partnership with the Northwest Aerospace Alliance, the Science and Technology Facilities Council, BAE Systems, Morson Projects and Airbus. It is a nationally focused research impact centre and is a hub for communicating research outcomes to potential users and to promote the exploitation of those outputs.

UBFC will promote the PAsCAL project in the scientific community through the publication of articles and our participation to conferences (e.g. International Ergonomics Association congress). Moreover, we will take advantage of the participation of Pr Jean-Claude Sagot to several scientific societies (occupational medicine, gerontology and innovation cluster, French-speaking society of ergonomics, etc.) to communicate about the project during the events organized by them.

ExaMotive S.A. will promote project activities and results of the project by organizing events at the pilot sites and through powerful local marketing channels. In addition, at least one-two peer reviewed publications will be produced.

RDGFI will promote PAsCAL at both national and European level mostly in ITS industry-oriented events and urban mobility related media. Bootlets, online press releases and interviews to stakeholders will be produced as well as promotional videos. In addition, RDGFI will provide web and material design experts to the Consortium.

UMAN commits to four to five peer reviewed publications (one to two high impact) on user acceptance of CAVs and ways to optimize it. Two presentations on how to enhance acceptance to policy makers.

E-Bus will promote project results among public transport authorities and operators to whom is connected. Additional promotion will be carried out via UITP events (including Global Public Transport Summit) and ITS ERTICO congresses. Promotion in the scientific community will be carried out via ITSC conference and academic network of UITP.

EBU will disseminate the project's progress and outcomes through the following modern, accessible and diversified information and awareness–raising channels: EBU website, EBU monthly newsletter (in English), EBU quarterly publication Focus (already available in English, French, German, Spanish and soon also in Serbian and Turkish), EBU podcast on Accessible Technologies (EBU Access Cast), Facebook and Twitter accounts and events (e.g. EBU 2019 General Assembly in Rome).

2.2.2 Exploitation of results

Although PAsCAL is a research-oriented project, part of the project results will be validated or demonstrated in relevant environment and therefore they will be ready to be exposed to potential large-scale adopters. The exploitation of PAsCAL will be steered strongly by the industrial partners. Since the Consortium includes several industrial companies and end-users associations, PAsCAL will be able to capitalize on the know-how acquired within the project to build components or exploit systems, services and materials in the market. Partners providing trial sites will become a reference for the market replication of PAsCAL's solutions into

similar environments. Universities and research centres have strong vocation in the transfer of scientific know-how to industry ensuring dissemination and creation of technical competences, exploiting it mainly for teaching.

Exploitation strategy

Adoption of PAsCAL's results by target groups requires a strong collaboration of different project areas (dissemination, scenarios definition, demonstration results, etc.) combined into a common Exploitation Strategy, defining specific actions to be undertaken during the project lifetime to promote the PAsCAL approach towards industry. It will focus on several critical aspects:

- Context characterization and interactions involving strong market and stakeholder analysis, engagement of CAV stakeholder community, end-users (drives and non-drivers) and standardisation and public procurement activities.
- Preparing exploitation during development to avoid R&D death-valley by performing competence assessment to match features with potential PAsCAL's results adopters needs, identifying the beneficiaries of each result with associated responsibilities and protecting IPR.
- Entering the market strongly supported by solid exploitation plan and business model for commercialisation enhanced by end-users'/stakeholder's education and training through multi-channel dissemination activities.

The PAsCAL Exploitation Strategy includes:

Market Analysis: Revision of the potential PAsCAL stakeholders and market opportunities. First, the potential market for PAsCAL's results is analysed. PESTEL analysis[38] is used to identify three important target scenarios starting at the exact point in time where the to-be scenarios that have been defined both on a generic level as well as for the trial partners. As basis, the markets for the demonstration partners will be a subset of the generic developed market. Hence, the market study will firstly concentrate on identifying the generic market of PAsCAL and then in the second phase clearly identify the submarkets for the trial partners (public transport fleets including emergency vehicles, driving training packages, impaired users, etc.). This approach has the advantage that the market analysis can proceed from both a bottom-up and top-down approach: Geographical identification of where the best conditions for PAsCAL adoption throughout Europe are to be found (top-down) while submarkets can be defined logically and geographically (bottom-up). Second, the analysis of the stakeholders will be performed, understanding the actors that may have an impact in the PAsCAL exploitation success, competitors included. In order to carry through the analysis of the specific PAsCAL market all constituting elements will be analysed: a) Trends, size and growth rates of above mentioned markets, b) Stakeholders, c) Competitors, other barriers and opportunities, d) Differentiators with competitors, e) Key success factors. Last, external alliances and cluster partnership strategy for finding of synergies within PAsCAL will also be included.

Definition of sustainable business models for PAsCAL's results: The methodology to identify the Exploitation Results will consider all project activities outputs, including the core concepts definition, business requirements, main technical components and the final evaluation results. This **iterative process** contemplates several activities to be performed along the complete project duration: i) Definition of preliminary generic scenarios and targeted scenarios in WP6; ii) Technical (risks assessment and mitigation) and demo requirements, involving WP3 to WP8; iii) Definition of the Exploitation Strategy, Market and stakeholders analysis and needs, iv) Development of the preliminary versions of the multidimensional map of public acceptance (WP3), educational material (WP5) and simulations prototype (WP4), v) Definition of the business models, vi) Final results of PAsCAL trials (WP6 and WP7), vii) Commercialization, replication and market uptake. A competence SWOT analysis will be followed by the identification of value propositions and related business models and their validation. Different methodologies will be applied in order to define innovation areas, possible business opportunities and to compare results for final assessment. For example, the Ten Types of Innovation[39] methodology will contribute to the identification of the most relevant and

[38] See https://blog.oxfordcollegeofmarketing.com/2016/06/30/pestel-analysis/
[39] See https://www.doblin.com/ten-types

promising-to-commercialize project results, and the Business Model Canvas[40] methodology for the Generation of initial business models using brainstorming techniques (Value Proposition Canvas, Business Model Canvas). Finally, both the initial consortium-level as well as the initial individual partner level exploitation strategies are then described considering the IPR agreements that may occur. Once the exploitation strategy is clearly defined, the Consortium will define how to make it a reality by performing a replication analysis. Variables such scalability, replicability of PAsCAL trials experience, cost and usability will be considered so PAsCAL results can be exploitable with a reasonable – affordable – investment from the partners. Every final business plan needs to contain targeted and thorough marketing analysis and financial plan.

While defining and executing the Exploitation Strategy a methodology for risk assessment of innovation[41] will be integrated. The essential steps of this risks assessment are the following: 1) Identify relevant business objectives, 2) Identify events that could affect the achievement of objectives, 3) Determine risk tolerance, 4) Assess inherent likelihood and impact of risks, 5) Evaluate the portfolio of risks and determine risk responses, 6) Assess residual likelihood and impact of risks. Risks include both external and internal factors:

- Economic situation: Market expansion/retraction, competition, financial viability, etc.
- Framework: Political situation, policies definition, execution framework, regulatory actions.
- Assets: IPR management, investment viability, knowledge maintenance, etc.
- Technological factors: Ethics issues, data management, know-how acquisition, etc.

In the proposal we briefly explained our exploitation strategy:

- It will start with the market analysis that will include: a) Trends, size and growth rates of identified markets, b) Stakeholders, c) Competitors, other barriers and opportunities, d) Differentiators with competitors, e) Key success factors. Last, external alliances and cluster partnership strategy for finding of synergies within PAsCAL will also be included.
- Then for the different solutions of the project we will define sustainable business models. For it, we will organize brainstorming sessions or workshops to which all partners will participate, split in heterogenous teams, in order to identify value propositions and then preliminary ideas for potential business models. After some months, during which developments and solutions validation is performed, we will be able to valorise these business models against experiments results in order to select final business models (with preliminary suggestions for costs and revenues). As final validation, these models will be presented to key stakeholders that will provide us with their input about them.
- The models will be exploited into detailed business plans. Financial and marketing strategies will be defined, with an special focus on financial sustainability. For those models participated by more than one partner (joint ownership) specific alliances will be proposed as well as Intellectual Property rules and strategies.

Individual exploitation plans

LIST will further develop the competence models from WP5, license them for later consulting training providers in CAV sector; further develop the home study simulator to reach TLR7 to transfer technology to third party for developing a product (TRL9); reuse and remix the developed training material for the national training needs in Luxembourg.

ACI will share the overall guidelines and the training results with the competent Italian Ministries and the national/international organisations active in road safety of which it is a member. It will adopt the training modules and programmes in the Ready2Go method and develop specific road education programmes for schools. Sara Assicurazioni will develop new insurance products designed for CAV users.

LuxMobility will ensure that the G2A framework and its contents will be kept updated as a living knowledge base during and after the course of the project..

[40] See http://www.businessmodelgeneration.com/canvas/bmc
[41] See http://www.innotour.com/innovation-tools/innovation-risk-assessment/

RDS Driving will share all the results with training organisations, and particularly learnings for training drivers of CAVs. We will present to and/ or use the findings as follows: Our 1500 instructors and 80,000 customers; The three UK trade associations; The DVSA and the Department of Transport - UK Government; The Driving Instructors Association of America; Trade press – press release once approved; Integrate learnings and relevant improvements in driving training into our teaching programmes in due course; The same for Driving Instructor training as appropriate; Develop our online training systems for learner drivers and corporate customers in our fleet training business as appropriate.

ETELÄTÄR will use PAsCAL results from WP3, WP6, and WP7 as a basis for Apertum's further improvements to enhance its competitive position on a global scale. The guidelines from WP8 will be incorporated into the system to increase Apertum's potential for system integration in existing applications.

UNIVLEEDS primary purpose is to advance the understanding of economic, environmental and societal impacts of connected and autonomous vehicles and transport systems, and to develop skills and best practice among transport professionals and decision-makers. The PAsCAL project brings together a wide range of skills in various field such as human factors, HMI interface, traffic control, impact assessment, simulation, and social inclusion. The research that will be undertaken by the University of Leeds will advance the understanding in these fields.

LIV, VEC will make a vital contribution to the widespread impact of the proposed project by ensuring that the results are communicated to a diverse range of interested end users. The VEC has a current network of over 50 large companies (including BAE Systems, ARUP, Rolls Royce, Airbus, IBM, Jaguar Land Rover, Bentley, Sellafield, Siemens PLC, Hitachi Rail, Cammell Laird, Wood Group, and EDF Energy) and an active network of 175 SMEs across the Aerospace, Automotive, Energy, Defence, Healthcare, and Logistics sectors.

For **UBFC**, the most relevant results will focus on the integration of the human factor in the design of CAVs, how the simulators have been adapted to such a project and what use comes out. The aim will be to promote the results of the experiments and to communicate the main outcomes.

ExaMotive S.A. will use results of the PAsCAL project and gained experience to further advance its shared mobility offerings with the focus on developed new offerings which will involve autonomous or semi-autonomous connected vehicles as part of the fleet. This will include development of new business models and strategies for a gradual transitioning to future autonomous electric fleets.

RDGFI will select a set of PAsCaL results to evolve into close-to market prototypes that RDGFI can offer to the market as well as consultancy services based on obtained know-how, adding them to the company portfolio. For it, RDGFI will capitalize on existing customers (e.g. Toyota Motor Europe, Volvo Trucks, Mercedes Trucks, Renault, SNCF, SNCB, public authorities all over Europe).

UMAN will extend the curriculum on consumer studies to novel forms of mobility.

For **E-Bus**, adopters of the results will mainly combine public transport authorities and bus manufacturers. We will investigate the required steps needed to commercialise the results via collaborative approach involving the necessary public transport stakeholders. Developing autonomous bus operations is very challenging as it requires close cooperation between manufacturers, authorities and operators. Therefore, for Volvo it is very valuable to have the possibility to test innovative solutions addressing social acceptance of driverless operations. The two project outcomes - understanding societal boundaries for autonomous mass people transport and a solution mitigating the key barriers are essential for us as they will bring the development of our driverless 12-metre bus to the next notch. The project is expected to design, and evaluate an effective solution allowing passenger-triggered alarm regarding pre-specified issues (including doors blocking, ramp/kneeling issues and stop-skipping) and to propose a remote assistance that would be perceived by majority of passengers as an equivalent assistance to the current solutions involving drivers action.

For **EBU**, potential customers/adopters will be blind and partially-sighted (BPS) persons, one of the most vulnerable group in society which suffers from reduced mobility and isolation due to the lack of accessible transport. CAVs will be a major step forward towards BPS persons' independent mobility and full participation in all aspects of social, economic, cultural and political life.

2.2.3 Data management

The consortium is aware of the relevance and complexity of data management activities and therefore reinforced them by defining a work package focused on Ethics and Data management, WP2 and appointing a Data Advisory Board.

Regarding data management, the PAsCAL Consortium is committed to the EU open access policy concerning data gathered or generated in the course of the project. The project main research results will be shared with the scientific community and general public through different channels (when IPR allows it) - see section ***Dissemination and communication of results*** above. With respect to publications, **the project will employ an Open Access strategy**, where the best-value-for-money will be approached. Therefore, if green open access is possible with a maximum embargo time of 6 months is possible, this will be followed. At the same time, if the required high quality of the selected journal has longer embargo time, gold open access with be selected. The emphasis of data management will be on faithful and reproducible record keeping, with an emphasis on transparency and accountability in methods utilized. At the same time, protection of critical data needs to be guaranteed. To this end, PAsCAL will request participants - at the moment data is collected - to indicate which information must be treated as confidential and apply the necessary measures.

PAsCAL will process special category (behaviour/physical) personal data for validation purposes of the guidelines, recommendations and simulation tools integrated into demonstration scenarios. It is not planned to share this data publicly. However, the consortium will provide access to non-personal data that may be used for testing and demonstration purposes whenever possible. Personal data is also expected to be generated in the validation process as evaluation feedback is collected. This data may be published in anonymous form, and participants will be informed as per the ethics procedures outlined below.

Public access to research results will be regulated by the consortium in order to protect privacy and confidentiality concerns, as well as respect any proprietary or IPR. Legal offices might be consulted on a case-by-case basis to address any concerns, if necessary. Terms of use will include proper attribution to the principal investigator and authors along with disclaimers of liability in connection with any use or distribution of the research data. All data generated as a result of this project will be backed up daily to protect from loss of data from hardware failures, fire, theft, etc. Long-term, public access to PAsCAL data will be hosted by an appropriate service such as Zenodo[42].

The standardization activities relevance is reflected in the perspective of building upon widely adopted standards, addressing the need for certification of products/devices and services in the CAV domain, and standards for security-by-design covering the whole lifecycle of IT applications.

As indicated above, the PAsCAL project will involve the processing of both primary and secondary data from human participants. The consortium's commitment to the appropriate ethical and legal handling of data gathered during the project is of paramount importance, not least because the project is expected to process data for testing and validation of tools regarded as special category personal data (General Data Protection Regulation or GDPR[43], Art. 1). In addition to the description of WP2 in Section 3, Section 5 of this proposal provides a thorough description of the general ethical considerations and processes that will be adopted in the project. Section 6 outlines ethical governance processes, and how the consortium plans to address data collection, ethical approval, assuring explicit consent from participants, secure data management, and result reporting. In addition to this, three dedicated deliverables released at month 4 will detail the data and ethics management plan and provide ethics guidelines to all partners needing to process personal data. Periodic reports will include updates on ethics management, which will be reviewed by the Ethics and Data Advisory Boards.

2.2.4 Knowledge management and protection

Information will flow within the project both vertically and horizontally. The vertical flow of information comprises mainly the administrative issues (e.g. financial progress reports, consolidated reports, meeting

[42] See http://zenodo.org
[43] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016

minutes and cost claims/advance payments), whereas R&D information flow is generally more appropriate to a less formal and horizontal process.

The core of the information exchange is the PAsCAL **Collaborative Working Environment**, which is visible to everyone (e.g. using ProjectPlace and GoToMeeting). Collaborating partners will acquire free access on a confidential basis to all items displayed in the Collaborative Working Environment database unless additional ad-hoc restrictions have been negotiated in advance. This platform will also include basic workflow tools to automate and simplify the working procedures. The EC will receive a special access code to receive the necessary reports and to access prototypes on the review process if necessary. The database and periodic reports will greatly help in assembling the annual and interim reports.

In parallel, the **website** will provide full access to all achievements in detail, publications, news, and sequence search sections will be open also to the public. Project publishable summary, general information and public reports will be public on the web also as a means to effectively communicate and coordinate, with parties outside the consortium, such as other related projects or the EU commission.

The **Consortium Agreement** (CA) will provide rules for handling confidentiality and IPR to the benefit of the Consortium and its partners. The CA, which will be signed before the beginning of the project, will gather the basic aspects of the IPR management: 1) Confidentiality, 2) Ownership of results / joint ownership of results / difficult cases (i.e. pre-existing know-how so closely linked with result difficult to distinguish pre-existing know-how and result), 3) Legal protection of results (patent rights), 4) Commercial exploitation of results and any necessary access right, 5) Commercial obligation, 6) Relevant Patents, know-how, and information Sublicense, 7) Pre-existing know-how excluded from contract. Nevertheless, many specific IPR cases, that will need a concrete solution from the bases previously fixed, may exist. In these conflict situations, the Project Coordinator will be responsible for arbitrating a solution. The policy that will govern the Intellectual Property Rights management in the scope of PAsCAL will be driven upon agreement of the partners on the following principles:

Ownership of knowledge: Knowledge shall be the property of the Party carrying out the work leading to that knowledge. Where several Parties have jointly carried out work generating the knowledge and where their respective share of the work cannot be ascertained, they shall have joint ownership of such knowledge. Details concerning jointly owned Results, joint inventions and joint patent applications will be addressed in the Consortium Agreement. The Parties concerned may further agree amongst themselves the allocation and terms of exercising ownership of that knowledge in accordance with the provisions of the consortium agreement.

Scientific publications: The nature of the project is to spread the knowledge acquired during it as much as possible. Therefore the Consortium definitely chooses a free online access to all kind of publications, as far as the publisher of scientific papers does not impose the contrary. For further details, refer to the Open Access approach described in section 2.2.3.

Protection of knowledge: Where knowledge is capable of industrial or commercial application, its owner shall provide for its adequate and effective protection, in conformity with relevant legal provisions, including the CA.

Patents: For handling patents, to the extent made possible by confidentiality terms stipulated in the consortium agreement and without compromising any protection rights according to any rules or laws, partners will inform the consortium of technologies, algorithms etc. that they offer for use in the WPs that they have patented, are in the process of patenting, or consider patenting. Lists of patents related to the project, whether adopted, applied or generated will be maintained for reference, and included in reports made to the Commission.

IPR/License: The general architecture and innovative results defined during the course of the project are public domain research through reports publication in the project website and publications (papers, articles, etc.). In agreement with such a general direction, PAsCAL aims to release at the end of the project as large as possible a set of the project results under an Open Source Software License. The goal is to facilitate adoption and take-up on a wide scale. At the same time, such type of license will allow for proprietary use, and for the PAsCAL results to be incorporated into proprietary solutions. Dual licensing will be considered in case the partners are willing to commercially protect their foreground for exploitation purposes (foreground could be

released under a proprietary license or as closed source software). The PAsCAL integrated solution will be designed in a modular fashion, in order to allow a section of code embodying a patent, or a service that has potential in the market, to be kept separate from the rest, in order to grant IPR protection and rights for use. Valuable IPRs that might come up during the course of the project with direct product use shall be protected by the consortium and/or single partner entity within the project. The IPRs shall be shared based upon rules agreed by all partners, and the Horizon 2020 Grant Agreement rules shall be strictly adhered to. To summarise, the basic philosophy of the consortium is to be not a closed and exclusive development community, but instead to aim at public good as far as possible. The basis for IPR protection in the consortium will be agreed upon in the consortium agreement, with advice provided by the leader of the exploitation tasks (RDGFI), with the support of the Technical Transfer Office (TTO) of the Project Coordinator. In this way IPR issues will not form any kind of difficulty on reaching consortium agreement.

Access rights: Partners shall enjoy access rights to the knowledge and to the pre-existing know-how (details will be addressed in the CA), if that knowledge or pre-existing know-how is needed to carry out their own work under that project.

Use and dissemination: The partners shall use or cause to be used the knowledge arising from the project, which they own, in accordance with their interests. If dissemination of knowledge would not adversely affect its protection or its use, partners shall ensure that it is disseminated within a certain period - fixed in the CA - after the end of the project.

3. Implementation

3.1 Work plan — Work packages, deliverables

The project will be implemented with the activities being performed in 9 dedicated work packages (WP) structured as depicted in Figure 13.

WP1 covers financial and administrative management/coordination activities. WP2 will ensure the setup of an Ethics Advisory Board as well as a Data Advisory Group: They will provide the necessary guidelines and procedures to handle data and to handle accurately sensitive user groups who are involved in the project (e.g., EBU).

The research work packages (WP3-8) are closely linked by providing input to subsequent work packages. Milestones guarantee that preliminary results can be delivered as early as possible to other work packages. Further, a feedback loop is implemented, i.e. intermediate results of the simulator and pilot studies are fed back to the work packages where constructs (e.g. WP3 multi-dimensional map CAVA), models (e.g. WP5 cognitive and competence models) or analysis frameworks (e.g. WP7 impact assessment framework) are developed. This ensures that all research findings and impacts of new PAsCAL innovations on user acceptance and user behavior at the end of the project are documented and made accessible for the wide public.

WP3 provides a comprehensive well-integrated picture on present road users deemed to be potential future users of CAVs as individual mobility mean or part of fleets. With a standardized survey WP3 measures CAV acceptance. This measure is validated in a series of validation studies, including discrete choice experiments, intervention studies to increase acceptance (together with WP5), immersive simulations (together with WP4) and pilot studies (together with WP6). Finally, this measure is used to develop a multi-dimensional map of CAV acceptance, to enable target-group specific interventions for increasing CAV acceptance (called CAVA). A first version of the measure is available in M10 and will help subsequent WPs design scenarios and technologies for simulations (WP4) and WP5 (training). The final version of CAVA will provide guide and recommendations to WP7.

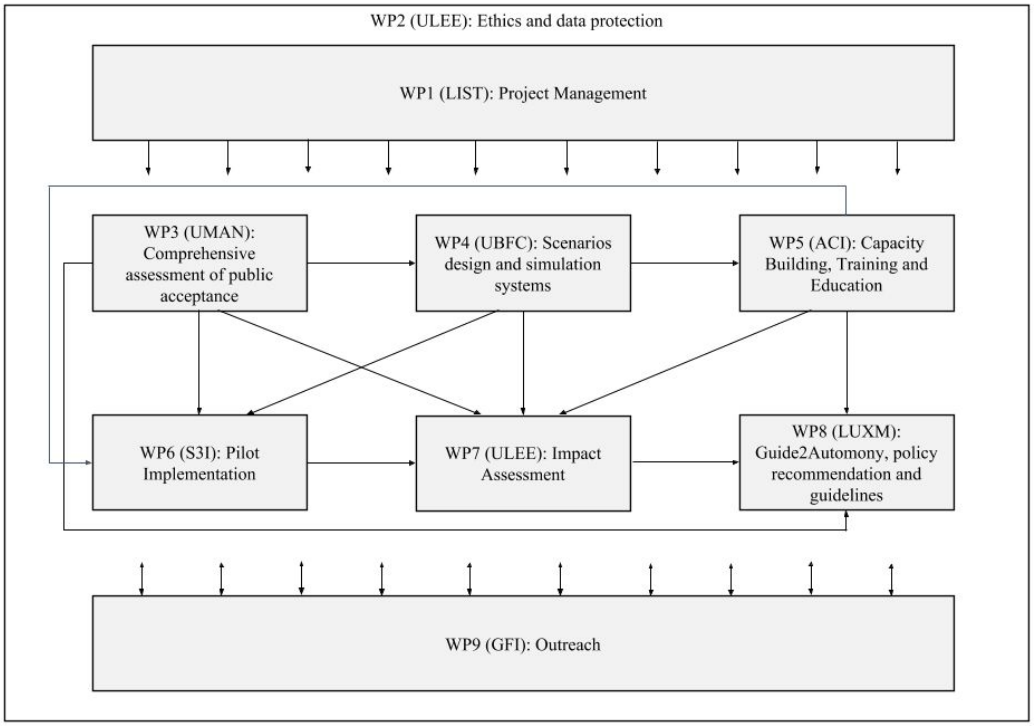


Figure 13: PAsCAL Pert Chart

The WP4 aims to collect attitudes, acceptances of participants exposed to CAV contexts (pedestrians, passengers) and user behaviours during the simulated use of CAVs. The simulated situations will be based on relevant use scenarios for drivers and non-drivers, meeting their expectations and needs identified in WP3. They will need adaptations of the road and aerial simulators provided by the partners (LIST, UNIVLEEDS and UBFC; LIV respectively) in order to immerse drivers and non-drivers in an environment as close as possible to reality. The integration of Human-Machine Interfaces (HMI) in the CAVs will be needed to assist drivers and non-drivers in the simulated situations and to address the implemented use scenarios. The experiments performed with the simulators will complement the acceptance map and define guidelines for WP5 and additional evaluation indicators for WP6.

WP5 emphasises on developing new trainings means for (professional) drivers, instructors and certificators. Cognitive and competence models are derived by observing drivers using the home study simulator. These models are the basis for developing learning scenarios and related tasks which are validated in WP5 as well. The impact of education on user acceptance is fed back to WP3. Results are forwarded to WP6 to run the training pilot.

WP6 aims to coordinate all the activities related to pilots. It will use the outcomes of the previous WPs including Ethics and Data Protection handbooks from WP2, and in compliance with the data analysis and impact assessment plans defined in WP7 so that its pilot results and data collected will be directly transferred to WP7 for evaluation.

WP7 acts as an assessor for the whole project, starting from determining impact areas and paths to be used as guidance by other WPs, to assessing the long-term impact of the developed solutions. It defines the project's overall assessment framework and KPIs which can be refined (and extended) to suit the specific research questions and hypotheses formulated for a specific activity (e.g. simulation)

WP8 packages all the results of the previous research work packages along the project by providing the Guide2Autonomy (G2A), which intends to become the European Reference for Guidance related to CAV. It consists of a set of guides and recommendations (about 100) that allow the industry, public authorities and other relevant stakeholders an improved understanding of the public awareness and the requirements and needs of different types of users in relation to CAV. Beyond PAsCAL's simulations (WP4, WP5) and pilots findings (WP6), the G2A will be based on other good learning practices identified in Europe (e.g. executed in the frame of Autopilot, L3 Pilot etc.).

WP9 designs and carries out the dissemination activities of PAsCAL. In addition, this WP will shape and posture the project foreground for sustainable long-term market impact in a structured and systematic way. WP9 will receive as input the results, knowledge, know-how and foreground from all WP activities for consideration of the exploitation potential. WP9 will provide as output exploitation-oriented dissemination guidance, for both technical foreground and know-how, to targeted CAV industry and academic stakeholders, and exploitation measures in the form of business and replication plans to promote post project uptake.

The detailed activities and their dependencies are provided in the following Gantt chart.

			Project's progress
			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
WP1	**Project Management, Coordination and Quality Control**	**LIST**	
Task 1.1	Organisation and Administration	LUXM	D1.1
Task 1.2	Coordination and Communication	LIST	
Task 1.3	Reporting and Monitoring of Work Progress	LUXM	
Task 1.4	Financial Management and Controlling	LIST	
Task 1.5	Quality Management	LUXM	
Task 1.6	Risk Assessment and Management	LIST	D1.2
WP2	**Ethics and Data Protection**	**ULEE**	M2.1
Task 2.1	Ethical Advisory Board	UMAN	
Task 2.2	Ethics Handbook	UMAN	D2.1
Task 2.3	Data Advisory Board	ULEE	
Task 2.4	Data management setup	ULEE	D2.2
Task 2.5	Data Protection Handbook	ULEE	D2.3
WP3	**Comprehensive Assessement of Public Acceptance**	**UMAN**	M3.1
Task 3.1	Creation of inclusive pool of item measures	UMAN	
Task 3.2	Initial assessment of acceptance dimensions and citizen clusters	UMAN	
Task 3.3	Behavioral and experimental validation of assessment instrument	UMAN	D3.1 D3.3
Task 3.4	Multi-dimensional map of public acceptance for higher levels of connectivity and automation in transport	LUXM	D3.2
Task 3.5	Assessment tool development	LIST	D3
WP4	**Scenarios Design and Simulation Systems**	**UBFC**	M4.1
Task 4.1	Definition of the simulation experiments	UBFC	
Task 4.2	Development and performing of the simulation experiments	UBFC	D4.1
Task 4.3	Results analysis, lessons learned and cross-fertilisation	ULEE	D4.2
WP5	**Capacity Building, Training and Education**	**ACI**	M5.1
Task 5.1	Define the requirements of a CAV environment with specific reference to a road educational environment	ACI	
Task 5.2	Adopt home study simulator to address road educational issues and implement training and educational scenarios	LIST	D5.2
Task 5.3	Derive cognitive models and define competence models	LIST	D5.1
Task 5.4	Develop and test a specific training programme for trainers in CAV environment	ACI	
Task 5.5	Develop and test road education modules for drivers in a CAV environment	ACI	
Task 5.6	Develop and test a specific road education modules for professional drivers in CAV environment	ACI	D5.3
WP6	**Pilot Implementation**	**S3I**	M6.1
Task 6.1	Pilot methodology	S3I	D6.1
Task 6.2	Pilot setup	S3I	D6.2
Task 6.3	Pilot running and coordination	S3I	D6.3
Task 6.3.1	High-capacity autonomous bus operations	EBUS	
Task 6.3.2	Autonomous driving training	RDS	
Task 6.3.3	SMEV - Smart Emergency Response	S3I	
Task 6.3.4	Shared multimodal transport	EXAM	
Task 6.3.5	Experience of vulnerable travellers with CAVs	S3I	
WP7	**Impact Assessment**	**ULEE**	M7.1
Task 7.1	Impact areas and pathways	LUXM	D7.1
Task 7.2	Assessment framework for public acceptance of CAV	UMAN	D7.2
Task 7.3	Integrated data analysis	ULEE	D7.3
Task 7.4	Proliferation modelling and evaluation	ULEE	D7.1

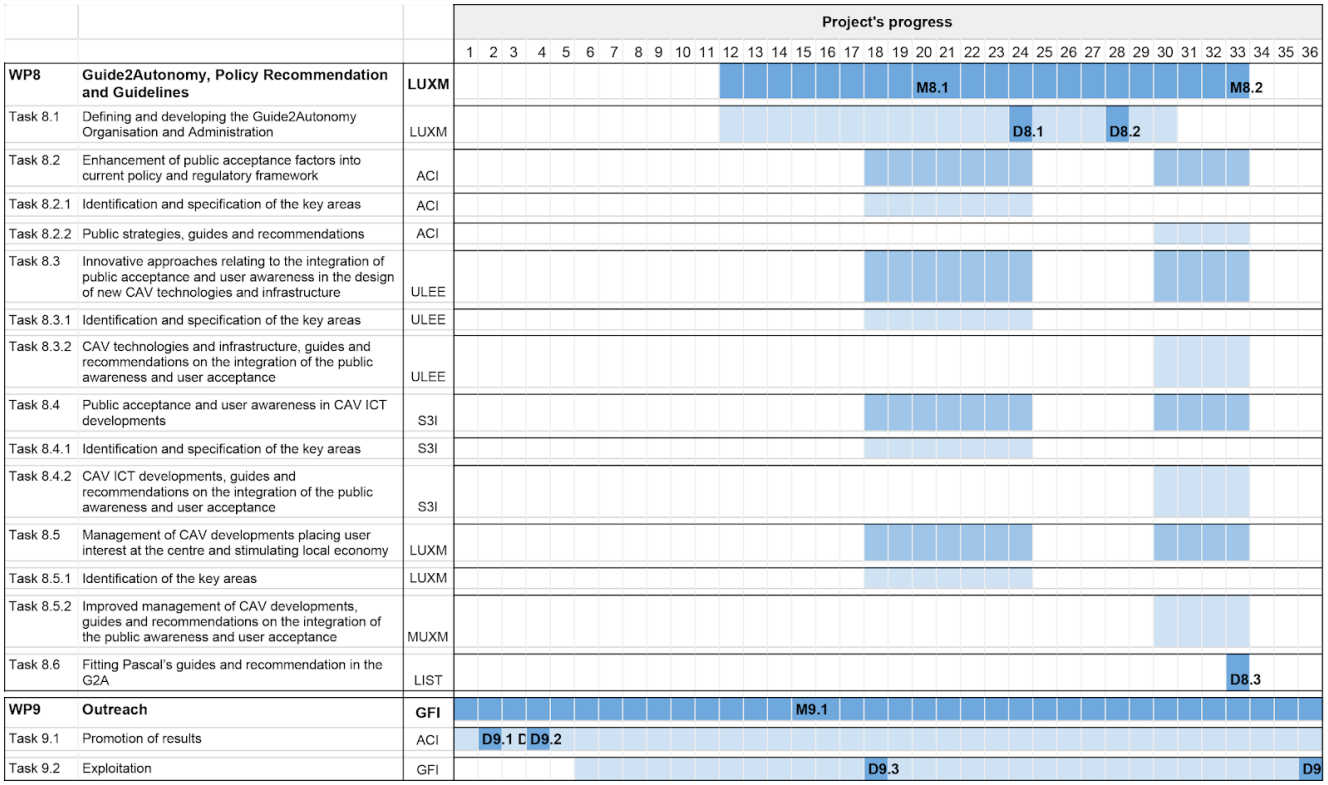


Figure 14: PAsCAL Gantt chart

3.2 Management structure, milestones and procedures

The primary objective of all management activities in PAsCAL is to guarantee the success of the project. During the 36-month duration of the project, 13 partners from 7 European countries will cooperate ensuring high quality and timely delivery of project results.

The PAsCAL management structure is based on well-known best practice methodologies and will ensure close links between the organization of the work, decision making and control while, at the same time, keeping the administrative effort to the minimum. It will further guarantee efficient communication flows within the consortium. Figure 15 depicts PAsCAL's Management Structure.

General Assembly

The General Assembly (GA) comprises one representative from each consortium beneficiary and is put in place before the first meeting in order to sign the Consortium Agreement (CA). The GA meets at least once a year. The GA elects the Steering Committee, ensures the coherence of the consortium, and approves any contractual decisions in case of modification of the consortium, project objectives or project budget.

Consortium Agreement

The project will be managed according to a Consortium Agreement (CA), based on the DESCA H2020 Model Consortium Agreement, which will define the principles of consortium organisation such as partner responsibilities, liability towards each other, management structure, operational procedures, financial provisions, IPR and confidentiality issues. The CA will be signed before the Grant Agreement with the EC enters into force.

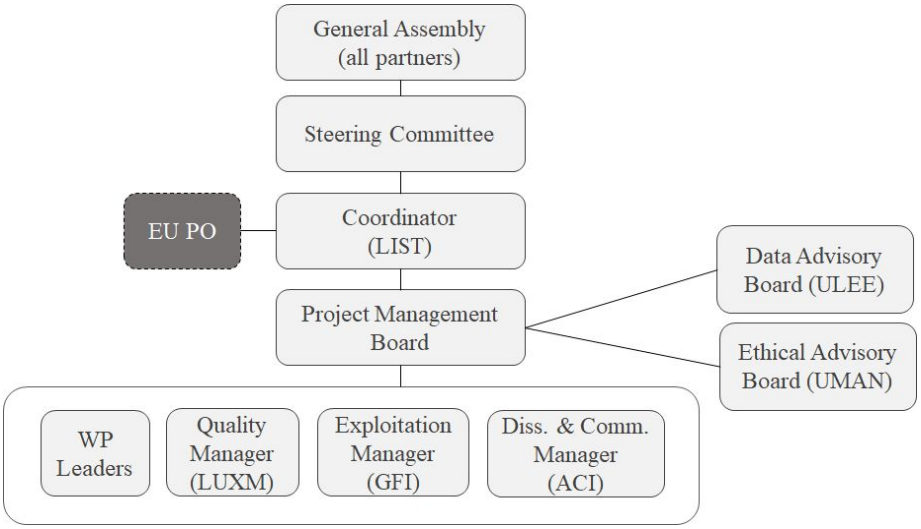


Figure 15: PAsCAL's Management Structure

Steering Committee

The Steering Committee (SC), with up at least 5 members representing each sectors of the consortium, is responsible for providing strategic direction and taking strategic decisions for the project. Members are senior managers not involved in the project work. It will be compose of LIST (coordinator) and representatives from the sectors Universities (1), R&D (1), Users (1), Industry (1).These organisations will be elected by the General Assembly.

Project Coordinator

The project will be coordinated and managed by an experienced Project Coordination team by LIST and LuxMobility. The scientific, financial and administrative coordination of the project will be the responsibility of the coordinator (LIST) who will act as the legal entity responsible for all contractual arrangements and reporting to the EC. LIST will be supported by the professional project manager and consortium member LuxMobility. LIST as well as LuxMobility have already successfully coordinated and managed H2020 projects.

The Project Coordinator is ultimately responsible for project management and for all communications with the European Commission, including financial and progress reporting. In this function the Coordinator shall sign the Grant Agreement with the Commission after all participants have negotiated and signed the Consortium Agreement and will be responsible of project funds distribution among partners.

Key tasks of the project co-ordinator team will be:

- Ensuring co-ordination with the European Commission to fulfil requirements;
- Liaison with the European Commission on financial and contractual issues;
- Scientific quality of the work, quality control, to fulfil requirements and policy objectives.
- Project implementation and co-ordination
- Project reporting
- Submission of Periodic Reports, Deliverables and Cost Statements to the European Commission

Project Management Board (PMB)

The day-to-day management of the project will be carried out by the Project Management (PMB) led by the Project Coordinator in the person of the Project Manager, comprising all Work Project Leaders (WPLs), the Quality Manager, the Exploitation Manager and the Dissemination and Communication Manager.

Work Package Leaders (WPL)

The coordination and support activities of PAsCAL are organised in Work Packages steered by the individual WP Leaders. Together with the Project Coordinator they will jointly define and implement the project and amend the work whenever necessary during the course of the project.

WP Leaders are responsible for:

- Preparing a work plan for their work package and defining responsibilities and activities;
- Supporting the related Task Leaders;
- Coordinating the activity of the work package, ensuring that tasks are completed in accordance to the agreed content and within the agreed schedule;
- Ensuring that task leader take responsibility for deliverables assigned to their task
- Submitting deliverables to the project co-ordinator;
- Providing status reports of their work packages as inputs to the periodic progress reports.

Task Leaders (TL)

The work in each WP is broken down into Tasks. Each task performs a number of activities. The responsibilities of the Task Leaders are to:

- Agree the task and activity work plan;
- Coordinate and monitor the task and its activities;
- Contribute to the deliverable content from each activity and task;
- Notify the Work Package Leader when outputs are ready for review;
- Maintain communications between the task and all other interacting tasks;
- Provide to other contributing partners detailed technical knowledge and advice about the work area being covered by his task.

3.2.1 Project planning and internal coordination of activities

Project planning will be performed at three levels with respect to the project goals:

- The overall project plan will be maintained by the Project Coordinator;
- The work package plans will be maintained by the Work Package Leaders and communicated to the Project Coordinator on a regular basis;
- Activities within work packages will be planned by the Work Package Leaders in consultation with Task Leaders and involved experts and researchers where required.

The following meetings will be organised in the framework of the project:

- General Assembly (GA) and Consortium technical meetings
- PMB telco and meetings
- Steering Committee (SC) meetings

GA will be organised at least once a year together with one of the Consortium technical meeting which will meet on a regular basis each Quarter, bringing together all partners for 2-3 days, giving rhythm and coordination to the whole technical work. This way of having regular consortium meeting has proven its efficiency and will lower the necessity of having each of the WP organising its own meeting schedule. Consortium meetings will be organised with plenary meeting at the beginning to have a status and synchronise all partners, then parallel WPs or specific topic session will address the core work of the project and the meeting will end with a plenary defining the next steps for the consortium in a coordinated way.

PMB meeting will be organised the morning before the Consortium meeting, but having a Conference call every two weeks should enable to have half day meeting.

The SC will meet at least once a year. To reduce the number of required trips, meetings of the SC will be scheduled to coincide with meetings of the Consortium as well.

Finally, an on-line project repository and Collaborative Working Environment (e.g. ProjectPlace and GoToMeeting) will be setup to support the sharing of internal and external documents. E-mail and a project document repository on ProjectPlace will be the main media used for the exchange of information between partners. The traditional forms of communication, such as fax and telephone, mail and courier services will also be used. The partners consider E-mail (Internet) to be the best way to secure easy, fast, efficient and low cost daily communication between partners. Minutes of meetings, including Action Lists, will be circulated to all partners through E-mail. The first meeting of the General Assembly will agree on the programs and program versions and documented in the Project Quality Handbook.

3.2.2 Decision making and conflict resolution

Mandatory decision rules and agreements are necessary for the success of the project. The decision making process will follow the guidelines to reach agreement as close as possible to the level of execution. At task level, decisions will be taken through discussion among WP Leaders, Task Leaders and participants contributing to that particular task.

In case a decision impacts other WPs (second level of conflict escalation), the issue will be reported to the Project Coordinator who will mediate among the WP leaders and propose a consensual solution. If a consensus cannot be reached, decisions shall be taken by a majority of the votes, where each partner of the Consortium has one vote. Decision-making rules will be described in detail in the Consortium Agreement.

3.2.3 Quality control and assurance

The purpose of the quality control and assurance activities in PAsCAL is to ensure the detection of errors and deviations as early as possible in the project's life cycle and to provide measures how to handle such issues. This will enable the consortium to apply systematically corrective actions or contingency plans, if necessary.

Quality control will allow maximum flexibility while maintaining a clear distinction of roles and responsibilities of all partners involved. To this end, under WP1 a Quality Handbook (D1.1) will be produced for identifying an unambiguous and appropriate workflow between consortium partners and the various roles designed for the project.

Other goal of the quality control mechanism is to ensure that the project fulfils its objectives also in terms of quality (technical, formal) of deliverables and publications. In this respect the project will implement a formal review procedure to ensure continuous quality of its documents and other deliverables.

Before submission to the EC, each deliverable will be verified and reviewed by a PAsCAL partner that is not involved in the preparation of the deliverable and the Project Coordinator. The Quality Handbook will provide a template for the peer reviews. Draft deliverables will be distributed to the reviewers 30 calendar days before the deliverable's deadline.

On receipt of the draft deliverable, each peer reviewer, comparing the quality of the draft deliverable with the rules and standards described in the Project Quality Handbook and with his or her knowledge of the subject matter, should express one of the following three judgements within 14 days of receipt: "Accepted"; "Accepted with minor modifications" - in this case the proposed modifications should be briefly indicated to the author and no iteration is required; or "Major modification suggested" - in this case the proposed modifications should be extensively indicated to the author and iteration is required.

3.3 Consortium as a whole

The PAsCAL consortium consists of 13 partners coming from 7 countries (UK, France, Belgium, Germany, Italy, Estonia, Luxembourg) demonstrating outstanding, well-balanced and complementary competences in the various fields of expertise that are relevant to the project activities.

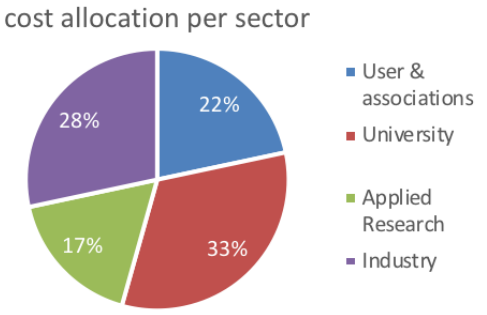
Additionally, most PAsCAL partners consortium offers important qualities such as an international reputation for scientific excellence and consolidated managerial competencies with expertise and facilities required to: (i) manage a project of this size and complexity, and (ii) mobilise and link the multidisciplinary knowledge and other complementary qualities for achieving PAsCal objectives. Indeed, it is worth noting that most PAsCAL partners can show a consolidated experience of participation in projects EU-funded projects under several research programmes on mobility and transport issues, firstly under the FP5, FP6, FP7 and H2020 Initiatives. Relevant projects carried by the PAsCAL partners are described in Section 4.

Expertise	**LIST**	**ACI**	**LUXM**	**RDS**	**S3I**	**ULEE**	**ULIV**	**UBFC**	**EXAM**	**GFI**	**UMAN**	**EBUS**	**EBU**

Empirical behavior observations	X		X			X		X			X		
(Big) Data analytics	X	X			X	X	X		X	X		X	
Simulators Engineering	X					X	X	X				X	
Survey management			X			X			X		X		
Dev. and integration IoT and sensors	X						X	X					
User experience measurement	X							X	X	X			
HMI development	X						X	X		X			
E-assessment, Training and Certification	X	X		X									
Citizen Involvement		X		X	X						X	X	X
Public dissemination		X	X							X			X
Commercial Expl.	X	X	X	X	X				X	X		X	

3.4 Resources to be committed

The distribution of person/months across the partners reflects the allocation of WP responsibilities as well as the partners' competence fields. The chart to the right shows that a substantial amount of funding is reserved to end user and associations involved as beneficiaries.



Tables for section 3.4

Table 3.4b: 'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)

All depreciation costs for equipment, infrastructure or other assets in the project are in compliance with Article 6 and will be recorded in the appropriate beneficiary's accounts, purchased in accordance with Article 10 of the grant agreement and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

Participant 2/ACI	**Cost (€)**	**Justification**
Travel	**9,600**	A total of 12 trips during the total duration of PAsCAL (12*800€)
Equipment		
Other goods and services	**33,000**	Translation services and incentives for the participants (2000 € +2500 €) to have an extraction of a representative sample in WP3; ; implication of 20 professional drivers in WP5 (2500€); + Renting of autonomous vehicles for the same duration (estimation of 15,000€) in WP6; Organisation of a Workshop (2000€) and Video (9000€) in WP9
Total	**42,600**	

Participant 2.1/ACI Informatica	**Cost (€)**	**Justification**

Travel	**4,800**	A total of 6 trips during the total duration of PAsCAL (6*800€)
Equipment		
Other goods and services	**50,000**	Use of the test track in Italy (Lainate) for 5 days (5*10,000€)
Total	**54,800**	

Participant 5/ETELÄTÄR	**Cost (€)**	**Justification**
Travel	**12,000**	A total of 15 trips during the total duration of PAsCAL (15*800€)
Equipment		
Other goods and services	**47,400**	For the pilot implementation of WP6; Incentives 12,900 (150 interviewee x 50 EUR + 18 App testers x 300€ SMEV 25,000 (use of the SMEV licence), 4500 € for implication of EBU members Certificate of financial statement (5000€)
Total	**59,400**	

Participant 7/UNIVLIV	**Cost (€)**	**Justification**
Travel	**9,600**	A total of 12 trips during the total duration of PAsCAL (12*800€)
Equipment		
Other goods and services	**16.300**	First usage of the flight simulator (8000€) (WP4): Second usage of the flight simulator (8000 €) + Incentives (300€) (WP6)
Total	**25,900**	

Participant 8/UBFC	**Cost (€)**	**Justification**
Travel	**12,000**	A total of 15 trips during the total duration of PAsCAL (15*800€)
Equipment	**15,000**	For WP4 where UBS is leader; Driving simulator (3 IR illuminators), VR platform (1 PC for 3D modeling), Cabin layout simulator (1 PC for CAD) (8150 €). HMI design (1 Axure software, Support arms, 1 kit for HUD, 1 or 2 digital tablet for prototyping embedded HMI, 1 or 2 smartphones for prototyping embedded HMIs) (2930 €), Experiments (3 micro-cameras, 1 HD camera, 2 hard disk, Participants' gratification, Hormonal titration,1 year SPSS software licence/support for statistical processing) (3920€)
Other goods and services		
Total	**27,000**	

Participant 9/ExaMotive S.A.	**Cost (€)**	**Justification**
Travel	**7,200**	A total of 9 trips during the total duration of PAsCAL (9*800€)
Equipment		
Other goods and services	**11,850**	For WP3, incentives 1,600€ (8€ x 200) + 3,500€ for survey adaptation and translation costs and in WP6, 6,750€ (750€ per vehicle/month * 3 vehicles * 3 months) corresponds to the rental of the cars (small-, medium-sized cars sports vehicles, vans, electric vehicles and vehicles

		with automatic features) and usage of them in the user experiments that will be necessary to run the pilot.
Total	**19,050**	

Participant 10/UMA	**Cost (€)**	**Justification**
Travel	**8,000**	A total of 10 trips during the total duration of PAsCAL (10*800€)
Equipment		
Other goods and services	**25,000**	Translation services and professional survey panels in WP3. (Estimated 5000€ per member state to engage the non vulnerable to exclusion panel members from professional organisation with panels in the respective countries + translation)
Total	**33,000**	

Participant 11/E-Bus	**Cost (€)**	**Justification**
Travel	**8,800**	A total of 11 trips during the total duration of PAsCAL (11*800€)
Equipment		
Other goods and services	**22,000**	In WP6, 2 pilot days Luxemburg (3600€ for the bus rental + some small equipment to be installed + 4 X 600€ daily rate for technical assistance) total 6,000€; and 2 pilot days Gothenburg 10.000 for the vehicles and test track rental (2X5000€) + 10X 600€ daily rate for technical assistance) total 16,000€.
Total	**30,800**	

Participant 12/EBU	**Cost (€)**	**Justification**
Travel	**8,800**	A total of 11 trips during the total duration of PAsCAL (6*800€)
Equipment		
Other goods and services		
Total	**8,800**	

Section 4: Members of the consortium

4.1. Participants (applicants)

4.1.1. Luxembourg Institute of Science and Technology (LIST)

Description of the organisation and its products/services

Serving the national and European economy and society, the Luxembourg Institute of Science and Technology (LIST - https://www.list.lu) is a Research and Technology Organisation (RTO) located in the very heart of Luxembourg's new Research and Innovation Campus at the former industrial site of Esch-Belval. From here, any major European city can be reached in less than 2.5 hours. Given the quality of its infrastructure, its esthetic appeal and its cultural heritage, the Campus brings together strong potential for innovation uniting university, research centres, joint laboratories, start-ups and incubators. LIST will join the project through the TSS unit of ITIS department.

Committed to multidisciplinarity, LIST's IT for Innovative Services (ITIS) department conducts research to develop models, methods, software and devices for smart systems, fusing human and technological aspects. Its ambition is to build trust around services, to develop new services with high level of informatics and to support innovation of IT-based services.

Aware of the challenge that ICT for mobility has presented for Luxembourg and its economy for many years, we have included mobility among our research priorities. The mobility market is currently faced with a number of challenges, such as the environmental impact of Internal Combustion Engines, increasingly stricter regulations, a growing congestion on the main roads of the Grand-Duchy, and the accelerating progress of technology, which obliges operators to keep up with developments. Our aim is to develop innovative solutions for sustainable mobility within the context of multimodal transport (multimodal routing tools, the sharing of multimodal data, autonomous mobility, etc.)

In 2017, ITIS built up a so-called *Cognitive Environment Lab* (CEL), which is used both for fast prototyping of interaction technologies as well as engineering IoT devices and enabling their integration on the data analytics layer. In the CEL immersive 360° road scenarios can be implemented and the fully equipped room allows tracking human behavior (incl. speech, gestures) while interacting with the simulators developed in PAsCAL. In additional, LIST has developed the home study simulator, by which studies take place in the end users home with each one installing a client application and a low-cost steering wheel. Users can experience the scenarios over a longer period of time in their own home.

Role and relevance in the project

LIST's role will be manifold:

- LIST is the project coordinator, leads scientifically the project, and is responsible for the coordination, communication and risk management of the project. In addition to the broad technical knowledge that a multidisciplinary organisation like LIST possesses, it will also need to be aware of the risks that project tasks may represent and be able to provide mitigation measures in cooperation with the partners involved in this task.
- LIST will engage both in more empirical as well as in engineer activities and the development of new training approaches. The multidisciplinary team of researchers, engineers and a business developer have a background in social science (psychology and pedagogy), computer science (simulations, IoT) and data analytics as well as substantial domain knowledge in the mobility sector. In WP3 LIST will engage in the development and validation of the item pool respectively measurement instrument. LIST also provide the Cross Skill tool for self-assessment purposes in WP3. In WP4 LIST will adopt the home study and setup the Cognitive Environment Lab to run observational studies. LIST is leading the task to understand which cognitive processes and hence competences are required to use a CAV in WP5 and will engage in developing the training programs with ACI and RDS Driving.
- Finally, LIST will participate in the assessment of the business and social impacts revealed by the investigations carried out in PAsCAL (WP7 and WP8). This participation will bring an expertise acquired from past experience (e.g. ZAC-eMovin, Nordstad-eMovin), notably on the evaluation of costs and benefits for the different actors in the value chain. Through its participation in Luxembourg's Working Group on Smart Mobility (WGSM) and in the stakeholders forum of the Franco-German-Luxembourgish cooperation on Automated and Connected Driving, LIST will advice the national authorities of Luxembourg, France and Germany on how to better consider the social acceptance of CAVs in their regulatory activities, at national and international level (e.g. The Vienna Convention and The Geneva Convention).

Five most relevant publications

Journals:

1. G. Perboli, F. Ferrero, S. Musso, and A. Vesco, "**Business models and tariff simulation in car-sharing services**". Transportation Research Part A: Policy and Practice, 2018.
2. R. McCall, F. McGee, A. Mirnig, A. Mescgtcgerjakiv, N. Louveton, T. Engel and M. Tscheligi. "**A Taxonomy of Autonomous Vehicle Handover Situations**". Transportation Research Part A. Policy and Practice, 2018.
3. N. Louveton, R. McCall, V. Koenig, T. Avanesov and T. Engel, "**Driving while using a Smartphone-based mobility application: Evaluating the Impact of three multi-choice user interfaces on visual-manual distraction**". Journal of Applied Ergonomics, 2016.
4. L. Codeca, R. Frank, S. Faye, and T. Engel, "**Luxembourg SUMO Traffic (LuST) Scenario: Traffic Demand Evaluation**". IEEE Intelligent Transportation Systems Magazine, 2016.
5. C. Lallemand, G. Gronier and V. Koenig, "**User experience: A concept without consensus? Exploring practitioners' perspectives through an international survey**". Computers in Human Behavior, 2015.

Projects

Project Name	Participant contributions	Project goal
COMOSEF (based on WiSafeCar and CarLink projects)	Through these projects we have contributed to the evaluation of distributed communication technologies between vehicles.	*Cooperative Mobility Services of the Future (Eureka funding).* Objective: define advanced co-operative mobility use cases, based on user requirements, and produce targeted services to increase traffic safety, traffic fluency and to decrease the amount of accidents and incidents.
MobiTraff	We have developed and implemented simulation scenarios, including multi-agent (e.g. MatSim) and traditional road traffic simulations (e.g. SUMO). In addition, the goal was to show by simulation the differences between and the advantages of V2V and V2I.	*Cooperative Way to Mobility and Traffic Efficiency (FNR funding).* Objective: improve the quality of public transport services by minimising traveling time, harmonising headways and providing passengers with dynamic public transport guidance.
ZAC-eMovin	Development of a national e-mobility strategy showing the attractiveness and benefits of e-car use. Development of mobility apps.	*Electromobility solutions dedicated to industrial activity zones (ZAC)* Objective: propose innovative solutions to work-related commutes by trialing and studying e-car sharing in three industrial activity zones around Luxembourg City.
MADSAV	The development of a home-based simulator testing platform and conducting tests.	*How do people maintain driving skills as they drive less and less?* Objective: how to make people maintain their driving skills in the event of handover

		situations, when they are driving less frequently.
Nordstad-eMovin	We have provided support to Nordstad during the installation of the customised infrastructure as well as provided IT services for charging stations.	*Electromobility solutions targeting the Nordstad region* Objective: provide a practical demonstration of the viability of e-mobility and benefit both citizens and local commerce.

Human Resources involved in the project

Dr Guillaume GRONIER (male) has realised a PhD in ergonomic psychology on Computer Supported Cooperative Work (CSCW). He studied the collective work of project teams during product design. Currently Researcher at the Luxembourg Institute of Science and Technology (LIST) since 2007, he works on issues related to cognitive ergonomics, collaborative work, Human-Computer Interaction (HCI), with a particular focus on Human-Centred Design and User Experience (UX). He is the author of more than 60 publications in national / international conferences (with proceedings) or journals. He has co-written a book on UX Design methods, published in Eyrolles Editions in 2016. As part of his activities at the LIST, Guillaume was principal investigator of the FNR-CORE funded research project GENIUS and has been involved in several competitive funding projects. Member of the User Experience Professionals' Association (UxPA), it is one of the founders and president of France-Luxembourg UxPA Chapter (FLUPA). Active researcher in the design of HCI, his research encompasses the perception of waiting time in the Graphical User Interfaces (GUI) and user experience.

Dr. Sébastien FAYE (male) is Research and Technology Associate at Luxembourg Institute of Science and Technology (LIST, ITIS department) and works on projects related to Smart Cities (Mobility and C-ITS related thematic areas). Sébastien became interested in telecommunication networks as a graduate student at the University of Picardie Jules Verne in 2009 (Amiens, France). Specifically, during his MS thesis, he carried out a number of studies on wireless sensor networks and the security mechanisms they offer. Between 2009 and 2014, Sébastien was a web entrepreneur and created several web services and two startups. From 2011, as a PhD candidate at Telecom ParisTech (Paris, France), he focused on distributed systems applied to intelligent transportation systems. His studies were focused on how sensors equipped with magnetometers and short-range wireless radio interfaces can be deployed along the road network so as to detect the passage of vehicles and exchange traffic count information, investigating their deployment and performance in the area of traffic light management. Between 2014 and 2017, he was a Research Associate at SnT/University of Luxembourg and responsible for the VehicularLab team. He has been involved in several national and European initiatives related to sensing systems, vehicular communications and multimodal mobility.

Francesco FERRERO (male) is the Lead Partnership Officer for Mobility, Logistics and Smart Cities with the IT for Innovative Services Department of LIST where he is in charge of developing new projects and partnerships in the field. Previously, Francesco was the Head of the Smart City Strategic Program with Istituto Superiore Mario Boella, Torino, where he led a multidisciplinary team of researchers conducting applied research in the field of economically, environmentally, and socially sustainable cities. He has been involved in several research projects related to smart and sustainable cities and he edited a handbook of research on the matter (http://bit.ly/1DGZAPt). Notably, he has been the Project Coordinator of the CIVITAS SUCCESS Horizon 2020 project (http://success-urbanlogistics.eu) on how to improve the mobility and logistic flows associated to construction works. Francesco is a member of Luxembourg's Working Group on Smart Mobility (WGSM), founded after a decision by the national government in May 2016 to recognize smart mobility as an economic opportunity for Luxembourg and to set up the required structures to unlock its potential, and of the stakeholders forum of the Franco-German-Luxembourgish cooperation on Automated and Connected Driving and he is doing a PhD at the University of Luxembourg on Data-driven Multimodal Mobility for Future Smart-Cities.

Dr. Alexandre BAUDET (male) has done a PhD in Work Psychology. He studied the psychometric validity and rater reaction (satisfaction, procedural justice) related to self and supervisor competency assessment. Currently Researcher at the Luxembourg Institute of Science and Technology (LIST) since 2006, he works on issues related to competency management, with a focus on Computer Based Competency Assessment. He is the author of several publications in national / international conferences (with proceedings) or journals and co-author of an active US patent application for a method of increase competency assessment accuracy. As part of his activities at the LIST, Alexandre has been involved in several competitive funding projects (Erasmus+, FP7, Interreg III, etc.).

Dr. Rod MCCALL (male) is Lead Researcher within the Environmental Research and Innovation Department. He is the technical coordinator of the H2020 TARGET and co-ordinator of the H2020 STEP-IN project. He is also the local PI for the H2020 SAYSO and TERRIFFIC projects. Since 2000 he has worked in the field of augmented and virtual reality, in addition since 2010 he has been working in topics related to driving with two FNR Grants in the automotive area as Vice-PI or co-PI (IGEAR and MADSAV). He has been a regular member of the Automotive UI Conference programme committee and has organised several workshops on automotive topics at various conferences. He is an associate editor of Interacting With Computers (Oxford University Press) and is the Vice-Chair of the IFIP Working Group on Social and Ethical Issues in Entertainment Computing. He previously held a post at Fraunhofer FIT where he was the coordinator of the EU IST IPCity project and PI of the MARCUS and MIRACLE projects. While at the University of Luxembourg he founded the IGNITE (Interaction, Games and Novel Interface Technology) team which was part of the SECAN-LAB Research Group.

Infrastructure and technical equipment

- LIST has a service-oriented HPC. It is composed of a machine cognition pillar, allowing to solve big data oriented problems using Machine Learning, Cluster Analysis etc., and of a visualisation part, which allows to answer graphical calculation problems.
- Cognitive Environment Lab to observe user engaging with the home study simulator (or other project simulators) to derive cognitive and competence models

4.1.2. Automobile Club d'Italia (ACI)

Description of the organisation and its products/services

The Automobile Club d'Italia (ACI) is a public non-profit body and a federation of over 100 Automobile Clubs and other bodies and associations, all operating in the fields of mobility, environment, tourism and sport.

With about 1 million members, ACI has the statutory mandate of representing and protecting the interests of Italian motorists and the right to mobility for all road users and is committed to promoting road safety ever since its foundation in 1905. ACI is a founding member of the FIA - Fédération Internationale de l'Automobile - and of TTS Italia, the Italian association of ITS private and public stakeholders, a member of EuroNCAP and of the European Transport Safety Council (ETSC) and cooperates with the Italian National Institute of Statistics within the National Statistical Programme taking care of the surveys on road accidents. Moreover, ACI has been entrusted by the State to supply public services since 1927.

Among the activities carried out by ACI - many of them in cooperation with other public bodies as well as private enterprises, those regarding the different facets of mobility stand out as especially relevant to spreading a new culture in line with the principles of safe mobility, environment protection, sustainable development and the correct management of land use. More specifically, ACI:

- provides roadside - technical and medical assistance, drivers training and road safety education, multimedia and multichannel road traffic information and touring assistance services;
- studies all issues relating to the development and management of the mobility of people and goods;
- carries out analyses on traffic- and accident-related issues, road and motor vehicle safety, the environment and energy, offers advice and formulates proposals to national and local governments.

To better achieve its goals, ACI has a network of sister companies operating in specific field of activity according to ACI's directives and assignments, i.e. ACI Global (roadside, technical and medical assistance); ACI Infomobility (multimedia and multichannel road traffic information), ACI Informatica (IT), Fondazione Filippo Caracciolo (study centre) and Sara Assicurazioni (insurance company). Both Fondazione Filippo Caracciolo and Sara Assicurazioni have a specific interest in PAsCAL's activities and results, they will therefore actively cooperate in the project, sharing their knowledge and expertise.

Role and relevance in the project

- ACI will contribute to activities related to public acceptance of CAV thanks to its direct relation with road users: from members (drivers) to learner drivers (driving schools) to policyholders.
- ACI's main effort will be in the area of driver training and road safety education. Ready2Go is the nation-wide ACI driving school network that aims at training drivers with a strong culture of safety and risk prevention, an increased awareness of unsafe behaviours, (e.g. driving under the influence of alcohol and drugs) and a better knowledge as to how to manage dangerous situations. The ACI Ready2Go method completes the traditional training based on the ministerial provisions with 10 theory/practice complementary modules aimed at making drivers more aware of risks, teaching them how to prevent and deal with them. The modules are specifically dedicated to safe driving, defensive driving and ecological driving. Moreover a half-day practice module takes place in dedicated, protected areas where it is possible to practice specific driving techniques and verify the reaction of the vehicle in particular, dangerous situations. In addition, a dedicated app is available to prepare the driving theory test while a simulator enables trainees to practice driving without risks. All the Ready2Go Instructors are trained at the ACI-Sara Safe Driving Centres in Vallelunga (near Rome) and Lainate (near Milan).
- Through its Legislative Office and Mobility and Road Education Office, ACI will also contribute to developing policy recommendations and guidelines. The Legislative Office's main tasks are: studying and conducting in depth analysis of all legal and administrative issues related to ACI's mission; following the parliamentary works and, in general, the national and European

legislative process, and drafting legislative proposals to be submitted to Government and Parliament. The Mobility and Road Education Office is involved in activities related to Mobility and Legal analysis also within the FIA. It also publishes the on-line Legal Magazine on Mobility and Traffic. Finally, a thematic technical table on the evolution of technological systems to support the driving was recently established at ACI, which also includes among its participants the Italian Ministry of Transport and the Ministry for Economic Development.

- Finally, ACI will be responsible for coordinating Dissemination activities, taking advantage of its long experience in communication campaigns and organisation of events as well as of an array of communication tools, from Press Office to on-line publications.

Human resources involved in the project

Vincenzo Leanza (male) Director of Road Education, Mobility and Tourism Department. Mr Leanza holds a Degree in Law at the University of Rome "La Sapienza". In ACI he is responsible for coordinating all projects and activities in institutional matters, mobility, road safety and road safety education, Traffic and Travel Information Services and Tourism. He is also responsible for the organization and coordination of and participation to events, conferences, exhibitions and workshops promoted by ACI or other organizations both at national and international level. Mr Leanza is a member and/or representative of ACI in numerous Committees and working groups dedicated to Road Safety and Road Education set up in ACI or from the Italian Ministry of Transport and Ministry of Education.

Lucia Vecere (female) Head of the Mobility and Road Safety Office. Mrs Vecere has a Degree in Law and Administrative Science at the University of Rome "La Sapienza", Working in ACI since 1991, she has extensive experience in ICT and marketing activities. She is presently responsible for ACI's road education activities and coordinator for Ready2Go, Director of the on-line Legal Review on Traffic. She is also ACI's representative within FIA's Mobility and Accessibility Commission and Legal and Consumer WG, and member in the WGs on Road safety and Security of the Italian Ministry of Transport and on Road Safety Educational Programme for Young People of the Ministry of Education and Research. Project leader in various projects dedicated to "vulnerable users" and speaker at numerous Conferences and workshops.

Elvira Mencarelli (female) Head of the Legislative Office. Mrs Mencarelli holds a University Degree in Law and one in Political Sciences. Working in ACI since 1991, among other activities, she was also project manager for the creation of the legal and regulatory data base on Vehicles Registration and Taxes and responsible for the "Research and analysis on users needs within the Public Relations Office.

Paolo Benevolo (male) Director of ACI's Onda Verde bimonthly on-line magazine and Editor-in-Chief at ACI's Press Office. Holding a University Degree in Philosophy and professional journalist since 1996, his career developed at University, in RAI (Italian national public TV) as programmer director and later in ACI, Mr Benevolo has extensive experience and skills in a range of sectors: coordination and preparation of studies, implementation of strategic and research projects, management and organization, communication (journalism, press offices, conferences, social media, television…) mobility and transport and vulnerable users issues. Author of numerous documentaries and programs, speaker and moderator in various conferences, events and public meetings.

Publications:

On-line magazines:

- **L'Automobile** (target: users, consumes, ACI's members)
- **Onda Verde** (target: Public Authorities, mobility stakeholders)
- **Legal Review on Mobility and Traffic** (target: law experts, lawyers, judiciary)

Conferences:

- Conference on Traffic (yearly)
- Presentation of Statistical Data on Road Accidents (yearly, in cooperation with ISTAT)

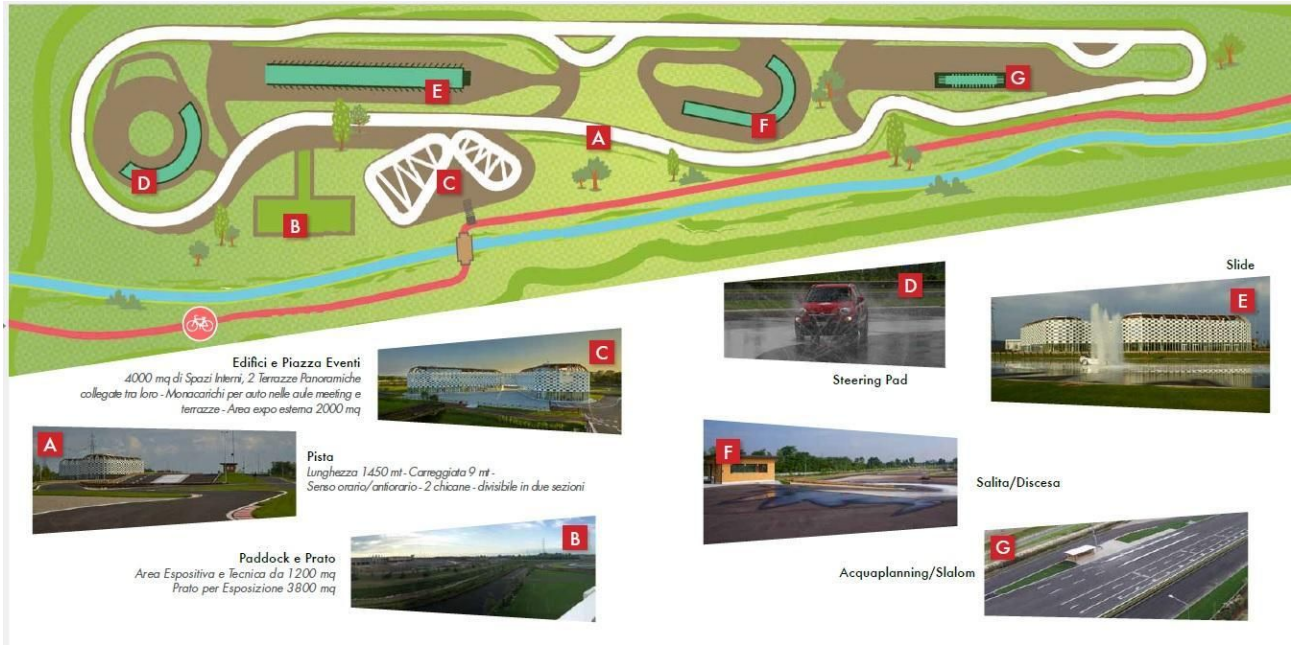
Projects

Project name	Participant contribution	Project Goal
HeERO	Italian Pilot, participation to development activities, development and test of bCall, dissemination	eCall development (EU FP7 funding)
I_HeERO	Italian pilot, Data Integration (MSD extension),dissemination	eCall deployment (EU CEF funding)
ITS Observatory	Analysis of legal requirements and issues, population of the platform, liaison activities, dissemination	Set up and development of an open repository for ITS solutions and products
FIA Actions for Road Safety	Dissemination and aware raising campaigns in coordination with FIA and othe EU Automobile Clubs	FI's activities to achieve the UN Global Plan for the Decade of Actions for Road Safety 2011-2020
FIA Smart Cities Global Startup Contest	Activities in Italy	Identify, support and invest in the world's most innovative and impactful technology companies in the smart cities ecosystem

Infrastructure and technical equipment

The ACI-Sara Safe Driving Centres in Vallelunga and Lainate are meant for already licensed drivers and feature advanced technology for safe driving training with all types of vehicles (cars, motorcycles, scooters, industrial vehicles, campers, vans and buses) under maximum safety conditions. Participants learn to control their reactions, to anticipate the behaviour of the vehicle and to choose the best manoeuvre to avoid an accident.

The facilities include five areas featuring cutting-edge technologies, such as low grip resins applied to the tarmac surface, water walls and other devices to simulate obstacles, low visibility and unexpected skidding. This way, it is possible to simulate such dangerous driving situations as aquaplaning, reduced grip, understeer and oversteer. The Centres have a potential of over 30,000 courses / year aimed at all drivers, with particular attention to newly-licensed and professional drivers. Trainees can take the courses using either their own vehicle or the vehicles made available by the Safe Driving Centers. Any kind of customization of the course is possible depending on the trainee needs. ACI-SARA Safe Driving Centers also organize travelling events and courses at racetracks, public outdoor locations or private areas using specific technologies, such as low-grip carpets, skid and anti-fall systems for motorcycles.



An example of the training infrastructure that will be used in PAsCAL (ACI).

Ready2Go is operated by ACI through its sister company ACI Informatica. This company is entrusted by ACI with the development and maintenance of all its IT activities and ICT infrastructures - e.g. the IT systems of the Italian Public Register of Motor Vehicles, run by ACI on behalf of the State; the IT system for collection and management of car taxes on behalf of the Italian Regions having an agreement with ACI; the websites of the whole ACI Federation -, as well as with IT activities committed to ACI by other entities of the Italian Public Administration, e.g. the website “viaggiaresicuri” for the Ministry of Foreign Affairs.

In the context of ICT infrastructures, ACI Informatica offers a full range of solutions - from the complete management of IT systems and services, to the hosting in their Data Center of dedicated / shared / customer-owned systems - providing services based on high-level technology, specialized know-how, quality certified procedures and the most innovative virtualization technologies, along with flexible, modular and highly reliable (cloud computing) architectures.

Here below a list of the services performed by ACI Informatica on behalf of ACI:

- Customized software maintenance and application management
- Data center and ICT central and local systems management
- Professional counseling on ICT planning and decision making (based on ongoing assessment of new technologies)
- Help Desk for central and local IT systems users
- Services for local points of sale (loyalty programs / research of partners / sales analysis)
- Software development (Major Release) and development of new applications

4.1.3. LuxMobility (LuxMobility)

Description of the organisation and its products/services

LuxMobility is a privately-owned transport consultancy based in Luxembourg www.luxmobility.eu. The permanent staff of LuxMobility consists of 7 senior consultants that have a vast experience in the field of Mobility, Traffic and Transport as well as in Education and Training in these areas.

Providing very different specialised transport and mobility consultancy services, LuxMobility works always from its Sustainable Mobility and Transport policy point of view. LuxMobility especially aims to play a major role in providing solutions for the growing mobility problems in cities worldwide. In a way, LuxMobility operates as a logical connector between mobility questions and solutions.

LuxMobility is producing knowledge, solutions and consultancy for mobility challenges in the wider urban environment. LuxMobility specializes in the following themes:

- Mobility and mobility management, including human behavior.
- Public Transport.
- ITS and traffic management.
- Traffic planning.
- Traffic safety.
- Traffic modelling, including traffic simulation (Macro and micro modelling).
- Cycling.
- Policy studies.

LuxMobility operates as a network organization. The abovementioned core staff of the company is extended with several dedicated Associated Consultants.

Role and relevance in the project

Luxmobility's role will be threefold:

- LuxMobility will assist the project coordinator with the day-to-day management of the PasCal project. Having over 20 years of European R&D experience within the organisation will allow the project to be implemented in line with the set research objectives, reactive management toward any challenges and risk the project might encounter as well to ensure that PasCal produces high quality results in line with the EU research guidelines.
- LuxMobility will lead the Ethics and Data work package (WP2). We will ensure compliance to ethical and latest data protection standards. Involving different CAV user groups in its research LuxMobility will make sure that the consortium applies the necessary informed consent procedures and that data storage policies are followed across the relevant partners.
- LuxMobility will lead the policy and guidelines work package. Based on earlier experiences (e.g. FP7 NODES Toolbox), LuxMobility will help the consortium to translate the project findings into practical guidelines, useable research findings. This will allow the consortium to provide an improved understanding of the "CAV, public acceptance, awareness and requirements" topic to all stakeholders.

Five most relevant publications

Journals:

1. Wright S., Cellina F., Bulgheronic M., Cartolano F., Lucietti L., van Egmond P., van Wijngaarden L., **Public acceptance of SocialCar, a new mobility platform integrating public transport and**

car-pooling services: Insights from a survey in five European cities, Proceedings of 7th Transport Research Arena TRA 2018, April 16-19, 2018, Vienna, Austria.

2. Kracheel M., van Egmond, P., Tavernier, G., **Positive Drive, tracking campaign to uncover human mobility behavior in an urban business district;** Proceedings of 7th Transport Research Arena TRA 2018, April 16-19, 2018, Vienna, Austria.
3. Sprumont, F., Astegiano, P., & Viti, F. (2017). **Analyzing the Relation Between Commuting Satisfaction and Residential Choices Using Discrete Choice Theory and Structural Equation Modeling** Transportation Research Board Conference. Washington DC (No. 17-01337).
4. van Egmond, P, Hoogendoorn, Caroline, UITP, van der Hoeven, F, TU Delft, **NODES Toolbox, new policies, guidelines and tools urban transport interchange facilities**, Proceedings of 5th Transport Research Arena TRA 2014, April 14-17, 2014, Paris, France.
5. Sprumont, F., Viti, F., Caruso, G., & König, A. (2014). **Workplace relocation and mobility changes in a transnational metropolitan area: The case of the University of Luxembourg**. Transportation Research Procedia, 4, 286-299

Projects

Project Name	Participant contributions	Project goal
FP7 NODES	Coordination of the work package that builded the Nodes toolbox, developed policy guidelines and tools	The project developed a Toolbox to assess, benchmark and improve transport interchanges enabling good intermodal solutions. NODES built a Toolbox filled with guidelines, policy recommendations, and research findings to allow practitioners and other stakeholder to assess, benchmark and improve their own transport interchanges networks
H2020 SocialCar	Organised five SocialCar site-based simulated experiments using traffic macro-simulation models in selected Social car cities equipped with appropriate simulation models as well as a car-pooling system in operation. This fed our macro-simulation models in with multimodal transport data, time traffic data as well as car-pooling data to evaluate the impact of using SocialCar intermodal solutions on user behaviour over time.	SOCIAL CAR aimed at the development of innovative software and service making urban mobility smarter. The project assimilated carpooling into existing MaaS systems by means of powerful route planning algorithms and integration of big data from public transport, carpooling and crowdsourcing. The mission is to design, develop, test and roll out a service that simplifies the travel experience of users in urban and peri-urban areas. SocialCar was tested in 10 European cities. (2015-2018)
H2020 HIREACH	LuxMobility is especially responsibles for the inclusion of the user perspectives and ethics.	HIREACH aims to "*Improve accessibility, inclusive mobility and equity" in transport and builds new tools and business models for public transport in prioritised areas'*. HiReach investigates the needs from different vulnerable user groups to favour inclusive and participative mobility rather than

		exclusive/special and geographically-limited mobility. The vulnerable user groups within HiReach include: • People with temporarily or permanent reduced mobility • Children and young people • Elderly people • Women • Migrants and ethnic minorities • Low income and unemployed • People living in rural and deprived areas HiReach explores viable business models for small scale, modular and easily replicable mobility services that can be provided at affordable prices and/or with minimum subsidies.
H2020 TRACE	LuxMobility was the Evaluation work package leader, as well as responsible for the testing of the trace tracking solutions in Luxembourg.	The project assessed the potential of User movement tracking services to better plan and develop cities. Issues such as data privacy, cost, interoperability, financial/tax incentives, infrastructure planning and service concepts were addressed. Dedicated TRACE tools to promote behavior change and support mobility planning were tested in eight pilot sites and evaluated in terms of impacts, success factors and benefits, while preparing for their full commercial exploitation; (2015-2018)
IEE ENERQI	As project coordinator LuxMobility took care that the project was correctly implemented with the highest level of quality, as well it had responsibility over the implementation and evaluation in one of the selected ENERQI cities.	The project aimed at the monitoring of transport user satisfaction and quality improvement through the use of a real time user observer approach. The project developed and tested in 7 European cities an online User quality management tool that registers, assess and allows management of transport improvements on the basis of real-time user observations (2010-2013)

Human Resources involved in the project

Patrick van Egmond (Graduated in Economics – Business and Transport economics, Msc Economics) is an expert in Urban Mobility and Public transport issues. Among other Patrick coordinated the ENERQI that aimed at the implementation of user quality monitoring in transport, using dedicated travel survey software, and client panels. User quality monitoring schemes were set up in Lisbon (Carris, Transdev), Lancashire

(Transdev) Toulouse (France), Province of North Brabant (Veolia, Arriva), Athens, Alba Lulia (Roemenia), and Plovdiv (Bulgaria).

Through the FP7 project NODES (Design of public transport interchanges) he cooperates among other with the UITP (International Union of Public transport) and the Netherlands Railways (NS) to develop a Toolbox filled with policy guidelines, research tools and business models, including new ways to improve intermodal travel and advancing user experience. He is involved in the H2020 SocialCar project responsible for the testing and evaluation the wider impacts of combined public transport and carpooling. SocialCar is an innovative software and service making urban mobility smarter. The project seeks to assimilate carpooling into existing MaaS systems by means of powerful route planning algorithms and integration of big data from public transport, carpooling and crowdsourcing. Since 2004 he is involved in the CIVITAS initiative, presently working within the H2020 CIVITAS Destination project.

Dr. Martin Kracheel works on the intersection of Mobility and ICT in academia and industry. With his background in social sciences and his familiarity for interdisciplinary contexts he strives for novel solutions in the Smart Mobility sector.

Martin worked in his multidisciplinary PhD on a European research project that used ICT to change mobility behaviors of users. He was responsible for the conceptualization, the development and the implementation of smart mobility applications in Luxembourg, where he built his network by identifying, contacting and coordinating relevant project partners. In addition, Martin was an active contributor to H2020 project proposals in the areas of Human Computer Interaction, Mobility and Traffic Management.

Having worked in different areas such as concurrent engineering, mobile traffic management and persuasive gaming, helps him to understand complex problems and think about them in a solution-oriented way.

Dr. François Sprumont is a consultant at LuxMobility since 2017, has gained professional experience in different environments such as academia and public administration. During his doctorate, François analyzed the effect of relocation in the workplace on the travel habits of the workers concerned. As a result, François has become an expert in modal choice behavior of user analysis from the point of view of understanding this complex process as well as modeling it. His solid theoretical knowledge, practical experience and daily mobility have allowed François to be a key expert in urban mobility and user behaviour.

Stephanie Kessler is responsible for the evaluation with the H2020 TRACE project in which she assesses the potential of ICT to enhance their attractiveness and potential impact. Issues such as data privacy, cost, interoperability, financial/tax incentives, infrastructure planning and service concepts are addressed

4.1.4. RDS Driving Services Ltd (RDS Driving)

Description of the organisation and its products/services

RDS Driving Services Ltd trading as RED Driving School RED currently has in excess of 1,400 driving instructors operating across United Kingdom. Learner drivers follow a carefully designed program, which is intended to not just help them pass the UK driving test, but also become safe drivers for life. It is estimated that well in excess of 80,000 people learn with RED every year. In addition, RED is the largest training school for driving instructors in the UK and is registered under the UK government ORDIT program. The company has over 100 trainers across the UK who are engaged with teaching new instructors.

RED is headquartered in Billingham, Teesside, where RED's operations, sales force and human resources functions are based. It also has a number of field-based staff around the UK. RED has won several awards including the 2018 First Car National Driving School of the Year. It has an unrivalled commitment to quality and is the leading brand in the UK for driving lessons and instructor training.

As the leading driving trainer business, it works closely with UK government training bodies including the DVSA (Driver and Vehicle Standards Agency) and key UK trade associations. RED is consulted on all major DVSA initiatives affecting learner and instructor training, and provides valuable input which helps frame the UK driver training agenda.

RED is also engaged in the corporate fleet training market and provides safety assessments and advanced driving training to businesses across the UK. In-car sessions can be supported by sophisticated online training and enables employers to ensure that not only are their drivers safe but also that the company is complying with UK Health and Safety law.

Role and relevance in the project

RED's role in the project can be summarized below

- Provide training expertise and resource for WP5, Capacity Building and Education. Work alongside ACI to develop a training program using the Home Study simulator for use in pilot studies
- Provide resource to WP6, Pilot studies, and help assess results and provide analysis of driver reaction and behaviour for WP7 and WP8
-

Human Resources involved in the project

Ian Mcintosh (male) is the CEO of RED. He joined the business in 2012, prior to joining RED he worked for a number of large corporates including MARS, Northern Food and AAK. Ian has a MSc in Mechanical Engineering and an MBA is general business management.

David Powell (male) is Business Information Director at RED. He joined in 2011, his role includes the operational management of the RED Training team as well as data analysis and reporting. He has experience of project management, including system and process implementation. He has 15 years in the UK driver training industry. He is a qualified Chartered Accountant, trained at KMPG, and has a degree in Economics.

Jane Taylor (female) is Head of the RED Training Department, a registered ADI and accredited Fleet trainer and assessor. Jane joined RED in 2002 following a number of years in the industry as a driving instructor and trainer. Jane is highly respected within the industry and has many close contacts in the DVSA and in many trade associations.

Infrastructure and technical equipment

RED is administered from its main location in Billingham in the north of England.

Learner and instructor diaries are hosted on its bespoke operating system, which is available 24/7. Information about learner and training products is available through its website www.reddrivingschool.com

4.1.5. S3Innovation (ETELÄTÄR)

Description of the organisation and its products/services

S3Innovation (www.s3innovation.com) specialises in developing Mobility 3.0 innovations, especially those kick-starting the circular economy through sharing and collaborative solutions. With headquarters in Tallinn (Estonia) and offices in London (United Kingdom) and Brussels (Belgium), the firm regroups a team of highly experienced innovators with an extensive international network.

By connecting smartphones with IoT proximity technologies and open data, the company offers a portfolio of crowd-sourced mobility innovations to accurately guide users in meeting peers or sharing bikes, cars, and parking spots. We interconnect a wide range of devices (including smartphones, beacons, and RFiD) by deploying networks based on GPS positioning, 3G/4G services, and new protocols over non-licensed frequencies (LoRaWAN, BLE Trackers SubGiga networks, etc.), following a low-cost, low-energy philosophy.

Current Mobility 3.0 deployments include:

- Secured e-Bike Sharing Networks: Rome (IT), Bari (IT), Málaga (ES).
- Crowd-sourced On-street Parking Exchange Platforms: Brussels (BE), Madrid (ES).
- Smart Route Optimisation for Emergency & Special Vehicles: Madrid (ES), Frankfurt-Oder (DE).
- Real-Time Guides to Step-Free Accessible Mobility: Madrid (ES).
- Crowd-sourced Networks for Parcel Delivery: Brussels (BE), Antwerp (BE).

These deployments, alongside numerous other research activities, have strengthened the company's position at the forefront of the design and implementation of innovative and unconventional mobility systems for the Smart Cities of the Future. In them we have tested, implemented and monitored exploitation & market acceleration strategies, public attitudes & acceptance of innovative mobility solutions, mobility demand analysis, and business models.

Role and relevance in the project

- ETELÄTÄR will be responsible for developing pilot plans, pilot test plans and evaluation plans to ensure that all tasks are completed and run successfully. In addition, ETELÄTÄR will coordinate pilot tests activities, such as engaging involved partners at a regular base to discuss issues related to the pilot sites. Furthermore, ETELÄTÄR will setup and execute on-street pilots. These will have detailed design and implementation plans based on generalized pilot framework defined in the specifications. Both reviewed and stated data will be collected and analysed at an individual level and the output will be evaluated and used for the impact assessment and guidelines for relevant stakeholders.
- ETELÄTÄR will participate in activities related to public acceptance, mobility behaviours, assessment of potential impact, data management, and definition of business models. Research activities will include conducting surveys through different distribution channels, and quantitative and qualitative data analysis based on past experiences. ETELÄTÄR will also undertake dissemination and exploitation activities.

Five most relevant publications

Journals:

1. A.Alessandrini, R. Alfonsi, P. Delle Site, D. Stam, **"Users' Preferences towards Automated Road Public Transport: Results from European Surveys"**, Transportation Research Procedia, 2014.
2. J. Papí, **"Crowdsourcing the Physical Internet in your neighbourhood"**, THINKING HIGHWAYS, Issue 1 2018, H3B Media, UK.
3. J. Papí, **"Road tech: Addressing the challenges of traffic growth"**, THE ECONOMIST INTELLIGENCE UNIT, September 2017, The Economist, UK
4. J. Papí, **"Step-free mobility: a problem worth solving"**, THINKING HIGHWAYS, Issue 2 2016, H3B Media, UK.
5. J. Papí, **"Crowd-sourced mobility: Changing mobility paradigms"**, THINKING HIGHWAYS, Issue 1 2016, H3B Media, UK.

Conferences:

1. A. Alessandrini, R. Alfonsi, P. Delle Site, V. Gatta, E**.** Marcucci**, "Economic assessment of driverless buses for urban application: a case study from the European project Citymobil2"**, XVIII Conference of SIET (Italian Society of Transport Economists), 2016.
2. A. Winder, A. Maj, K. Torp, E. Portouli, Y. Li, **"Perceptions of using electric light vehicles in cities: Survey results from six cities in the ELVITEN project"**, 25th ITS World Congress, Copenhagen, 17-21 September 2018.
3. J. Papí, **"upark!: Towards Crowd-parking / Apertum: A Real-Time Guide to Step- Free Mobility / Dynahubs: Crowd-sourced Door-to-Door Freight Delivery"**, Thematic Session 3, 2016 STA Technical Roundtable, Brussels, 25 October 2016.

Projects

Project Name	**Participant contributions**	**Project goal**
Apertum	i) Leads a technical, mobility and commercial team developing a multi-user platform (Full Stack Development). ii) Defines and implements strategies for the Acceleration & Market Uptake of the solution. ii) Currently deployed in the 8th largest public transport network in the world (Madrid, Spain).	*A real-time guide to step-free mobility* (EU's FP7 funding). Objective: offering real-time accessible public transport routing to vulnerable and non-conventional transport users.
ELVITEN	Leading a 'EL-V real usage and acceptance' WP, we have conducted surveys for mobility demand analysis and public perceptions and attitudes towards using EL-Vs. We have also contributed to ICT integration into a connected platform and KPI definition related to acceptance, environment etc. We are conducting studies into EL-V usage and acceptance, as well as creating business models and exploitation strategies. Moreover, we are deploying our e-Bike sharing system (including e-Bikes and e-Hubs for parking) in Rome (Italy) Bari (Italy) and Málaga (Spain).	*ELVITEN - Electrified L-category Vehicles Integrated into Transport and Electricity Networks* (EU's H2020 funding) Objective: proposing replicable usage schemes to boost the usage of all categories of EL-Vs. Demonstrating these EL-Vs in 6 European Cities with a connected platform.

SMEV	i) We provide a testing environment for both the frontend and backend of the platform. ii) Beta-tested in Frankfurt-Oder (Germany) and Madrid (Spain). iii) We define and implement strategies for the Acceleration & Market Uptake of the solution.	*Digital Optimisation of Traffic Conditions for Special Vehicles* (Private funding: SMEV AG, Germany) Objective: stimulating market uptake for mobility innovations.
upark!	i) Leads a technical, mobility and commercial team developing and deploying a multi-user platform (Full Stack Development). ii) Defines and implements strategies for the Acceleration & Market Uptake of the solution. ii) Beta-tested in Brussels (Belgium) and Madrid (Spain).	*Make Space. Make it Happen* (EU's FP7 funding) An app that connects drivers to on-street parking spots in order to make accessing a parking space more efficient.
DynaHUBs	i) We provide a testing environment for both the frontend and backend of the app. ii) Beta-tested in Brussels and Antwerp (Belgium) with more than 200 testers involved and 2,000+ exchanges completed. iii) We are defining strategies for the Acceleration & Market Uptake of the solution.	*Crowd-sourcing the Physical Internet in your Neighbourhood* (H2020 funding) Objective: providing a new way of connecting routes and increasing capacity for door-to-door cargo and freight logistics in a connected environment.
frontier Cities2	We are responsible for the coaching, market uptake and external investment of the solutions funded by frontierCities2.	*fC2: Another Level of Impact* (H2020 funding) Objective: fostering the deployment of Smart City FIWARE-powered solutions in European cities

Human Resources involved in the project

Mr. José F. Papí (male) holds 22+ years of general professional experience in transport and mobility, across Europe and beyond. A serial entrepreneur, José works as Founder & CEO at S3Innovation. He further serves as Chairman of the Smart Transportation Alliance, STA (www.smart-transportation.org), a global collaborative platform for transport infrastructure innovation across all modes and the Smart City.

In the past he worked for the Directorate-General for Transport of the European Commission, for the CIDAUT Foundation (Spain's leading technology centre for R&D in Transport & Energy) and for the European Road Federation (ERF), where he held the positions of Head of Office for 4 years, and Secretary General for 6 years. From November 2009 to December 2013 he has served as Director General of the Spanish Road Technology Platform (a body under the supervision of the Spanish Ministry for Economy & Competitiveness). In addition he has conducted an extensive consulting activity in Eastern Europe and Northern Africa for both the European Commission and the World Bank.

He has participated in 29 EU-funded R&D projects, having acted as Director in 11 of them. During their implementation he has led FOTs and acceleration strategies for numerous mobility innovations. He holds two Master's Degrees (Economic & Business Sciences, Law) from Universidad Pontificia de Comillas–ICADE (Spain) and a Master in International Business from ESIC Business School (Spain). He is the 1st European having completed the TLGC Certificate jointly organised by 12 U.S. Universities, where he has specialised in Quantitative Methods for Transportation, Transportation Security, Public Transportation and

Transportation Planning & Environmental Compliance. In addition, he is currently finalising (4th year) his PhD in Civil Engineering.

He writes and speaks three languages (English, French and Spanish).

Dr. Ying Li (female) is the Chief Innovation Officer at S3Innovation and is currently working on ELVITEN, a Smart Cities-related H2020 project, in which the company is the leader of a work package as well as several tasks. She has played a leading role in tasks involving mobility demand, analysis of the attitudes towards electric light vehicle use, exploitation strategy, and innovation management.

After graduating with a degree in mechanical engineering, Dr. Li played a leading role in several mechanics-based projects at the Institute of Agricultural Mechanization in China. She then branched into computer science, achieving a Master's degree from the University of Leeds. Funded by EPSRC, she continued her PhD at Leeds, researching into virtual reality techniques and scientific data visualisation. During this, she developed real-time 3D deformable modelling techniques, built a simulator for web-based training of neurosurgical procedures, and performed testing and evaluation of the simulation. Dr. Li has worked on several EU/UK funded projects in the field of scientific data visualisation as a research fellow in the University of Luton, De Montford University and the University of Leeds.

She writes and speaks English and Chinese.

Dr. Raffaele Alfonsi (male) is Chief Technical Officer at S3Innovation. Ph.D in Transportation and Infrastructures, he further holds a Master's Degree in Political Science with specialization in Economics, in addition to a Master (2nd Level) in Antitrust and Market Regulation with specialization in Transportation.

He holds 10+ years of international professional experience in Transport Planning and Road Safety at international level, in particular in the fields of Economic and financial Feasibility Studies (mainly Cost Benefit Analysis), Plans and Policies in public and private transport; Demand analysis and calibration of econometric models supporting traffic flow simulations; Transport services demand estimation; Socio economic, statistical and sectorial analysis for the definition of Transport Strategic Plans; Road safety analysis and countermeasures assessment.He holds a high degree of competence in quantitative and qualitative methods of analysis (e.g, statistical analysis, econometric discrete choice models, experimental design, survey design, cost benefit analysis, before –after analysis, multi criteria analysis, risk analysis).

He writes and speaks three languages (Italian, English and French).

Mr. Vicente Massó (male) is Chief Digital Officer at S3Innovation. Vicente is a Telecommunications Engineer by the U.P.M. (Universidad Politécnica de Madrid) and a MBA by the Instituto de Empresa in Madrid. He has more than 25 years of experience working both for global companies like Telefonica and Cable & Wireless, and for Spanish companies as Ono, Grupo Prensa Ibérica, Polaris World and the four banks that took over the control of this last company (Bankia, CaixaBank, Banco Sabadell and Banco Popular).

His main skills are related to the management of technical resources, both human and material, for the transformation of processes towards the digital world, the deployment of new digital business lines and the improvement of internal and external information channels and workflows. Other skills are a strong knowledge of the Finance, Strategic Planning and Marketing areas, having also been responsible for these areas in several companies. Vicente speaks and writes Spanish and English fluently and has basic notions of French.

4.1.6. University of Leeds (UNIVLEEDS)

UNIVERSITY OF LEEDS

Description of the organisation and its products/services

The Institute for Transport Studies of the University of Leeds (short as UNIVLEEDS in this proposal) is one of the largest university-based research institutions in Europe, devoted to transport research and teaching. It has 60+ active researchers and was judged to be 'internationally excellent in terms of originality, significance and rigour' and was 2nd in terms of research power – a measure capturing quantity and quality in the latest Research Excellence Framework (REF) exercise and was the first British university department to obtain ISO 9001 certification for its research quality assurance procedures. Its research is sponsored by a variety of organisations, including the UK Department for Transport, the European Commission, and the Research Councils UK. UNIVLEEDS prides itself on its inter- and multidisciplinary nature, and its staff have provided expert advice to international organisations such as the World Bank, the European Commission and the International Transport Forum, to national governments around the world and to UK entities such as the House of Commons Transport Select Committee. They also serve as editors and/or members of the editorial boards of many leading transport journals and play a prominent role in the organisation of international transport conferences. UNIVLEEDS has provided sustainable contributions to more than 150 EU projects, and some projects related to this call are mentioned in the key personnel profiles.

The UNIVLEEDS researchers have developed a set of dynamic traffic simulation and modelling tools ranging from microscopic to macroscopic levels. These tools are currently being updated for the simulation of autonomous vehicles operating in mixed traffic. UNIVLEEDS also developed several research facilities including Car Simulator (UoLDS), Truck Simulator (TruckSIM), Pedestrian Laboratory (PEDSIM), and Automatic Train Operation (ATO), as well as Virtuocity - a proving ground in which new technologies, data and models are harnessed to help local authorities plan and design their city to be efficient and sustainable.

Role and relevance in the project

UNIVLEEDS will make major contributions to the following activities:

- UNIVLEEDS will be responsible for bringing together results from surveys, simulation, training and pilots, and producing a detailed, evidence-based assessment of real "driver" behaviour and public acceptance of CAVs to the PAsCAL's Guide2Autonomy framework.
- UNIVLEEDS will lead on data management and protection handbook, analysis of simulation results, and development of innovative approaches relating to the integration of public acceptance and user awareness in the design of new CAV technologies and infrastructure.
- Finally, UNIVLEEDS will contribute to quality management and risk assessment, development of multi-dimensional maps for the comprehensive assessment of public acceptance, definition of simulation scenarios and use cases, "Volvo Bus" demonstration, and awareness campaigns.

Five most relevant publications

Journals:

1. Liu B; Jia D; Lu K; Chen H; Yang R; Wang J; Barnard Y; Wu L (2017) **Infrastructure-Assisted Message Dissemination for Supporting Heterogeneous Driving Patterns**, *IEEE Transactions on Intelligent Transportation Systems*, 18, pp.2865-2876. doi: 10.1109/TITS.2017.2661962.
2. Basu S; Omotubora A; Beeson M; Fox C (2018) **Legal framework for small autonomous agricultural robots**, *AI and Society*, pp. 1-22. doi.org/10.1007/s00146-018-0846-4.
3. Markkula GM; Romano R; Madigan R; Fox CW; Giles OT; Merat N (In press) **Models of human decision-making as tools for estimating and optimising impacts of vehicle automation**, *Transportation Research Record*.

4. Markkula G; Romano R; Jamson AH; Pariota L; Bean A; Boer ER (2018) **Using Driver Control Models to Understand and Evaluate Behavioral Validity of Driving Simulators**, *IEEE Transactions on Human-Machine Systems*. doi: 10.1109/THMS.2018.2848998.

5. Milne D; Watling D (2018) **Big data and understanding change in the context of planning transport systems**, *Journal of Transport Geography*, doi: 10.1016/j.jtrangeo.2017.11.004.

Projects

Project Name	Participant contributions	Project goal
AUTOPILOT	We have developed a system dynamics model and an expert system for the evaluation of IoT technologies in CAVs, business exploitation, quality of life, and user acceptance. We are also a major contributor to the analysis of pilot tests data, and to legal issues.	*AUTOmated driving Progressed by Internet Of Things* Objectives: The overall objective of AUTOPILOT is to bring together relevant knowledge and technology from the automotive and the IoT value chains in order to develop IoT-architectures and platforms which will bring automated driving towards a new dimension. Five specific objectives are to define and implement an IoT architecture for autonomous driving; realize IoT-base automated driving use cases; advanced business models and services for autonomous driving; involve users, public services, and business players; and contribute to standards.
L3PILOT	Our main contributions are to define and prioritise research questions (RQs) and hypotheses for technical and traffic evaluation, user evaluation, all impact areas (safety, mobility, efficiency and environment) and for socio-economic impact evaluation; specify performance indicators with which the hypotheses can be tested and the measures needed for calculation of the indicators and the requirements for logging; analyse the acceptance, trust in ADFs and usage of the AV and function as well as the interaction between function and user.	*Piloting Automated Driving on European Roads* Objectives: create a standardised Europe-wide piloting environment for automated driving; coordinate activities across the piloting community to acquire the required data for evaluation; pilot, test and evaluate automated driving functions; and innovate and promote automated driving for wider awareness and market introduction.
CARTRE	We led the development of the evaluation methodology for automation pilots and FOTs, workshops, online interviews, webinars and workshops with various stakeholders, and an update of the FESTA handbook.	*Coordination of Automated Road Transport Deployment for Europe* Objectives: support the development of clearer and more consistent policies for EU Member States in collaboration with industry players; create a solid knowledge base of all European activities, to support current activities and structure research outcomes by enablers and thematic areas; setup a platform for sharing

		and re-using data and experiences from different automated road transport systems; actively support Field Operational Tests (FOTs) and pilots carried out at National and European levels; and work on future visions, potential impacts and research gaps in the deployment of automated road transport.
FOT-Net Data	We updated the Field Operational Tests methodology in the FESTA handbook, led FOT knowledge transfer and learning, and contributed to the creation of the FOT Networking Platform.	*Field Operational Test Networking and Data Sharing Support* Objectives: develop a data sharing framework for use in global data sharing including a catalogue showing available datasets; maintain the FOT wiki catalogue of past and current activities around the world with practical information needed to facilitate further exploitation of the results and available data; and provide the FOT community with knowledge on data sharing.
CRITiCaL (EPSRC)	We have studied different types of crime that can happen in the Cloud, built systems that allow the detection of this criminal behaviour and enable the use of digital evidence to lead to successful prosecution of Cloud crime perpetrators.	*Combatting cRiminals In The Cloud, June 2015 - May 2020* Objectives: develop a true understanding of what crime can be conducted on the Cloud; facilitated through the development of cloud crime scripts, define the activities of a criminal act.

Human Resources involved in the project

Dr. Haibo Chen (male) is a Principal Research Fellow with over 20 years research experience in the broad field of Intelligent Transport Systems (ITS) and data analytics. Much of his work involves the development of green transport solutions to improve traffic network performance and reduce congestion and environmental impacts. He has produced 100+ articles in peer-reviewed journals, conference proceedings and project deliverables. He has led 30+ projects funded by various bodies. Currently, Haibo is Project Manager and Grant Holder at Leeds on several European projects including Viajeo PLUS (International Coordination for implementation of innovative and efficient urban mobility solutions, 2013-2016), FOT-Net Data (Field Operational Test Networking and Data Sharing Support, 2014-2017), optiTruck (optimal fuel consumption with Predictive PowerTrain control and calibration for intelligent Truck, 2016-2019), AUTOPILOT (AUTOmated driving Progressed by Internet Of Things, 2017-2020), ELVITEN (Electrified Lcategory Vehicles Integrated into Transport and Electricity Networks, 2017-2020), as well as the £3.5m Smarter Travel Solution project (2015-2018) funded by the Innovate UK in which he is working closely with partners from cities, public transport operators and app designers to develop a “one screen journey” solution for public transport in West Yorkshire. He was an international expert in one of the Chinese “111 Plan” project at Beijing Institute of Technology, with a specific focus on “development of clean vehicles and applications in transport” (2012-2017). He is the Research Group Leader of Spatial Modelling and Dynamics, and School Equality & Inclusion Coordinator.

Dr Subhajit Basu (male) is an Associate Professor of Information Technology Law (Cyberlaw) at School of Law of the University of Leeds. His research is focused on data protection, privacy and crime issues particularly related regulation of emerging technologies such as Internet of Things (IoT), and big data. Subhajit is Chair of British, Irish Law Education and Technology Association (BILETA), Managing Editor of International Review of Law Computers and Technology (IRLCT), as well as on the Editorial Boards of

several law journals. Currently, Subhajit is working with Haibo on the AUTOPILOT project, studying ethical and legal issues of IoT-enabled autonomous vehicles and examining how the legal framework can be updated to protect privacy and equip the public with the knowledge needed to make informed choices.

Dr. Yvonne Barnard (female) is a Senior Research Fellow with over 30 years research experience in projects on human behaviour and new technologies. After her study in psychology, with a specialization in Artificial Intelligence, she worked from 1984-1995 as a researcher in the field of computers and education at the University of Utrecht and at the University of Amsterdam, where she received her Ph.D. with a thesis on open, technologically rich, learning environments. From 1995-2008 she worked at various research institutions (e.g. TNO, EURISCO) in the field of user acceptance and human factors in transport, and cognitive and organizational processes. She started work at the Institute for Transport Studies in 2008, and was involved in FESTA and the three FOT-Net projects, as well as in national projects on driver behaviour in automation and in user acceptance of new technologies. From 2013-2015 she was seconded at ERTICO – ITS Europe, working as the coordinator of FOT-Net 2, and coordinating the operation-sites of the UDRIVE project, and responsible for communication and dissemination activities. Currently, Yvonne is the project manager at Leeds for the CARTRE project which a Coordination and Support Action funded under the H2020 programme to accelerate the development and deployment of automated road transport.

Prof. Richard Romano (male) is a professor at the Institute for Transport Studies. He directs the development of and research on the University of Leeds driving simulator and pedestrian simulator. He is the PI on the EPSRC funded pedestrian simulator (£820k) and an Innovate UK funded project to replace HGVs with delivery robots on the high street (£230k) and a CoI on the European funded interAct project and Innovate UK funded HumanDrive project. All four projects are looking at improving the interaction between humans and automated vehicles. With over 25 years of experience and over £11M of research funding, Prof Romano is an expert in vehicle dynamics modelling, motion cueing, and nano-scopic traffic simulation as well as having extensive experience developing simulation based testing systems for automated vehicles.

Prof. David Watling (male) is Centenary Professor of Transport Analysis with over 25 years research experience in the analysis and modelling of transport systems. His first degree was in mathematics and his PhD in statistics, the latter concerned with the estimation of trip patterns. David was the grant holder of the DRACULA project and instrumental to the development of dynamic route assignment at microscopic level. He has also participated in a wide variety of transport projects, from developing fundamental techniques to advising government agencies on innovative methods. He has published widely on new and innovative mathematical modelling methods to address new kinds of issue, such as unreliability, behavioural adaptation, and mass effects. Through the projects VISIONS2030 and STEP-CHANGE his interests have widened into incorporating qualitative methods and factors into the design and planning of transportation systems.

Bryan Matthews (male) is a Lecturer with over 20 years experience of research and project management gained in both consultancy and university settings, His research expertise is in transport policy analysis and economics – particularly in relation to disability and ageing, travel technologies and the links between transport and health. Current research involves the developing and testing of prototype technologies to assist disabled and older pedestrians. The clients for his research have included the European Commission, the UK Department for Transport, the Disability Rights Commission, the Office for Disability Issues, the European Conference of Ministers of Transport, the Community of European Railways, the Engineering and Physical Sciences Research Council and a range of UK local authorities. In addition, Bryan has gained considerable experience in project management, including managing a 30-month European research project comprising of 15 partners in 11 countries. Beyond the Institute, Bryan is the chair of the Intelligent Transport Systems UK's Inclusive Mobility Interest Group, and an active member of the Centre for Disability Studies and the Chartered Institute of Logistics and Transport's Accessibility and Inclusion Forum. He is also a member of the UK government's Disabled Persons Transport Advisory Committee. Bryan also has over ten years experience of university teaching (and is currently studying toward qualifying to become a fellow of the Higher Education Academy). His teaching portfolio involves leading six transport policy modules (including Transport Policy in Action and Transport and Society) as well as contributions to modules on travel behaviour and on transport and public health; he also supervises students and post-graduate researchers conducting their research projects.

Dr Malcolm Morgan (male) is a research fellow in the Leeds Institute for Data Analytics (LIDA) for over two years. He originally trained as a Civil Engineer at the University of Warwick. Malcolm went on to specialise in the use of data analytics for environmental assessment and infrastructure planning, though his PhD in Engineering at the University of Cambridge. His areas of expertise are the use of geo-computation and spatiotemporal analysis, with particular relevant to transport and the built environment. Since joining the University of Leeds, Malcolm has worked across three groups, LIDA, the Sustainability Research Institute (SRI), and the Institute for Transport Studies (ITS). Malcolm has worked on a range of 'Big Data' projects such as the Cycling Infrastructure Prioritisation Toolkit (CyIPT) for the UK Department for Transport (DfT), which analysed every road in England to find suitable locations for cycling infrastructure. He has also developed new methods of analysis social networks on Twitter as part of the Governance of Low-carbon Innovation in Domestic Energy Retrofits (GLIDER) project. Currently he is working on a range of transport related projects such as the EU-funded OptiTruck and a joint Elgin-RAC project on the impact of roadworks.

Dr Gillian Harrison (female) is an experienced transport policy researcher, with a committed professional interest in low carbon vehicle technologies and sustainable mobility. She has published papers in numerous peer-reviewed journals, presented at a variety of international conferences, organised interdisciplinary workshops and mini-conferences, and acted as a reviewer for both international journals and conferences. More recently she has gained experience in lecturing and PhD supervision. She is a member of the European Association of Transport, sitting on a programme committee for their annual European Transport Conference and the System Dynamics Society, acting as secretary to their Transportation Special Interest Group. Dr Harrison has six years of business experience in environmental management, project and data co-ordination (in the UK water industry), holds a MSc/PhD in low carbon technologies (modelling, policy and ethics of low carbon vehicles) and three years of post-doctoral research for the European Commission, Joint Research Centre in electro-mobility modelling and policy advice. In this role, she was responsible for the development and application of the EC-JRC Powertrain Technology Transition Market Agent Model (PTTMAM), a state-of-the-art system dynamics model representing all 28 EU member states. During this time she contributed to five European research projects and to the development of the Alternative Fuel Infrastructure Directive. Since April 2017, Dr Harrison has been employed as a Post-Doctoral Research Fellow at the Institute for Transport Studies, University of Leeds, supporting EU Horizon 2020 and UK funded projects on automated & connected vehicles and mobile phone travel apps. Her specialisms include system dynamics modelling, data analysis, electric vehicles, auto-mobility, emissions, policy appraisal and social equity.

Infrastructure and technical equipment

UNIVLEEDS has no infrastructure or technical equipment to be used in this project as its simulation facility (which consists of Car Simulator (UoLDS), Truck Simulator (TruckSIM), Pedestrian Laboratory (PEDSIM), Automatic Train Operation (ATO), and Virtuocity) is currently going through a planning review for upgrading. However, UNIVLEEDS will provide the results and learning material (e.g. videos, e-learning modules) produced from the previous projects in which these simulators were used.

4.1.7. University of Liverpool (LIV)

Description of the organisation and its products/services

The University of Liverpool (www.liv.ac.uk), which is ranked in the top 1% of higher education institutions in the world, is a globally-focused institution whose activities are rooted in world-leading research excellence and reflect the dynamics of the knowledge economy.

Based in an ultra-modern £32m facility on the University of Liverpool campus, the School of Engineering is one of the UK's most innovative centres for engineering research and education, with staff and students working across two Departments: Mechanical, Materials and Aerospace Engineering and Civil Engineering and Industrial Design. The Deartments bring together multidisciplinary research from across the School in areas that have significant current relevance and potential for further impact. They also provide support for the major degree programmes in the School (Aerospace Engineering, Civil Engineering, Mechanical Engineering and Industrial Design).

In 2000, the University established the Flight Science and Technology Laboratory, investing around £2 million to create what is still the most capable flight simulation facility in academia globally. The aerospace capability was further enhanced in 2005 with the introduction of the Computational Fluid Dynamics laboratory. The strength of the University in the aerospace domain was recognised when it became one of three European AgustaWestland Rotorcraft Technology Centres, in 2011. In addition to the partnership with AgustaWestland, the University continues to enjoy strong links with global players such as Airbus Group and BAE Systems.

In recognition of the current and future importance of autonomous systems, the University created the Centre for Autonomous Systems Technology (CAST, https://www.liverpool.ac.uk/autonomous-systems/) in 2012. CAST provides expertise in autonomous systems from across the University of Liverpool. Its members carry out world-class research, provide high-quality training and education and, through the University's Virtual Engineering Centre (http://www.virtualengineeringcentre.com/), collaborate with a range of companies to develop, analyze, enhance and deploy autonomous systems. The combination of research excellence in areas such as software autonomy, verification, agreement technologies, reliability and safety, autonomous sensors, communications, data fusion, machine learning, vehicle dynamics, and aerospace and robotics applications, together with the high fidelity design, simulation and analysis capabilities and technological exploitation provided by the make CAST ideally placed to impact upon research, technology transfer, exploitation, and advanced training in this crucial area.

Role and relevance in the project

The University of Liverpool's primary role will be threefold:

- Based upon the outputs of the FP7-funded myCopter project (www.mycopter.eu) and beyond, provide a link to and expertise on the role of personal aerial vehicles within the connected autonomous vehicles landscape. In this way, the University of Liverpool contributes to the multimodal aspects of the project.
- Provide a personal air vehicle flight simulation capability within the pilot studies / experiments to explore the operation and acceptance of these types of vehicle within the connected autonomous vehicle paradigm.
- To analyse on the results of the experiments performed and to contribute to the planned project outputs, specifically the guidelines, from the perspective of personal aerial vehicle users.

Five most relevant publications

Journals:

1. Perfect, P., Jump, M., & White, M. D., "**Towards the development of a flight training programme for future personal aerial vehicle users**", CEAS Aeronautical Journal, 8(3), 541-560, 2017
2. Lu, L., Jump, M., White, M., & Perfect, P., "**Development of Occupant-Preferred Landing Profiles for Personal Aerial Vehicles**". JOURNAL OF GUIDANCE CONTROL AND DYNAMICS, 39(8), 1805-1819. 2016, doi:10.2514/1.G001608.
3. Perfect, P., Jump, M., & White, M. D., "**Handling Qualities Requirements for Future Personal Aerial Vehicles**", JOURNAL OF GUIDANCE CONTROL AND DYNAMICS, 38(12), 2386-239, 2015, doi:10.2514/1.G001073.
4. Webster, M., Cameron, N., Fisher, M., & Jump, M., "**Generating Certification Evidence for Autonomous Unmanned Aircraft Using Model Checking and Simulation**", JOURNAL OF AEROSPACE INFORMATION SYSTEMS, 11(5), 258-278. doi:10.2514/1.I010096.
5. Jump, M., "**Handling Qualities and Training Requirements for Personal Aerial Vehicles**" in The Future of Transportation World Conference. Cologne, Germany, 2017.

Projects

Project Name	Participant contributions	Project goal
myCopter (http://mycopter.eu/)	The University of Liverpool explored the design space for control system technologies that would be used for a Personal Aerial Vehicle (PAV) and then designed an analysed a training program for PAV occupants. The results were validated through high fidelity flight simulation.	The myCopter project aimed to pave the way for Personal Aerial Vehicles to be used by the general public within the context of a Personal Aerial Tramsportation System.
GAMMA	University of Liverpool provided key simulation and software integration capability to the programme as well as a destination for SMEs to showcase their technologies to Pirme contractors.	The aim of the UK Regional Growth Funded Growing Autonomous Mission Management Applications (GAMMA) Programme was to develop existing software applications ('apps'), which may also be supported by sensor integration, for managing autonomous systems for unmanned vehicles.

Human Resources involved in the project

Dr. Michael Jump (male) is a Senior Lecturer at the University of Liverpool's (UoL) School of Engineering (SoE) and is an Advisory Board member of the University's Centre for Autonomous Systems (CAST, https://www.liverpool.ac.uk/autonomous-systems/). As the researcher on *Prospective Skyguides* (EPSRC GR/R84795/01), with BAE Systems, he was the first to investigate τ theory from the field of psyco-physics for fixed-wing aircraft. The project explained the various approach and landing strategies adopted by pilots, including the so-called τ-pause, where pilots maintain a constant rate of change of τ just before the final flare. The research resulted in the first patented τ-guidance algorithms for use as guidance aids. Dr. Jump was the UoL PI on the EC FP7-funded projects ARISTOTEL (Prediction, Detection and Alleviation of Adverse Rotorcraft-Pilot Couplings, no. 266703) and myCopter (Assessment of Control Laws for Electric Vertical Take-Off and Landing (e-VTOL) personal aerial vehicles (PAVs), no. 266470).

Infrastructure and technical equipment

The Flight Science and Technology Research Group at the University of Liverpool houses the HELIFLIGHT-R reconfigurable flight simulator. HELIFLIGHT-R consists of a 12-ft visual dome mounted on a six-degree-of-freedom motion platform. The system utilises general purpose Linux-based computers to drive the simulator from a central Instructor– Operator Station (IOS) PC. The IOS PC is connected to a local network that allows communication with each of the other elements of the system – three image generation (IG) machines that produce the visual environment, one machine to run the reconfigurable instrument panel displays (left and right primary flight displays, backup analogue displays and Head Up Display), and a machine for the Instructor Station within the dome, which serves a dual purpose by creating the audio environment. In addition, the network is connected to the control interfaces for the control loading and motion systems. An interchangeable and reconfigurable crew station, allowing one or two crew operations, is equipped with two wide-screen 1900 LCDs to represent the primary flight information, engine information and navigation information. The configuration provides a glass cockpit layout of analogue instruments as well as simulation of multi-function keyboards and displays via touch-sensitive transparent overlays. The two centre displays are 1000 4:3 touch screens. The upper centre screen displays generic backup instruments, whilst the lower centre screen displays a Control Display Unit multi-function keypad and message display area.

4.1.8. Université de Bourgogne Franche-Comté (UBFC)

Description of organisation and products/service

University of Bourgogne Franche-Comté (UBFC) is a French higher education and research organisation, created in 2015, federating three public universities (UB, UFC, UTBM), three public engineer schools (ENSMM, AgroSup, ENSAM) and one private business school (BSB) in the Bourgogne Franche-Comté (BFC) region according to the collegiate university model (COMUE: Community of University and Establishments). The mission of University of Bourgogne Franche-Comté is to enhance societal values by ensuring excellence in training, education and research at the regional level.

The University of Technology of Belfort-Montbéliard (UTBM) is a public higher education and research institution located in the towns of Belfort, Sévenans and Montbéliard (France). The university has approximatively 3,000 students for the academic year 2018-2019. UTBM is authorized by the Ministry of Higher Education and Research to issue engineering diplomas in the following domains: automatic, industrial electronics, IT, mechanical, production systems, mechanical design and ergonomics. UTBM is developing research activities in accordance with the industrial environment of the northern Franche-Comté: land transportation and energy.

The Ergonomics and Design for Systems (ERCOS) research group is part of the ELLIADD laboratory and the UTBM. ELLIADD-ERCOS research is intentionally multidisciplinary and interdisciplinary, combining the humanities and engineering sciences (mechanical and computer engineering). The objectives of the research are to develop knowledge, methods and tools for human and user-centred design, in order to increase the performance and reliability of human-machine interactions and to ensure safety, comfort and health. To do so, ELLIADD-ERCOS benefits from a wide range of tools to ensure a user-centric design process, including advanced measure and simulation equipment, such as a driving simulator and a virtual reality platform.

Role and relevance in the project

UBFC is mainly involved in WP4 for designing scenarios and experimental protocols, preparing, performing and analysing simulations. The research group is clearly relevant thanks to its staff (gathering skills in both ergonomics and ITs for simulation), its equipment (including a driving simulator, several virtual reality solutions and metrology tools) and its experience of numerous research projects: industrial ones as well as institutional ones.

Five most relevant publications

Journals:

1. Bertin, M., Bluntzer, J.B, Roger, M., Sagot, J.C., Darmouni, D., & Del Fabro, L., "**Design for Well-being into the Automotive Design Process: Contribution to the Evaluation Space**", INTERNATIONAL JOURNAL OF DESIGN AND INNOVATION RESEARCH, 7(1), 72-87, 2018.
2. Roger, M., Vignais, N., Ranger, F., & Sagot, J.C., "**Physical ergonomic testing for the design of an innovative mail delivery vehicle: a physical mock-up case-study**", JOURNALS OF ERGONOMICS, 8(2), 2018, doi: 10.4172/2165-7556.1000228.
3. Bluntzer J.B., Ostrosi E., & Sagot J.C., "**Styling of cars: is there a relationship between the style of cars and the culture identity of a specific country?**", INSTITUTION OF MECHANICAL ENGINEERS, PART D: JOURNAL OF AUTOMOBILE ENGINEERING, 229 (1), 38-51, 2014, doi:10.1177/0954407013517221.

Conferences:

4. Bertin, M., Bluntzer, JB., Roger, M., Sagot, JC., & Del Fabbro, L., "**Integration of the well-being in the early phases of the automotive design process: first approach and contribution of physiological measures**", in 14th International Design Conference on Applied Human Factors and Ergonomics, Dubrovnik, Croatie, 2016.
5. Vignais, N., Roger, M., Maysse, J., Baume, H., & Sagot, JC., "**Ergonomic analysis of egress/ingress postures for vehicle design: digital prototype vs. Physical mockup"**, in. 4th International Digital Human Modeling Conference (DHM2016), Montréal, Canada, 2016.

Projects

Project Name	Participants Contributions	Project Goal
MobyPost	Responsible for the ergonomic package, the vehicle architecture and its style. Preliminary ergonomic study of existing delivery vehicles, proposal of a custom vehicle architecture, definition of a style theme, convergence between ergonomic, style and technic considerations, development of the body parts and interior trims.	To develop and test a carbon-free mobility system for postal delivery. The mobility system included both a fleet of single-seat vehicles with a hydrogen-electric hybrid powertrain and two solar-powered refilling stations producing H2 by electrolyse.

Smart cruise control	Integration of an advanced driver-assistance system (ADAS) based on an inter-distance keeping system. Design and integration of a head-up display (HUD) and an additional display in our driving simulator. Comparison of the efficacy of two information displays with objective (reaction time) and subjective (DALI survey and interview) measures.	Test of the haptic feedback on the throttle pedal depending on the inter-distance and measure of the effect on the driving activity. Design of several ways to display information in order to evaluate contribution of visual assistance when the inter-distance is dangerous.
Ergonomic study of a new gen HUD system	Carry out of an experimental protocol in order to validate the HUD ergonomics, considering both physical reachability of the controls and driver's cognition. The experience involved eye-tracking and video analysis.	Utility and ergonomics validation of a HUD system. Evaluation of several scenarios defined by the automotive supplier. Observation of the impact on driver's ability to access the displayed information.
Study of an embedded infotainment display for PSA	Design and integration of several HMIs within the vehicle cockpit varying information density and arrangement. We tested the HMIs in our driving simulator and collected behavioural data about the HMI perception thanks to an eye-tracking system.	Design of an embedded infotainment display aiming to not interfere with driving activity and to ease the search for information.
Ergonomic design of a new gen high-speed train cockpit for SNCF and GEC Alsthom	Implementation of an ergonomic process: - Analysis of the TGV drivers' activity and measure of the cockpit environment (light and sound); - Co-design of a new HMI and a new cockpit (in collaboration with the train makers); - Validation of prototypes, with TGV drivers, regarding their efficacy for the driving activity.	Enhance the driver's cab, on improving driving activity: safety, effectiveness, efficiency, postural, satisfaction and on environmental aspects: comfort, compliance with ergonomic standards.

Human Resources involved in the project

Jean-Claude Sagot (male) is a Full Professor (exceptional class) and head of the research group in ergonomics and design for systems. He received the PhD degree in 1987 from University of Strasbourg in France and the Habilitation to Supervise Researches in 1997 from Lorraine University (Nancy), France. He is the author of over 67 journal and 144 international conference papers with reading committee. Professor Jean-Claude Sagot has been the scientific manager for more of 100 studies and research contracts both institutional (French and European) and industrial (DGA, SNCF, RATP, Alstom, EDF, PSA

Peugeot-Citroën, Renault, Faurecia, General Electric, etc.). He is also involved in scientific council of the regional gerontology and innovation cluster dedicated to improving the quality of life of elderly people.

Mohsen Zaré (male) is an Assistant Professor in ergonomics and biomechanics in the ELLIADD-ERCOS team since December 2015. Mohsen worked mainly in the automotive sector (Scania production Angers) on the design and analysis of workstations and the measurement and analysis of human activity. He collaborated in several national and European projects such as "Serious Game for Health at Work", and he published many scientific articles in ergonomics and biomechanics.

Nicolas Bert (male) is a researcher in cognitive ergonomics, oriented to the consideration of human factor. In other words, it means he considers the personal, psychological, sociological and environmental factors guiding the attitude, the use behaviour and the interaction with a product.

Maxime Larique (male) is a mechanical design engineer with a 8 year experience in driving industrial or institutional projects gathering ergonomics, industrial design and mechanical design. He has notably worked on the FP7 MobyPost project consisting in the design of a hydrogen-powered vehicle and, more recently, on the Interreg project "Serious Game for Health at Work" using virtual reality to prevent musculoskeletal disorders.

Sara Escaich (female) is a UX Designer, which integrates the user-centred approach into research projects by considering usability and accessibility. Moreover, she conducted a research in psychologic ergonomics on "The role of control in *a priori* acceptability of autonomous car" (Published in Epique conference at Dijon, 2017).

Sébastien Chevriau (male) is a research engineer, expert in software projects management with high skills in virtual reality, 3D and CAD fields. He mainly focuses on virtual reality (VR) applications. For the FP7 MobyPost project, he notably developed VR applications for design reviews and user tests as well as a 3D online interactive mockup of the vehicle. He is also involved in the Interreg "Serious Game for Health" project as VR advisor.

Gérard Touvenot (male) is a technician, expert in electronics and ITs. With 30 years of experience at UTBM, he technically carries out the driving simulator for electronic and IT aspects. Moreover, he is also expert in developing and implementing physiological (such as eye tracking and electro-myography) and environmental (light, sound, thermal and vibration environment) metrology instruments.

Infrastructure and technical equipment

- Driving simulator;
- Virtual reality platform (CAVE);
- Cabin layout simulator;
- Physical and physiological metrology: motion capture system and numerous biosensors (heart rate monitoring, external and internal temperatures, stress hormones dosing, etc.);
- Cognitive activity: eye-tracking system (Tobii) for analysing the looking behaviour.

4.1.9. ExaMotive S.A. (ExaMotive S.A.)

Description of the organisation and its products/services

ExaMotive S.A. (https://www.examotive.com/) is a well-funded, tech-focused start up headquartered in Luxembourg which designs and performs development of the smart mobility and automotive ICT solutions. One of its core projects carsharing, which operates under Oply brand (https://www.oply.com/), is in the process of rapid rollout for Europe-wide operations, with Germany and UK being the first countries to introduce operations. ExaMotive successfully serves tens of thousands of customers, which its fleet will reach several thousand of shared vehicles during the course of the project. Over five years of innovation and R&D experience are at the core of the developed software and technological solutions for intelligent mobility and automotive eco-systems that offer unique user experience.

Role and relevance in the project

ExaMotive is mainly involved in (a) comprehensive assessment of public acceptance (WP3) by performing operational database analysis and performing active surveys of its current shared mobility users and (b) conducting a pilot study of shared connected transport (WP6). For performing these tasks ExaMotive will leverage its international user base and large scale car sharing network (reaching most of the major European cities with a combined fleet of several thousand vehicles).

Most relevant publications

Journals:

1. C. Fiandrino, A. Capponi, G. Cacciatore, D. Kliazovich, U. Sorger, P. Bouvry, B. Kantarci, F. Granelli, S. Giordano, "**CrowdSenSim: a Simulation Platform for Mobile Crowdsensing in Realistic Urban Environments**," *IEEE Access*, vol. 5, pp. 3490-3503, 2017.
2. B. Changaival, G. Danoy, D. Kliazovich, F. Guinand, M. R. Brust, J. Musial, K. Lavangnananda, P. Bouvry, "**Optimal Fleet Placement in Station-based Round-trip Carsharing**," *Journal of Transport and Land Use*, 2018.
3. A. Capponi, C. Fiandrino, D. Kliazovich, P. Bouvry, S. Giordano, "**A Cost-Effective Distributed Framework for Data Collection in Cloud-based Mobile Crowd Sensing Architectures**," *IEEE Transactions on Sustainable Computing*, vol. 2, no. 1, pp. 3-16, 2017

Conferences:

4. M. Pouryazdan, C. Fiandrino, B. Kantarci, D. Kliazovich, T. Soyata, P. Bouvry, "**Game-theoretic recruitment of sensing service providers for trustworthy cloud-centric Internet-of-Things (IoT) applications**," *IEEE International Workshop on Cloud Computing Systems, Networks, and Applications (CCSNA)*, Washington, DC, USA, 2016.

Human Resources involved in the project

Dzmitry Kliazovich is a Head of Innovation at ExaMotive S.A. He is focusing on driving innovation in technology, sciences and business processes while helping companies to develop intelligent solutions for smart mobility. Dr. Kliazovich is an experienced manager, visionary research scientist, frequent keynote and panel speaker, received numerous scientific awards, author of 100+ scientific manuscripts and holder of several patents. Prior to joining ExaMotive, he was a Senior Scientist at the Faculty of Science, Technology, and Communication of the University of Luxembourg. Dr. Kliazovich holds an award-winning Ph.D. in Information and Telecommunication Technologies from the University of Trento (Italy). Dr. Kliazovich is a holder of several scientific awards from the IEEE Communications Society and European Research Consortium for Informatics and Mathematics (ERCIM). His main research activities are in the field of intelligent transportation systems, telecommunications, cloud computing, and internet of things (IoT).

Florian Frohn received his M.Sc. in computer science at RWTH Aachen University in 2013. He has been active in the field of automated reasoning since 2011, when he started to work on verification techniques for Java programs as a student assistant. Since then, the scope of his research covered many aspects of automated software verification, but his main focus was on automated complexity analysis techniques. Since starting his PhD studies in 2013 he has been one of the main developers of the verification tool AProVE, which he extended significantly by implementing the results of his research. Consequently, AProVE is now the most powerful complexity analysis tool for various models of computation, as witnessed by the annual International Termination and Complexity Competition. So far, his research led to 15 peer reviewed publications at international conferences (10 publications) and in international journals (5 publications). Currently, he is preparing for the defense of his PhD thesis with the title "Automated Complexity Analysis of Rewrite Systems". It is supervised by Prof. Jürgen Giesl, head of the "Programming Languages and Verification" group of RWTH Aachen University, and has been submitted in Mai '18. Since he joined ExaMotive in June '18, he is working on the application of deep learning techniques to real-life scheduling problems from the domain of carsharing. Moreover, he is applying agent-based simulation techniques in order to test and optimize an existing carsharing system.

Infrastructure and technical equipment

- Fleet of shared vehicles operated in multiple European cities operated via proprietary shared mobility platform
- Multi-agent shared mobility simulator (MATSim-based

4.1.10. RealDolmen (RDGFI)

All references to previous projects, publication and experience refer to GFI, yet that as the result of an Universal Take of GFI by Realdolmen are now attributed to the PasCal partner RealDolmen.

Description of the organisation and its products/services

Since 1995, the Group Gfi Informatique (http://www.gfi.world/en/) has positioned itself as one of the leading IT service firms in Europe, with worldwide presence - 17 countries and employing more than 20,000 people in 2018. The Group recorded revenues of €1132M in 2017. Group Gfi provides its customers with expertise in consulting, systems integration, outsourcing and software solutions. Gfi has developed 10 skills centers, 6 services centers in France and 3 off-shore centers, which are key points in the industrialization process. The company covers all stages of the information system life cycle and caters mainly for large corporates, public bodies and local authorities. Innovation at Group Gfi is a structured process with clear results. Our approach is based on two principles: giving the Group and its customers a view of their digital strategy two years ahead, and bringing out solutions that will have a place in the market (www.gfi.world/en/innovation/1-demanding-innovation). The Belgian branch of Gfi, named Realdolmen, counts with approx. 2000 employees.

In PAsCAL different areas of the company will be involved:

- Software solutions dedicated transport and logistics: GfI brings all the business and technological expertise gained over 15 years of success with the implementation of transport plans optimization, time management, mobility solution, smart cities sensoring, etc.
- Smart Cities: Launched in 2016, the Smart Cities unit is in charge of solutions for intelligent living in urban areas. It offers services and ICT solutions for 5 verticals, silos and cross-domain: Transport, Energy, Water, Citizen and Smart Building (Infrastructure).
- Innovation at GfI Research enables the Group to focus on the technologies of tomorrow. Innovation at GfI is a structured process with clear results. Our approach is based on two principles: giving the Group and its customers a view of their digital strategy two years ahead, and bringing out solutions that will have a place in the market. The innovation unit's task is to detect the best ideas and do a first screening. The unit is also responsible for relationships with partners, and relies on dynamic, multi-partner input to fulfil its mission. Employees, PhD students, start-ups, and institutional partners like Europe, the French government and local authorities, not to mention its most involved customers all enable GfI Group and its innovation unit to do a thorough job both in terms of detection and in building out partnerships.

Role and relevance in the project

RDGFI will make major contributions to the following activities:

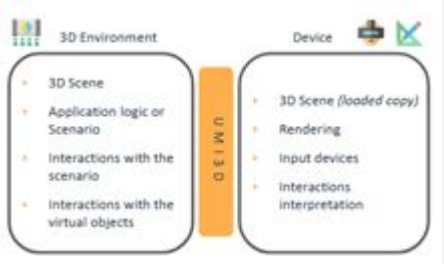
- WP9 leader and Exploitation leader. RDGFI will be responsible for guiding partners in the definition of effective and sustainable commercialization/adoption plans for PAsCAL's results. As WP9 leader, RDGFI will closely work with ACI (Dissemination Leader) in the alignment of these two activities to reach project objectives.
- Major contributor to WP4, RDGFI will participate in the improvement and development of new Human Machine Interfaces for simulators and real CAV environments. RDGFI will analyse a big spectrum of communication channels options (visual, audio, tactile including Braille) provided via adoption of different technologies like Augmented Reality, Virtual Reality, social robots, etc.
- RDGFI will develop in WP8 the web container for the Guide2Autonomy solution. In order to guide users in its utilization, the provision of a chatbot will be considered.

Five most relevant publications

1. Casarin J.; Pacqueriaud N.; Bechmann D. (2018) UMI3D: **A Unity3D Toolbox to Support CSCW Systems Properties in Generic 3D User Interfaces**. Proc. ACM Hum.-Comput. Interact.
2. Casarin J.; Bechmann D.; Keller M. (2017). **A unified model for interaction in 3D environment**. VRST'17.
3. Larroque S.; Casarin J.; (2018) **"PARA: experimental device for virtual and augmented reality", Proc. SPIE 10676, Digital Optics for Immersive Displays**, 106761L.
4. Klingert S.; Perez M; (2018) **E-MMM: A Market Maturity Model for Electric Mobility Grid Integration**, 2nd E-Mobility Power System Integration Symposium.
5. Tosi D., Serrano J.; Perez M; (2013) **SUPERHUB: User Centric Approach for New Traffic Prediction Models**, with dedicated Stand in the ITS Exhibition area - TS European Congress 2013.

Projects

Project Name	**Participant contributions**	**Project goal**
ELECTRIFIC, Grant Agreement #713864 *H2020*	GFI is the project coordinator and exploitation leader. In addition, GFI has developed the ADAS mobile app (routing EV drivers including charging) and an event-driver (big data) solution to monitor more than 800 parameters coming from grid status.	Seamless integration of electromobility in the grid system, involving active drivers, charging services providers and grid operators.
SUPERHUB, Grant Agreement #289067 *FP7*	GFI was the project coordinator. From technical activities, we were in charge of the integration of the complete platform, development of the mobile app for citizens and integration of external data sources from the city and transport operators.	SUstainable and PERsuasive Human Users moBility in future cities is a European co-funded project strongly committed to the realisation of an open source platform and mobile app able to plan customised urban routes, combining all mobility offers in real time. SUPERHUB Project provides a user-centric, integrated approach to multi-modal smart metropolitan mobility systems. The project involves designing and testing an open platform able to combine all mobility offers.
«Data» from the the French Road-Preventio n Association *Customer*	Collection (62 mobile phones- 2.5M GPS data in 3 months, 5 devices providing data while driving), cleaning (abnormal data, route alignment), treatment (e.g. different routes by 2Km or 15 min) and extraction of relevant data obtained via	Recovery of data related to driving via the mobile app "ConnectedDrive" by the French Road-Prevention Association.

	the mobile application "Connected Drive"	association PRÉVENTION ROUTIÈRE 
Rolls Royce Digital *Customer*	Big data solution developed by GFI including the collection of more than 5000 flight parameters real-time to understand the behaviour of Rolls Royce engines during operation.	After-sales (predictive maintenance) analysis of the performance of Rolls Royce aircraft engines.
UMI3D project *Internal innovation*	The objectives of the UMI3D project are to simplify the collaboration between multiple and potentially asymmetrical devices in Augmented and Virtual realities, and to enable the design of collaborative applications without a prior knowledge of user devices.	Collaborative 3D 
L'Oreal (France)	The bot answers general questions on the topic. Furthermore, does the bot guide you through the complex material of finding information related to your personal situation. Finally the bot integrates with a tax calculation engine that provides specific services.	Chatbot on intranet helping people with tax related topics in the context of the stock option plan.
Bel (France):	GFI developed the chatbot	Chatbot on intranet to assist with parking spot reservation and request of WIFI codes.

Toyota (Dashboard warning lights chatbot) – ongoing POC	The user can upload a picture of the dashboard and the bot will use Computer Vision technology to identify the warning light. Alternatively, the use can describe the warning light by specifying color and shapes (like a car, a person, a circle, an exclamation mark, …). Once the warning light is identified, the chatbot explain the warning light and suggests possible solutions. If that fails, the chatbot can look for the closetst dealer based on your current position (only on Facebook Messenger).	Chatbot provides information on warning lights on the dashboard of your Toyota car. 
Stella BackOffice chatbot (GFI NV Belux) – ongoing	Chatbot will handover to HR team when bot cannot answer the question. Answer is forwarded to user and added to the knowledge base so that next time bot can answer the question.	Chatbot that tries to answer FAQ on topics like HR, policies that today are send to Gfi HR team by mail.

Human Resources involved in the project

Dirk Gepts (male), Civil Engineer spec. Computer Science, has more than 20 years of experience in ICT and has become an experienced Project Manager and Application Solution Architect. Combining both roles, Dirk is specialized in both elaborating the best Application Software solution for any given context and assuring delivery within the agreed constraints. In Gfi NV he is Solution Lead Innovation for the Pepper Robot with Choreograph and Python development, and BotFramework for Chatbot. He is responsible for market follow-up on innovative technologies like Chatbot, Pepper, Internet of Things and Blockchain, for preparing basis for additional GFI NV offerings and elaborating vision on innovative technologies, for looking for practical uses in GFI NV context and helping "Go-To-Market" info to sales team. He is certified as PMP-PM, SAFE Practitioner and Scrum Master.

María Pérez (female) is Computer Engineer educated in the Univ. Complutense de Madrid. Her professional career started at IBM – INSA as developer of J2EE solutions. She joined the Group Gfi in Spain in 2003 as IT Consultant and started working on EC FP6 projects in 2004 as IT researcher. After 4 years she moved to Gfi Belgium as EC R&D Projects Manager. Specialized in the coordination and management of EC-funded projects, she has coordinated the EC FP7 and ICT-PSP Demos@Work, U@MareNostrum, PERIMETER, FIT4Green, All4Green, SUPERHUB (IP) and DC4Cities projects, and is currently the coordinator of the H2020 ELECTRIFIC project.

Julien Casarin is PhD Student in Human-Computer Interaction at Gfi Research, PhD Student in Human-Computer Interaction in the IGG team at ICube laboratory and Member of the French association for VR/AR/MR/3DUI AFRV. Julien is currently working on the UMI3D project. The objectives of this project are to simplify the collaboration between multiple and potentially asymmetrical devices in eXtented Reality (XR), and to enable the design of collaborative applications without a prior knowledge of user devices.

4.1.11. Universität Mannheim (UMAN)

Description of the organisation and its products/services

The University of Mannheim - UMA (www.uni-mannheim.de) in Germany is a strongly research-oriented university. The first German Consumer Psychology Chair held by Prof. Michaela Wänke is part of the psychology department. The department has a strong record in basic and applied research in areas such as survey design and economic decision-making. The core competence of the Consumer Psychology Group is experimental methodology combined with a profound knowledge of psychological variables such as needs, attitudes and cognitive limitations. The Consumer Psychology Group has larger interactive laboratories and access to representative panels to run experiments and surveys.

Role and relevance in the project

University of Mannheim's role will be threefold:

- UMAN will lead the public acceptance workpackage (WP3). We will make sure to deploy the most up-to-date measurement tools and to acquire the most representative samples possible.
- UMAN will lead the tasks 2.1. and 2.2 in Ethics and Data workpackage (WP2). We assist LuxMobility will ensure compliance to ethical and latest data protection standards.
- UMAN will support the definition of research designs to enable causal interpretation of the results. Their expertise in conducting randomized control trials will be used to define experimental factors in WP4 (definition of simulation scenarios and related acceptance measures), WP5 (definition of cognitive-affective model on driver training needs) and WP6 (critical test of training effectiveness.)

Five most relevant publications

Journals:

1. Eider, M., Sellner, D., Berl, A., Basmadjian, R., de Meer, H., Klingert, S., ... & Stolba, M. (2017, May). **Seamless electromobility.** In *Proceedings of the Eighth International Conference on Future Energy Systems* (pp. 316-321). ACM.
2. Krüger, T., Vogel, T., & Wänke, M. (2016). **Framing effects in consumer judgment and decision-making**. *International handbook of consumer psychology.* Sussex, UK: Taylor & Francis.
3. Kutzner, F., & Fiedler, K. (2017). **Stereotypes as pseudocontingencies**. *European Review of Social Psychology*, *28*(1), 1-49.
4. Vetter, M., & Kutzner, F. (2016). **Nudge me if you can-how defaults and attitude strength interact to change behavior**. *Comprehensive Results in Social Psychology*, *1*(1-3), 8-34.
5. Vogel, T., & Wänke, M. (2016). ***Attitudes and attitude change***., 2nd ed. New York, NY, US: Routledge/Taylor & Francis Group

Projects

Project Name	Participant contributions	Project goal
H2020 ELECTRIFIC	GFI NV is the work package leader for behavioural trials and electric vehicle user profiling. Provides user interface input to the design of an advanced driver assistance system for electric cars.	The ELECTRIFIC project addresses the call "GV.8-2015. Electric vehicles' enhanced performance and integration into the transport system and the grid". Specifically, it targets the integration of the overall cycle of EV energy management into a comprehensive EV battery and ICT-based re-charging system management, providing ergonomic and seamless user support. ELECTRIFIC develops novel technologies and theoretical understanding that enable highly attractive and sustainable electro-mobility through smart vehicle-grid integration. The technologies will be developed at three layers – the grid, the EV and the user. Seamless and ergonomic collaboration between all layers will be created to make using EVs at least as convenient and attractive as combustion engine vehicles, all the while optimizing the grid, the EV infrastructure utilization and maximizing the use of renewable energy resources.
German research foundation (DFG) "Contextualized decision making"	GFI NV was work package leader on the effects of framing on consumer and causal judgments.	The present proposal was a joint undertaking by social and cognitive psychologists to investigate human decision making. It aimed at bridging the frequently observed gap between research in decision making and research in social and cognitive psychology. There was a particular focus (a) on the processes that mediate between the input of a decision situation and the resulting decision, (b) on variables that moderate this processes, and (c) on experimental tests of the hypothesized causal process chains.

Ministry of Science, Research and Art of the State Baden-Württemberg "ForDigital"	is project leader of research on cognitive biases due to using information technologies	Based on a cognitive-ecological sampling approach and previous research on contingency illusions (Vogel & Kutzner, 2017), the project elaborates on cognitive illusions residing from the use of sorting and filtering functions. It is proposed that consumers exhibit a preference for sampling by desirable attributes which in turn yields non-representative information samples and ultimately causes biased brand evaluations in favour of high-market share brands.

Human Resources involved in the project

Dr. Tobias Vogel [*male*] is currently employed as a senior research at the Department of Consumer and Economic Psychology at the University of Mannheim/Germany. He received his PhD psychology in 2011, and worked as a researcher and lecturer at the Universities of Heidelberg (Cognitive Research in Social Psychology Group), Basel (Department of Social and Economic Psychology), and Mannheim (Department of Consumer and Economic Psychology), and was a visiting scholar at the Universities of Louvain-la-Neuve/Belgium and University of California San Diego (UCSD)/United States. He has a strong focus on experimental research, with an emphasis on consumer attitudes and decision making. His current projects involve research on attitudes in and acceptance of new technologies in the domain of e-commerce. In 2016, he published the book "Attitudes and Attitude Change" released by Routledge/Taylor Francis Group.

Dr. Florian Kutzner [*male*] is currently employed as post-doctoral researcher at the chair for social and consumer psychology at the University of Mannheim. He obtained his Diploma in psychology (2006) at the University of Jena and his PhD (2009) at the University of Heidelberg. He spent one year (2012-2013) working with the behavioural science group of Prof. Nick Chater at Warwick Business School, UK. His research revolves around human rationality and the question how sustainable behaviour can be promoted using monetary and psychological or symbolic incentives. He is cofounder of the consultancy Decision-Context that helps promoting behavioural insights to clients such as the German Institute for Development (DIE) or the Gesellschaft für internationale Zusammenarbeit (GIZ). He is currently working on the H2020 ELECTRIFIC project.

4.1.12. E-Bus Competence Center SARL (E-Bus)

Description of the organisation and its products/services

The E-Bus Competence Center (EBCC) was created in Luxembourg in 2016 by Volvo Bus Corporation. It supports Volvo electric bus system deployments in Europe and functions as an R&D centre with the main focus on the innovative services in the fields of cooperative intelligent transportation systems and electromobility. EBCC conducts research exploring how connectivity, data and automation can make public transport more attractive. It is also responsible for development and deployment of zone management systems dedicated to Volvo electric-hybrid buses. Research is carried out in collaboration with Volvo Technology center. EBCC works together with academic network of the International Association of Public Transport (UITP) and several EUs public transport operators. R&D activities are led by Dr. Marcin Seredynski. Currently EBCC is engaged in three research projects co-financed by Luxembourg National Research Found (FNR). The projects explore benefits of data, connectivity and cooperation for the next generation public transport systems:

- Dynamic Zero Emission Bus Corridor Management (AIR) researches how to best use intelligent transportation systems to improve the performance of plug-in electric-hybrid buses (https://www.fnr.lu/projects/dynamic-zero-emission-bus-corridor-management/)
- Electrified Cooperative Bus System (eCoBus) exploits the potentials of cooperative driver advisory systems to meet the requirements of the next generation electrified public transport systems. (https://www.fnr.lu/projects/electrified-cooperative-bus-system/)
- HyBrid bUs geoSpatial Data and Network Analysis (BusDNA) aims at designing and validating new methods allowing understanding, predicting and improving performance of electrified buses in reference to specific operational conditions.(http://www.fnr.lu/projects/hybrid-bus-geospatial-data-and-network-analysis/)

Role and relevance in the project

With the support of its national members and experts from its Network on Access to Mobility and Transport, E-Bus will actively contribute to the PAsCAL project as follows:

- E-Bus will be responsible for identifying the obstacles, challenges and opportunities CAVs represent for BPS persons. Enhanced mobility perspectives offered by CAVs will be discussed as well as their subsequent direct and indirect impact during specific focus groups (FG) held in 4 EU member countries (1 per country). National reports will be drafted and compiled into a European one thus feeding the whole data collection and comparison process implemented in the framework of the PAsCAL project.
- Based on the needs and information collected, prioritised and compiled in the reports aforementioned, E-Bus will draft recommendations with a view to providing policy-makers with clear and fit-for-purpose guidance on how to make CAVs accessible also to BPS potential drivers while also contributing the BPS near-CAV pedestrians' perspectives.
- Collecting feedback on blind and partially-sighted passengers' acceptance and attitude towards high-capacity autonomous buses in public transport operations.
- Finally, E-Bus will disseminate the project's progress and outcomes though the following modern, accessible and diversified information and awareness–raising channels: E-Bus website, E-Bus monthly newsletter (in English), E-Bus quarterly publication Focus (already available in English, French, German, Spanish and soon also in Serbian and Turkish), E-Bus podcast on Accessible Technologies (E-Bus Access Cast), Facebook and Twitter accounts and events (e.g. E-Bus 2019 General Assembly in Rome).

Five most relevant publications

1. M. Seredynski, F.Viti, Novel C-ITS support for Electric Buses with Opportunity Charging, Proc. 20th International IEEE Conference on Intelligent Transportation Systems, Yokohama, Japan, October 16 - 19, 2017

2. M. Seredynski, J. Pang, D. Kliazovich and D. Khadraoui, Towards novel public transport services via real-time optimisation of demand and supply with traveller incentivisation, 23rd ITS World Congress, Melbourne, Australia, October 10-14, 2016
3. A. Grzybek, G. Danoy, P. Bouvry, M. Seredynski, Mitigating Flash Crowd Effect Using Connected Vehicle Technology, Vehicular Communications, Elsevier, vol. 2, no. 4, pp. 238–250, 2015
4. M. Seredynski, D. Khadraoui, F. Viti, Signal Phase and Timing (SPaT) for Cooperative Public Transport Priority Measures, Proc. 22nd ITS World Congress, Bordeaux, France, October 5-9, 2015 (best technical paper award)
5. M. Seredynski, P. Bouvry, Analysing the Development of Cooperation in MANETs Using Evolutionary Game Theory, Journal of Supercomputing, vol. 63, no. 3, pp. 854-870, Springer

Human resources involved in the project

Dr. Marcin Seredynski (male) is a head or innovation and research at the E-Bus Competence Center. He received his M.Sc. (2004) from the Warsaw University of Technology. In 2009 he defended his PhD thesis with the University of Luxembourg and Polish Academy of Sciences. Since then he was working as researcher in the field of intelligent transportation systems at the University of Luxembourg and Luxembourg Institute of Science and Technology. He has published over 50 peer-reviewed articles and serves as a steering board member of the academic network of the International Association of Public Transport (UITP). His research interests include trust management, electromobility and cooperative intelligent transportation systems.

Dr. Sune Nielsen (male) completed his M.Sc. in Electrical and Electronic Engineering in 2002 at the Technical University of Denmark (DTU) and proceeded with a career in software and electrical engineering. In 2016 he received his PhD in computer Science from the University of Luxembourg on topics including parallel and multi-objective optimisation algorithms. Currently his main research focus is on big data analysis and visualization in the context of electrified and autonomous public transport systems.

Infrastructure and technical equipment

Hybrid, plug-in hybrid, full electric buses and an autonomous electric hybrid bus.

4.1.13. EBU - European Blind Union

Description of the organisation and its products/services

The European Blind Union (EBU) is a non-governmental, non-profit-making European organisation founded in 1984. One of the six regional bodies of the World Blind Union, it represents the interests of Blind and Partially-Sighted (BPS) persons at European level.

EBU aims to protect and promote the interests of all BPS people in Europe and works towards an accessible and inclusive society with equal rights and opportunities for them to fully participate in all aspects of social, economic, cultural and political life.

With its large network of 41 national members, EBU brings together a wealth of knowledge and experience on visual impairment and its implications on the daily life of millions of Europeans. EBU provides a platform for its member organisations for the exchange of information, cooperation and collective actions to promote the rights and needs of more than 30 million BPS persons across continental Europe.

EBU's working activities include access to culture, to education, to information, ageing and the elderly, employment, rehabilitation and vocation training, rights, mobility and transport, technology, low vision, persons with additional disabilities including deafblind persons, and women. Work in these different areas is carried out by project groups and monitored by the EBU board. Part of the work undertaken by EBU, is also carried out with the direct support of national member organizations' staff and volunteers.

In addition to benefiting from an operating grant from the Rights, Equality and Citizenship Programme of the European Commission, EBU has coordinated a number of EC-recognized educational projects through the former Lifelong Learning Programme and, more recently, participated in FP7/H2020 projects.

Role and relevance in the project

With the support of its national members and experts from its Network on Access to Mobility and Transport, EBU will actively contribute to the PAsCAL project as follows:

- EBU will be responsible for identifying the obstacles, challenges and opportunities CAVs represent for BPS persons. Enhanced mobility perspectives offered by CAVs will be discussed as well as their subsequent direct and indirect impact during specific focus groups (FG) held in 4 EU member countries (1 per country). National reports will be drafted and compiled into a European one thus feeding the whole data collection and comparison process implemented in the framework of the PAsCAL project.
- Based on the needs and information collected, prioritised and compiled in the reports aforementioned, EBU will draft recommendations with a view to providing policy-makers with clear and fit-for-purpose guidance on how to make CAVs accessible also to BPS potential drivers while also contributing the BPS near-CAV pedestrians' perspectives.
- Finally, EBU will disseminate the project's progress and outcomes though the following modern, accessible and diversified information and awareness–raising channels: EBU website, EBU monthly newsletter (in English), EBU quarterly publication Focus (already available in English, French, German, Spanish and soon also in Serbian and Turkish), EBU podcast on Accessible Technologies (EBU Access Cast), Facebook and Twitter accounts and events (e.g. EBU 2019 General Assembly in Rome).

Projects

Project Name	Participant contributions	Project goal
eVADER (Electric Vehicle Alert for Detection and Emergency Response)	Funding programme: FP7 Funding scheme: CP-FP - Small or medium-scale focused research project Project number : 285095 End: 31/12/2014 EBU contributed to the organisation of tests involving BPS persons aiming to identify the best characteristics equipping future AVAS (Acoustic Vehicle Alerting System) on electric vehicles in the future.	To investigate the interior and exterior sound scape of electric vehicle for safe operation.
PRO4VIP (Innovative PROcurement for Visual Impaired People)	Funding programme: H2020 Fnding scheme: CSA - Coordination and support action Project number : 645584 End: 30/11/2016 EBU coordinated the organisation of focus groups in 3 EU member countries to identify and priorise partially-sighted persons' needs in terms of assistive devices.	To define a common innovation procurement roadmap to support the early detection and the screening of functional low vision conditions or would support the provision for low vision services.

Human Resources involved in the project

Romain FERRETTI (male) Project officer. Holding a NGO management degree and a languages degree, Romain FERRETTI has been in charge since 2008 of the administrative, operational and financial management of the EBU projects throughout Europe.

4.2. Third parties involved in the project (including use of third party resources)

The PasCal partners that subcontract will do so fully in lince with the following statement:

"The beneficiaries must base their contracts/subcontracts according to the principles for best value for money and absence of any conflict of interest (according to Articles 10, and 13 of AMGA). Beneficiaries that are 'contracting authorities' or 'contracting entities' (within the meaning of the EU public procurement Directives 2004/18/EC and 2004/17/EC or any EU legislation that replaces these Directives) must moreover comply with the applicable national law on public procurement."

Please complete, for each participant, the following table (or simply state "No third parties involved", if applicable):

Partner 2 ACI

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
If yes, please describe and justify the tasks to be subcontracted	
Does the participant envisage that part of its work is performed by linked third parties	Y
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party ACI Informatica is one of ACI's sister company. It is 100% owned by ACI which entrusts it with the development and maintenance of all its IT activities and ICT infrastructures. ACI Informatica is responsible for ACI's databases, therefore also for the members' DB, ACI might need ACI Informatica to extract the sample of partners to be involved in WP2 questionnaires. ACI Informatica is also in charge for specific operational activities of Ready2Go. Ready2Go is a network of franchised driving schools. ACI Informatica driving instructors will assist ACI in WP5 to develop the appropriate simulation environment to be used to assess training needs referred to all categories of road users; as well as develop and test the specific training program for trainers, drivers and professional drivers (i.e. tests in 5 cities).The educational modules on autonomous driving developed in PAsCAL will later become part of the R2G method. (8 Man Months are attributed to ACI informatica for this task) Finally, ACI Informatica will assist ACI with the task 6.3.2. at the Lainate Safe Driving Centre to carry out the driving tests. ACI Informatica will also be responsible for the use of the Lainate test track (5 days X 10.000 €/ total €50.000). (2 Manmonths are attributed for this task to ACI informatica) 6 trips are also reserved for ACI informatica to carry out the tests foreseen in tasks 5.5 and 6.3.2. Total costs = 188,306.25€	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

*P*artner 3 LuxMobility

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
If yes, please describe and justify the tasks to be subcontracted In the frame of task 8.1 and Deliverable 8.2 Luxmobility will develop a web based interface that allows for a multidimensional access to the generated PasCal research, findings and recommendations. The dimensions are based on KPT's, Pascal target groups, specific CAV developments. The open structure will allow to add new guides, findings and recommendations beyond the lifetime of the projected. The contracted work and costs are estimated on the basis of the work elements that consist of a specification of the general structure of the interface (4 Mandays), development of the user interface, and management of the interface of graphs and tables (for general reporting) (29 Mandays), testing of all interface functionalities (10 Mandays), inclusion of an Helpdesk (4 Manday) functioning and project management of the interface development(ICT related) (14 Mandays) + 10% (5 Mandays) to cover andy development risk (so estimated 66 Mandays at a rate of 800€) and 4200€ for any need of licences for part of the interface. Total costs 57.000 €	
Does the participant envisage that part of its work is performed by linked third parties[44]	N
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners[45] (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

Partner 8/ UBFC

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	N
If yes, please describe and justify the tasks to be subcontracted	
Does the participant envisage that part of its work is performed by linked third parties[46]	Y
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party Université Bourgogne Franche-Comté (UBFC) is a public institution of scientific, cultural and professional teaching established in Besançon, France which is set up in the form of Communauté d'Universites et d'Établissements (COMUE). Thus, UBFC federates numerous researchers and teachers-researchers employed by three public universities (uB, UFC, UTBM), three public engineer schools (ENSMM, AgroSup, ENSAM) and one private business school (BSB). The UBFC member institutions have decided that UBFC will undertake EU research projects submitted by research institutions of Burgundy and Franche-Comté that will act as linked third	

[44] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

[45] 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

[46] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

parties. Such a possibility has been confirmed by the EU Commission in a note from DG RTD/DDG1.J/LDW/JD/mv from June 27, 2016 In this project, UBFC acts for and through the ELLIADD laboratory (E.A. 4661), jointly operated by Université de Franche-Comté (UFC) and Université de Technologie Belfort- Montbéliard (UTBM). All ELLIADD permanent employees involved in PAsCAL project are members of the ERCOS research team, which is attached to UTBM and develops user-centric knowledge, design methods and tools. So permanent employees will appear as a UTBM contribution while the recruited staff will be directly recruited by UBFC. The UTBM's direct personal costs declared as actual costs is 148.902€, for an effort of 23,5 months. Total costs = 186,127.50€

Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners[47] (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

Partner 12 EBU

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
If yes, please describe and justify the tasks to be subcontracted In WP3, Engagement of at least 5 member organisations of EBU Luxembourg with E-Bus (total 40,000€). In WP6, To cover EBU member states in Luxembourg and Sweden (2 x 7544,37€) In task 3.2 a sample of 1,000 participants are needed to execute the surveys consisting of a sample this including blind and partially-sighted people will be recruited through local organisation in 5 EBU member states such as Germany, Spain, Slovenia, The Netherlands greater region of Luxembourg. An amount of 8.000 € is set per member state for the organisation to recruit the vulnerable to exclusion citizens (1000€), provide incentives (500€), organise the transport and accompaniment to the place where the panel experiments will take place and during the panel discussions, and use of specific equipment (2000€), assistance of the consortium in the organisation, reporting and interpretation of the results (€4500) (Total 5 x 8000€ = 40.000€) In SubTask 6.3.3 this corresponds to use of specific equipment and incentives (2500 €) and interpretation of results (4500€) in Luxembourg as the recruitment already has been done in WP3 and recruitment of vulnerable to exclusion citizens in Sweden, equipment and incentives (3544,37€) , interpretation of results (2000€) (2 x 7544,37= 15.088,75). Total subcontract (40.000 + 15088,75 = 55.088,75€).	
Does the participant envisage that part of its work is performed by linked third parties[48]	N
If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N

[47] 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

[48] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the Model Grant Agreement).

If yes, please describe the third party and their contributions	
Does the participant envisage that part of the work is performed by International Partners[49] (Article 14a of the General Model Grant Agreement)?	N
If yes, please describe the International Partner(s) and their contributions	

All other partners are not subcontracting, neither using linked third parties.

Section 5: Ethics and Security

5.1 Ethics - Self-Assessment of Ethics Issues

Does this research involve human participants? Yes

Detailed profiles of users will be carried out, including demographic variables (such as gender and level of education) and a range of psychological variables including attitudes, feelings, and personality traits need for cognition or openness to new experience.

To ensure gender equality and produce better quality research findings, equal consideration will be given to the life patterns, biological differences, needs and interests of both women and men.

Given the heterogeneous involvement of human participants, there will not be a single informed consent form. Forms and information sheets will be developed in the first two months of the project in WP2 and updated upon need. Generally, informed consent forms will contain name of the project, the name of responsible board members (cf. Ethical- and Data Advisory Boards, Tasks 2.1 & 2.3), the type of data collected, the reasons for collection of the data, the type of data processing including the possible combination of different data sources and parties involved in the processing and the length of the storage of the data. Additionally, participants will be informed in a detailed fashion about their upcoming involvement and that they can quit participation without any negative consequences at any time.

Thus, the consent form will be based on the template provided below:

“The data collected or logged during the experiment/pilot/study will be processed in order to draw conclusions about your opinion and design aspects that influence quality of service and levels of satisfaction. The treatment will be statistical and not per individual.

The personal data recorded consists of (specify/elaborate/customise):

• Any identification data entered by you, the participant;

• Technical information pertaining to the experiment (simulator/app/questionnaire…);

Your data will not be sold to third parties; nor will we allow third parties to use your data for their own purposes. However, backup services may be outsourced by (partner) to a third party service provider. (Partner) will ensure at all times that the third party service provider will be bound by an appropriate agreement in accordance with applicable data protection law, and ensuring at all times that your data will remain protected in accordance with at least the same standards as under the present privacy policy.

You can access, correct and delete your profile data at any time. You can also request a copy of personal data collected, to view and/or correct. You can request to delete any personal data collected as well as your account at any point. For any questions regarding your data or privacy protection, please contact us via privacy@pascal.eu.

(Partner) will implement appropriate technical and organisational measures and procedures in such a way that ensures the protection of your rights, and always in accordance with applicable data protection law.

In case of a breach of security leading to the accidental or unlawful destruction, loss, alteration, unauthorised disclosure of, or access to, your personal data, (Partner) will inform you of the breach without undue delay,

[49] ‘International Partner’ is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.

including a summary description of the potential impact and a recommendation on measures to mitigate the possible adverse effects of the breach.

All personal data collected will be anonymised by 31st December 2021. If the service remains in operation after this date, you will be notified by email at least a month prior to anonymisation, and be given the option to log in and accept a new consent form. After the anonymisation access to personal data will no longer be possible.

I have read and understood the terms, I am over 18, (sign or Press Accept)."

Are they volunteers for social or human sciences research? Yes

Most human participants involved, participation is voluntary with persons of legal age. Recruitment will be performed in writing, either on social networks or newsletter or by recruiting subscribed users of professional survey panels, such as for example Crowdflower or Respondi. Participants will be clearly informed of the objectives of the study for which they will be solicited, in accordance with the EU Regulation 2016/679 [Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)]. Samples will consist of either ad-hoc samples without exclusion criteria or of stratified samples where sociodemographic variables will be used to reach the according quotas. Informed consent forms will be provided to all participants before their participation.Geolocation data and the identity of the drivers of the vehicles involved in real-life piloting will be collected during the testing and deployment phases of the project; these data shall be carefully treated. In particular, the consent for testers and users of the system to be tracked will be guaranteed.

We will only work with voluntary users and who hold the required driving permits and with capability to understand how their data will be used in our research. Before starting our testing, we will inform our users clearly about the information we seek the purpose of seeking it and how it will be processed. Upon signing up to our pilot tests, users will be explicitly asked to sign up to the data protection policy of the project, separate from any other terms and conditions.

Are they vulnerable individuals or groups? Yes

Research involves blind and partially-sighted participants to be selected by EBU's national members in the countries concerned. Panels will reflect the diversity of the blind and partially-sighted population, in particular age, gender and degree of partial sight. EBU national members will recruit participants through their accessible information channels (paper and on-line publications, podcast, website, and social media).

As a European network defending the rights of millions of blind and partially-sighted citizens, EBU has always worked to make equality a reality. In the framework of the PAsCAL project, EBU will raise the consortium partners' awareness on the human right of any visually impaired reader, focus group participant or tester involved to receive accessible information, a right enshrined in article 21 "Freedom of expression and opinion, and access to information" of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and in articles 21 "Non-discrimination" and 26 "Integration of persons with disabilities" of the Charter of Fundamental Rights of the European Union. In particular, EBU will introduce common sense tools that can be easily implemented by partners to make information accessible (e.g. large print, contrasted text, alternative text for pictures or graphs, avoiding massive texts on powerpoint slides, etc.). Blind or partially-sighted staff, experts or volunteers of EBU will also be given the possibility, as always, to travel with a sighted guide if needed. Such combination of measures should minimise the risk of stigmatising visually impaired involved in the project, thus enforcing the motto of the European Disability Forum (which EBU is a founding member): "Nothing about us without us.".

Does your research involve personal data collection and/or processing? Yes

Ethics requirement #1: The host institution must confirm that it has appointed a Data Protection Officer (DPO) and the contact details of the DPO are made available to all data subjects involved in the research.

For host institutions not required to appoint a DPO under the GDPR a detailed data protection policy for the project must be kept on file (to be specified in the grant agreement).

Given the importance of personal data protection in the current project, resources are specifically devoted to develop guidelines to follow the GDPR and to ensure the full adherence to them within the project by means of an internal ethics committee. All activities will be bundled under WP2. Until the establishment of the ethics committee, the interim appointed DPO for the project is PhD Mauro Annibali, m.annibalidpo@aci.it, AutomobileClubItalia@pec.aci.it, phone +39 649982492 of ACI. These contact details will be made available to all data subjects involved in the research.

Ethics requirement #2: The beneficiary must explain how all of the data they intend to process is relevant and limited to the purposes of the research project (in accordance with the 'data minimisation 'principle). This must be specified in the grant agreement.

According to the 'data minimisation principle', we will ensure the personal data processed in PAsCAL will be 1. adequate (sufficient to properly fulfil your stated purpose); 2. relevant (has a rational link to that purpose); and 3. limited to what is necessary (you do not hold more than you need for that purpose). In this context, the personal data following will be collected and stored:

- firstname and postname;
- email address or any means of contact;
- gender;
- age;
- questionnaires answering (especially questionnaires on user acceptance);
- drivers' behavior in simulated environments;
- data recorded by simulators (scenarios, timeline, vehicule behaviors, etc.)

Ethics requirement #3: Detailed information on the procedures for data collection, storage, protection, retention, and destruction, and confirmation that they comply with national and EU legislation must be kept on file (to be specified in the grant agreement).

In WP2 we will outline detailed procedures to prevent unauthorised access to personal data, including who has access to which data. All personal data will be stored on password-protected computers or flash-drives at all times. In addition, personal data will be stored in encrypted format, for example using Ubuntu (Linux) servers with encrypted Ext4 file systems. Data cannot be decrypted without the encryption keys, therefore even if it is stolen, personal information cannot be used by third parties. Where necessary, we will limit remote access to personal data by using a firewall. Servers will only be accessible from the production servers, backup servers and a private VPN.

Data will be stored and processed in Luxembourg. The Luxembourg Institute of Technology (LIST) will be the host and the Controller/Processor. Data Controllers will enforce the following measures:

- Data will be backed-up regularly. The exact period will depend on how often new data is collected. Data back-up will preferably be off-site. Since all Controllers have more than one buildings, data will be backed-up to a safe location at another building.
- Server hard-disks will be also mirrored.
- Personal data stored in the platform and backup data will be encrypted.
- Communications between servers and applications will be encrypted.
- Servers will be installed behind firewalls.
- In the case of data breach, users as well as corresponding DPA(s) will be immediately notified. The Controller will take action against the infringing individual(s) and revise the security policy accordingly.
- If a user asks for a copy of her/his personal data collected so far, the Controller should be able to provide a copy, preferably in XML format.

- Data will be deleted in the case of an explicit request by user/participant. In the case of data deletion, data will be also deleted from backups. In this case, a new encrypted, full backup will replace existing older backups.

Ethics requirement #4: A description of the technical and organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants must be specified in the grant agreement.

Data will be stored and transferred using EU based services such as redmine (https://www.redmine.org/).

The controller[50] shall, at the time when personal data are obtained, provide the data subject with the following further information necessary to ensure fair and transparent processing:

- the period for which the personal data will be stored, or if that is not possible, the criteria used to determine that period;
- the existence of the right to request from the controller access to and rectification or erasure of personal data or restriction of processing concerning the data subject or to object to processing as well as the right to data portability;
- where the processing is based on subject's consent, the existence of the right to withdraw consent at any time, without affecting the lawfulness of processing based on consent before its withdrawal;
- the right to lodge a complaint with a supervisory authority;
- the existence of automated decision-making, including profiling, referred to in Article 22(1)1 and (4)2 and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.

Only data pertinent to the purpose of the project will be collected. Data that turns out not to be relevant during the project will not be collected in subsequent stages. Personal data will be deleted after the end of exploitation activities (e.g. scientific publications) or at least 2 years after the end of the project.

Ethics requirement #5: Detailed information on the informed consent procedures with regards to data processing must be kept on file (to be specified in the grant agreement).

PAsCAL guarantees that collected and stored data cannot be traced back to the identity of the research participant. For data that has to be handed-over within projects (repeated-measures designs), pseudonymisation matching techniques will be used. That is, within questionnaires, anonymous keys will be generated (e.g. first letter of first name of mother, last number of day of birth of father, third letter of place of birth). Personal data will not be stored at all unless needed for participant compensation. This information will be stored independent of the research data so answers/behaviors cannot be linked to person identity.

Ethics requirement #6: Description of the anonymysation/pseudonymisation techniques that will be implemented must be specified in the grant agreement.

All personal data collected will be anonymised by December 31st 2021. If the partner wants to keep offering the service either as a Controller or through another legal entity, users have to be notified and explicitly give their consent. To this end, at least a month prior to anonymisation, the user will be notified by email and be given the option to log in and accept the new consent form. If the user does not accept the new consent form, his/her personal data will be anonymised. The user retains the right at anytime prior to data anonymisation to ask for the deletion and/or for a copy of her/his personal data. Anonymised data will be extracted according to the PAsCAL Open Data policy.

[50] 'Controller' means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law.

The Sampling method will be used to anonymise the data (extract from the report "Anonymisation: managing data protection risk code of practice", Information Commissioner's Office - https://ico.org.uk/media/1061/anonymisation-code.pdf). Sampling is one of the non-perturbative methods in anonymisation techniques, suitable when the original data is in sufficient quantity to make a sample meaningful. Instead of publishing the original microdata file, we take a sample from it and publish that without identifiers. The resulting sample may contain information which is sensitive and which in other circumstances could be quite disclosive. However, because there is no way of knowing whether a particular individual's data is included in the sample, it is unlikely, though not impossible, that it would actually be disclosive.

Ethics requirement #7: In case the research involves profiling, the beneficiary must provide explanation how the data subjects will be informed of the existence of the profiling, its possible consequences and how their fundamental rights will be safeguarded. This must be specified in the grant agreement.

The PAsCAL consortium appreciate that the use of personal data in profiling processing is a particularly sensitive issue both from a legal and from an ethical point of view. In PAsCAL, profiling is a type of processing that the Data Controller would strongly advise against; this refers both to profiling being carried out by PAsCAL partners themselves (for instance, affecting their hiring policies) and to such processing being technically enabled so as to be undertaken by third parties (particularly, state law enforcement agencies).

Although it is possible that profiling might prove useful under certain circumstances (for instance, its contribution to security purposes is widely discussed), the Data Controller believes that such personal data processing is incompatible with the PAsCAL project purposes. In addition, the legal and technical conditions under which it may be allowed, under data protection law, are too complex to observe within the PAsCAL project context, and its risks would far outweigh its potential benefits. Its recommendation is therefore to abstain for undertaking or enabling such processing as much as possible during project execution.

In any situation where the research involves profiling, the involved beneficiary in PAsCAL will provide explanation how the data subjects will be informed of the existence of the profiling, its possible consequences and how their fundamental rights will be safeguarded.

Ethics requirement #8: In case of further processing of previously collected personal data, relevant authorisations that the beneficiary has lawful basis for the data processing and that the appropriate technical and organisational measures are in place to safeguard the rights of the data subjects must be kept on file (to be specified in the grant agreement).

PAsCAL will involve personal data collection, processing and analysis, but it is not explicitly defined that the project will involve further processing of previously collected personal data. However, in any situation in which re-using of data in PAsCAL is needed, the following information will be provided:

- Details of the database used or the source of data.
- Confirmation of open public access to the data or of authorisation for secondary use. More specifically, detail how this consent was obtained specifically in case of public archives usage (automatic opt in, etc.).

Ethics requirement #9: All relevant authorisations that the data used in the project is publicly available and can be freely used for the purposes of the project must be kept on file (to be specified in the grant agreement).

Access to data will be restricted. Data processing access to servers will take place only from specific IPs/MAC address and only from specified users. All access will be recorded and processing actions will be logged, including at least username, timestamp, action performed and data extracted. Different persons will be assigned to data processors and system managers roles to minimise the risk for data breach. Apart from

the log files kept, each time an extract operation of personal data is performed (i.e. an operation which results in a bulk of data for offline processing), system managers and pilot responsible will automatically notified by email. All servers will be installed in limited access rooms. If a PAsCAL partner requests access to data hosted by a Controller, the Controller will process the request and extract anonymised statistics to send to the partner.

Ethics requirement #10: The beneficiary must evaluate the ethics risks related to the data processing activities of the project. This includes also an opinion if data protection impact assessment should be conducted under art.35 General Data Protection Regulation 2016/679. The risk evaluation and the opinion must be kept on file (to be specified in the grant agreement).

Considering the sensitive nature of the data which will be processed and the categories of data subjects who will be involved, an assessment of the impact of the envisaged data processing in the Project will be carried out by the DPO of the Data Controller before the processing takes place. This assessment will be carried out with the partners involved in the processing of the personal data within the project under the responsibility of the Data Controller. The assessment will contain the description of the envisaged processing operations, the purposes and objectives, an assessment of the necessity and proportionality of the envisaged data processing operations with regards to the objectives of the project, an assessment of the risks to the rights of the data subjects involved and all measured which will be taken to protect them as well as to address the identified risks.

Does it involve the processing of special categories of personal data (e.g. genetic, health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction.)? Yes

This is related to the special attention paid within the project to Blind and Partially-Sighted (BPS) people. Their inclusions is necessary as they could benefit as a group from the introduction of CAV solutions. The data collected will contain the degree of visual impairment.

At the simulation and pilot stages of the project, the human participants will be placed in immersive reality environments or test environments containing CAVs respectively. The direct experiences made are indispensable for the comprehensive understanding of the CAV acceptance. We do not foresee any risk to the health or dignity of the involved participants.

Does it involve processing of genetic, biometric or health data? Yes

We will combine different physiological and biometric measurements during the simulations, in order to try and evaluate as accurately as possible physiological responses as a sign of stress. To do this, we plan to measure:

1. Body temperature (adhesive sensors for skin temperature, swallowable capsule for internal temperature);
2. Heart rate (adhesive electrodes or chest belt);
3. Stress hormone (collection of saliva for cortisol titration, of urine for catecholamines titration).

We will also use an eye-tracking system for observing eye-behaviour. It allows cognitive inferences about participants' attention, understanding of the displayed elements and cognitive load during the interaction.

Does it involve profiling, systematic monitoring of individuals or processing of large scale of special categories of data, intrusive methods of data processing (such as, tracking, surveillance, audio and video recording, geo-location tracking etc.) or any other data processing operation that may result in high risk to the rights and freedoms of the research participants? Yes

1. In order to monitor the advantages brought up by PAsCAL during real-life pilots and simulations, it is necessary to maintain a database with personal information and additional information such as location. Without the possibility of keeping this data the project would not be realizable, as behavior

analyses and self reports from interviews/surveys are required. Behavior will be assessed using geolocation of CAVs, video and audio recording and biometric data mentioned above such as eye tracking during simulations.

2. User profiling in PAsCAL will be achieved by combining different types of data. These will include acceptance measures collected in self reports and behavior exhibited during simulations or pilots described above.
3. Data processing risk assessment will be undertaken for all data collection activities in the PAsCAL project to meet the requirements according to GDPR. We do not anticipate high risk processing. Specifically, given the data security measures taken, unauthorized access is unlikely. Additionally, in case of unauthorized access, no large scale data will be available. Only limited numbers of people will be concerned since the overall number is limited and data collection is distributed across project partners. Also no novel types of data processing posing possibly unanticipated risk will be performed.
4. Apps and real CAVs to be used in WP6 will be checked by company's DPOs and will have to prove to meet GDPR requirements before usage. Access policies, consent and pseudonymisation are, among others, aspects that should be taken into consideration to prevent harm to the rights of the research participants.
5. The consent for testers and users of the system to be tracked will be guaranteed. We will inform participants upfront about the information we seek and the purpose of seeking it. Upon signing up to our pilot tests, participants will be explicitly asked to sign up to the data protection policy of the project, separate from any other terms and conditions.

Does your research involve further processing of previously collected personal data (including use of pre- existing data sets or sources, merging existing data sets)? Yes

The customer databases from ExaMotive S.A. and ACI will be used for recruitment purposes. Additionally, the databases of ExaMotive S.A. will be used for re-analyses of customer profiles. In all cases, data will be anonymized or pseudonymised before being handed over to PAsCAL project partners.

5.2 Security[51]

Please indicate if your project will involve:

- activities or results raising security issues: NO
- EU-classified information' as background or results: NO

According to the objectives and results expected during PAsCAL's real-life piloting, the project involves activities or results raising minor security issues (e.g. driving on a test track).

The PAsCAL Consortium shall check that all vehicles involved in the testing are insured according to EU and national regulations, and in addition that all drivers involved hold the necessary driving permits.

Last but not least, we confirm the proposed project does not entail any 'EU-classified information' as background or results.

Despite the fact that PAsCAL is not security sensitive, before any project testing results' publication, (if appropriate) the Commission will be contacted for authorisation.

[51] See article 37 of the Model Grant Agreement. . For more information on the classification of Information, please refer to the Horizon 2020 guidance: https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/secur/h2020-hi-guide-classif_en.pdf.

ESTIMATED BUDGET FOR THE ACTION

Associated with document Ref. Ares(2019)2581271 - 12/04/2019

	Estimated eligible[1] costs (per budget category)										EU contribution			Additional information		
	A. Direct personnel costs				B. Direct costs of subcontracting	*[C. Direct costs of fin. support]*	D. Other direct costs		E. Indirect costs[2]	Total costs	Reimbursement rate %	Maximum EU contribution[3]	Maximum grant amount[4]	Information for indirect costs	Information for auditors	Other information:
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons *[A.6 Personnel for providing access to research infrastructure]*		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary				D.1 Travel D.2 Equipment D.3 Other goods and services *[D.4 Costs of large research infrastructure]*	D.5 Costs of internally invoiced goods and services						Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/ linked third parties not receiving funding/ international partners
Form of costs[6]	Actual	Unit[7]	Unit[8]		Actual	Actual	Actual	Unit[9]	Flat-rate[10] 25%							
	a	Total b	No hours	Total c	d	*[e]*	f	Total g	h = 0,25 x (a +b+c+f+g +*[i1]*[13]+*[i2]*[13]-n)	j = a+b+c+d +*[e]*+f+g+h +*[i1]*+*[i2]*	k	l	m	n	Yes/No	
1. LIST	0.00	406 626.00	0.00	0.00	0.00	0.00	51 800.00	0.00	114 606.50	573 032.50	100.00	573 032.50	573 032.50	0.00	No	n/a
2. ACI	211 858.00	0.00	0.00	0.00	0.00	0.00	42 600.00	0.00	63 614.50	318 072.50	100.00	318 072.50	318 072.50	0.00	No	n/a
- ACI INFORMATICA	95 845.00	0.00	0.00	0.00	0.00	0.00	54 800.00	0.00	37 661.25	188 306.25	100.00	188 306.25	188 306.25	0.00	No	n/a
Total beneficiary	307 703.00	0.00			0.00	0.00	97 400.00	0.00	101 275.75	506 378.75		506 378.75	506 378.75	n/a	n/a	0.00
3. LuxMobility	276 000.00	0.00	0.00	0.00	57 000.00	0.00	32 000.00	0.00	77 000.00	442 000.00	100.00	442 000.00	442 000.00	0.00	No	n/a
4. RDS Driving	177 502.00	0.00	0.00	0.00	0.00	0.00	22 100.00	0.00	49 900.50	249 502.50	100.00	249 502.50	249 502.50	0.00	No	n/a
5. ETELÄTÄR	279 500.00	0.00	0.00	0.00	0.00	0.00	59 400.00	0.00	84 725.00	423 625.00	100.00	423 625.00	423 625.00	0.00	No	n/a
6. UNIVLEEDS	404 800.00	0.00	0.00	0.00	0.00	0.00	16 200.00	0.00	105 250.00	526 250.00	100.00	526 250.00	526 250.00	0.00	No	n/a
7. LIV	51 256.00	0.00	0.00	0.00	0.00	0.00	25 900.00	0.00	19 289.00	96 445.00	100.00	96 445.00	96 445.00	0.00	No	n/a
8. UBFC	16 102.00	0.00	0.00	0.00	0.00	0.00	27 000.00	0.00	10 775.50	53 877.50	100.00	53 877.50	53 877.50	0.00	No	n/a
- UTBM	148 902.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37 225.50	186 127.50	100.00	186 127.50	186 127.50	0.00	No	n/a
Total beneficiary	165 004.00	0.00			0.00	0.00	27 000.00	0.00	48 001.00	240 005.00		240 005.00	240 005.00	n/a	n/a	0.00
9. ExaMotive S.A.	117 047.00	0.00	0.00	0.00	0.00	0.00	19 050.00	0.00	34 024.25	170 121.25	100.00	170 121.25	170 121.25	0.00	No	n/a
10. UMA	178 350.00	0.00	0.00	0.00	0.00	0.00	33 000.00	0.00	52 837.50	264 187.50	100.00	264 187.50	264 187.50	0.00	No	n/a
11. E-Bus	61 200.00	0.00	0.00	0.00	0.00	0.00	30 800.00	0.00	23 000.00	115 000.00	100.00	115 000.00	115 000.00	0.00	No	n/a
12. EBU	41 480.00	0.00	0.00	0.00	55 088.75	0.00	8 800.00	0.00	0.00	105 368.75	100.00	105 368.75	105 368.75	0.00	No	n/a
13. RDGFI	187 200.00	0.00	0.00	0.00	0.00	0.00	22 500.00	0.00	52 425.00	262 125.00	100.00	262 125.00	262 125.00	0.00	No	n/a
Total consortium	2 247 042.00	406 626.00		0.00	112 088.75	0.00	445 950.00	0.00	762 334.50	3 974 041.25		3 974 041.25	3 974 041.25			0.00

[1] See Article 6 for the eligibility conditions.
[2] Indirect costs already covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary/linked third party that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant, unless it can demonstrate that the operating grant does not cover any costs of the action (see Article 6.2.E).
[3] This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Agency decided to grant for the action) (see Article 5.1).
[4] The 'maximum grant amount' is the maximum grant amount decided by the Agency. It normally corresponds to the requested grant, but may be lower.
[5] Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies.
[6] See Article 5 for the forms of costs.
[7] Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to the beneficiary's usual accounting practice.
[8] See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).
[9] Unit and costs per unit : calculated according to the beneficiary's usual accounting practices.
[10] Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E).
[11] See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).
[12] See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc).
[13] Only specific unit costs that do not include indirect costs.
[14] See Article 9 for beneficiaries not receiving funding.
[15] Only for linked third parties that receive funding.

ANNEX 2a

ADDITIONAL INFORMATION ON THE ESTIMATED BUDGET

- **Instructions and footnotes in blue will not appear in the text generated by the IT system (since they are internal instructions only).**
- **For options *[*in square brackets*]*: the applicable option will be chosen by the IT system. Options not chosen will automatically not appear.**
- **For fields in [grey in square brackets] (even if they are part of an option as specified in the previous item): IT system will enter the appropriate data.**

⚠ **Transitory period: Until SyGMa fully supports Annex 2a, you must prepare it manually (using this template by choosing and deleting the options/entering the appropriate data).**
For the 'unit cost tables': either fill them out manually or use currently existing tables from Annex 1 or the proposal.
The document can then be uploaded in SyGMa and attached to the grant agreement.

Unit cost for SME owners/natural beneficiaries without salary

1. Costs for a *[*SME owner*][*beneficiary that is a natural person*]* not receiving a salary

Units: hours worked on the action

Amount per unit ('hourly rate'): calculated according to the following formula:

{the monthly living allowance for researchers in MSCA-IF actions / 143 hours}
multiplied by
{country-specific correction coefficient of the country where the beneficiary is established}

The monthly living allowance and the country-specific correction coefficients are set out in the Work Programme (section 3 MSCA) in force at the time of the call:

- for calls *before* Work Programme 2018-2020:
  - for the monthly living allowance: **EUR 4 650**
  - for the country-specific correction coefficients: see Work Programme 2014-2015 and Work Programme 2016-2017 (available on the Participant Portal Reference Documents page)
- for calls *under* Work Programme 2018-2020:
  - for the monthly living allowance: **EUR 4 880**
  - for the country-specific correction coefficients: see Work Programme 2018-2020 (available on the Participant Portal Reference Documents page)

[additional OPTION for beneficiaries/linked third parties that have opted to use the unit cost (in the proposal/with an amendment): For the following beneficiaries/linked third parties, the amounts per unit (hourly rate) are fixed as follows:

- beneficiary/linked third party [short name]: EUR [insert amount]
- beneficiary/linked third party [short name]: EUR [insert amount]

[same for other beneficiaries/linked third parties, if necessary] *]*

Estimated number of units: see Annex 2

Energy efficiency measures unit cost

2. Costs for energy efficiency measures in buildings

Unit: m^2 of eligible 'conditioned' (i.e. built or refurbished) floor area

Amount per unit*: see (for each beneficiary/linked third party and BEST table) the 'unit cost table' attached

* Amount calculated as follows:
{EUR 0.1 x estimated total kWh saved per m^2 per year x 10}

Estimated number of units: see (for each beneficiary/linked third party and BEST table) the 'unit cost table' attached

Unit cost table (energy efficiency measures unit cost)[1]

Short name beneficiary/linked third party	BEST No	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)

[1] Data from the 'building energy specification table (BEST)' that is part of the proposal and Annex 1.

Research infrastructure unit cost

3. Access costs for providing trans-national access to research infrastructure

Units[2]: see (for each access provider and installation) the 'unit cost table' attached

Amount per unit*: see (for each access provider and installation) the 'unit cost table' attached

* Amount calculated as follows:

$$\frac{\text{average annual total access cost to the installation (over past two years[3])}}{\text{average annual total quantity of access to the installation (over past two years[4])}}$$

Estimated number of units: see (for each access provider and installation) the 'unit cost table' attached

Unit cost table (access to research infrastructure unit cost)[5]

Short name access provider	Short name infrastructure	Installation		Unit of access	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)
		No	Short name				

Clinical studies unit cost

4. Costs for clinical studies

Units: patients/subjects that participate in the clinical study

Amount per unit*: see (for each sequence (if any), clinical study and beneficiary/linked third party) the 'unit cost table' attached

* Amount calculated, for the cost components of each task, as follows:

For **personnel costs**:

For personnel costs of doctors: 'average hourly cost for doctors', i.e.:

{certified or auditable total personnel costs for doctors for year N-1

{1720 * number of full-time-equivalent for doctors for year N-1}
multiplied by
estimated number of hours to be worked by doctors for the task (per participant)**}**

For personnel costs of other medical personnel: 'average hourly cost for other medical personnel', i.e.:

{certified or auditable total personnel costs for other medical personnel for year N-1

{1720 * number of full-time-equivalent for other medical personnel for year N-1}

2 Unit of access (e.g. beam hours, weeks of access, sample analysis) fixed by the access provider in proposal.
3 In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.
4 In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.
5 Data from the 'table on estimated costs/quantity of access to be provided' that is part of the proposal and Annex 1.

multiplied by
estimated number of hours to be worked by other medical personnel for the task (per participant)**}**

For personnel costs of technical personnel: **'**average hourly cost for technical personnel', i.e.:

{certified or auditable total personnel costs for technical personnel for year N-1

{1720 * number of full-time-equivalent for technical personnel for year N-1}
multiplied by
estimated number of hours to be worked by technical personnel for the task (per participant)**}**

'total personnel costs' means actual salaries + actual social security contributions + actual taxes and other costs included in the remuneration, provided they arise from national law or the employment contract/equivalent appointing act

For **consumables**:

For each cost item: 'average price of the consumable', i.e.:

{{certified or auditable total costs of purchase of the consumable in year N-1

total number of items purchased in year N-1}
multiplied by
estimated number of items to be used for the task (per participant)**}**

'total costs of purchase of the consumable' means total value of the supply contracts (including related duties, taxes and charges such as non-deductible VAT) concluded by the beneficiary for the consumable delivered in year N-1, provided the contracts were awarded according to the principle of best value- for-money and without any conflict of interests

For **medical equipment**:

For each cost item: 'average cost of depreciation and directly related services per unit of use', i.e.:

{{ certified or auditable total depreciation costs in year N-1 + certified or auditable total costs of purchase of services in year N-1 for the category of equipment concerned}

total capacity in year N-1
multiplied by
estimated number of units of use of the equipment for the task (per participant)**}**

'total depreciation costs' means total depreciation allowances as recorded in the beneficiary's accounts of year N-1 for the category of equipment concerned, provided the equipment was purchased according to the principle of best value for money and without any conflict of interests + total costs of renting or leasing contracts (including related duties, taxes and charges such as non-deductible VAT) in year N-1 for the category of equipment concerned, provided they do not exceed the depreciation costs of similar equipment and do not include finance fees

For **services**:

For each cost item: 'average cost of the service per study participant', i.e.:

{certified or auditable total costs of purchase of the service in year N-1

total number of patients or subjects included in the clinical studies for which the service was delivered in year N-1**}**

'total costs of purchase of the service' means total value of the contracts concluded by the beneficiary (including related duties, taxes and charges such as non-deductible VAT) for the specific service delivered in year N-1 for the conduct of clinical studies, provided the contracts were awarded according to the principle of best value for money and without any conflict of interests

For **indirect costs**:

{{{cost component 'personnel costs' + cost component 'consumables' + cost component 'medical equipment'}

minus

{costs of in-kind contributions provided by third parties which are not used on the beneficiary's premises + costs of providing financial support to third parties (if any)}**}**

multiplied by

25%**}**

The estimation of the resources to be used must be done on the basis of the study protocol and must be the same for all beneficiaries/linked third parties/third parties involved.

The year N-1 to be used is the last closed financial year at the time of submission of the grant application.

Estimated number of units: see (for each clinical study and beneficiary/linked third party) the 'unit cost table' attached

Unit cost table: clinical studies unit cost[6]

Task, Direct cost categories	**Resource per patient**	**Costs year N-1 Beneficiary 1 [short name]**	**Costs year N-1 Linked third party 1a [short name]**	**Costs year N-1 Beneficiary 2 [short name]**	**Costs year N-1 Linked third party 2a [short name]**	**Costs year N-1 Third party giving in-kind contributions 1 [short name]**
Sequence No. 1						
Task No. 1 Blood sample						
(a) **Personnel costs:** - Doctors	n/a					
- Other Medical Personnel	Phlebotomy (nurse), 10 minutes	8,33 EUR	11,59 EUR	10,30 EUR	11,00 EUR	9,49 EUR
- Technical Personnel	Sample Processing (lab technician), 15 minutes	9,51 EUR	15,68 EUR	14,60 EUR	15,23 EUR	10,78 EUR
(b) **Costs of consumables**:	Syringe	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Cannula	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Blood container	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) **Costs of medical equipment**:	Use of -80° deep freezer, 60 days	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	Use of centrifuge, 15 minutes	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) **Costs of services**	Cleaning of XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) **Indirect costs** (25% flat-rate)		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
Task No. 2						
…						
Amount per unit (unit cost sequence 1):		**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**
Sequence No. 2						
Task No. 1						

[6] Same table as in proposal and Annex 1.

XXX						
(a) **Personnel costs:** - Doctors	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Other Medical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
- Technical Personnel	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(b) **Costs of consumables**:	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(c) **Costs of medical equipment**:	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(d) **Costs of services**	XXX	XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
(e) **Indirect costs** (25% flat-rate)		XX EUR	XX EUR	XX EUR	XX EUR	XX EUR
Task No. 2						
…						
Amount per unit (unit cost sequence 2):		**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**
…						
Amount per unit (unit cost entire study):		**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**	**XX EUR**

1

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AUTOMOBILE CLUB D ITALIA (ACI), established in VIA MARSALA 8, ROMA 00185, Italy, VAT number: IT00907501001, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

LUXMOBILITY S.A.R.L. (LuxMobility), established in 70, Boulevard de la Fraternite, Luxembourg L-1541, Luxembourg, VAT number: LU26663075, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Patrick VAN EGMOND with ECAS id negmonpa signed in the Participant Portal on 09/05/2019 at 15:20:04 (transaction id SigId-2670-UnnUXUREB6fGVpOQKR6K1SYiXCT8eGyrFKbbXLEYGAuYuSp91MNGmWlsMkG2gwCJ38Ovv8bJdXlCGnq0eNUeDW-rS0vSrmBGYCAF7GxdOQa8O-Eql5zaxq9oUpTg0J2t67lQFQaLaoAWXZrcW0WFF23HG). Timestamp by third party at Thu May 09 16:20:12 CEST 2019

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

RDS DRIVING SERVICES LIMITED (RDS Driving), established in PAVILION 6, COXWOLDS WAY, BELASIS TECH PARK, BILLINGHAM TS23 4EA, United Kingdom, VAT number: GB198193557, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ETELÄTÄR INNOVATION OÜ (ETELÄTÄR), established in NARVA MAANTEE 5, HARJU MAAKOND KESKLINNA LINNAOSA, TALLINN 10117, Estonia, VAT number: EE101823966, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

José Francisco Papí Ferrando with ECAS id npapifej signed in the Participant Portal on 06/05/2019 at 16:09:50 (transaction id SigId-139592-h63zwH9sDzy2NpKXWB87WEpb886baTRjzho7gXBrymRdAB8HhsagrJ0EyrtXIHcsCRoofvPZS7fyxCLBOD2cRd0-jpJZscgsw0KN09GwxKpZgW-Pq7Z3dVjRKQqSbxbzL6WT4DPmzW0EqPiNXrzgvBzw3VL). Timestamp by third party at Mon May 06 17:09:56 CEST 2019

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITY OF LEEDS (UNIVLEEDS), established in WOODHOUSE LANE, LEEDS LS2 9JT, United Kingdom, VAT number: GB613451470, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Ceri WILLIAMS with ECAS id nwiliace signed in the Participant Portal on 07/05/2019 at 13:42:15 (transaction id SigId-151274-nSV37gGgtELgyRqMD7a6WGwapXuLmnt6pvltzPkwYKAAZ3rrJFyzQeqxvWp9DKUB6gzmoK0A8dn3s7LNJc7OrO0-jpJZscgsw0KN09GwxKpZgW-XhGhf0YPuNNbSTyaFXPU093r3NtzM4i3IXQzLD24Ffsm). Timestamp by third party at Tue May 07 14:42:20 CEST 2019

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THE UNIVERSITY OF LIVERPOOL (LIV), established in BROWNLOW HILL 765 FOUNDATION BUILDING, LIVERPOOL L69 7ZX, United Kingdom, VAT number: GB673598875, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

David MCVEY with ECAS id nveydavi signed in the Participant Portal on 07/05/2019 at 09:48:06 (transaction id SigId-145838-LxVOsViKilbCzPzIJwG46379GjizIY8lBgCDtTyuJF8LFLnOgKFAyhKToy10qkx9bHW7QhNwzrkswN3NYNRbyUe-jpJZscgsw0KN09GwxKpZgW-yaYl7ssDtlPRB4v7pScxmogCd3r1kWdJLUNVr8ECjZ0). Timestamp by third party at Tue May 07 10:48:12 CEST 2019

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

COMMUNAUTE D' UNIVERSITES ET ETABLISSEMENTS UNIVERSITE BOURGOGNE - FRANCHE - COMTE (UBFC), established in 32 AVENUE DE L'OBSERVATOIRE, BESANCON 25000, France, VAT number: FR37130020910, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

EXAMOTIVE SA (ExaMotive S.A.), established in AVENUE DU BLUES 9, BELVAUX 4386, Luxembourg, VAT number: LU28292684, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITAET MANNHEIM (UMA), established in SCHLOSS, MANNHEIM 68131, Germany, VAT number: DE143845342, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

E-BUS COMPETENCE CENTER S.A.R.L (E-Bus), established in 1, RUE FONTEBIERG, LIVANGE 3381, Luxembourg, VAT number: LU27977245, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNION EUROPEENNE DES AVEUGLES UEAASSOCIATION (EBU), established in RUE GAGER GABILLOT 6, PARIS 75015, France, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('12')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Mokrane BOUSSAÏD with ECAS id nboussme signed in the Participant Portal on 13/05/2019 at 09:34:44 (transaction id SigId-5707-UaOwdAdORKrOyKPgj7yd3AckGFER6a3Zzh58rw0HJBH2ezhL0oMqBhuKs7EfdDm3zdGFd97rR2zzhUtQNRSzzHwO-jpJZscgsw0K0Gq8XWOOM38-RKbRzznxcVRoQzqwvS09PucyOxmaZD8QC0Swqm6v4px0). Timestamp by third party at Mon May 13 10:34:50 CEST 2019

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

REALDOLMEN NV (RDGFI), established in A VAUCAMPSLAAN 42, HUIZINGEN 1654, Belgium, VAT number: BE0429037235, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('13')

in Grant Agreement No 815098 ('the Agreement')

between LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY **and** the Innovation and Networks Executive Agency (INEA) ('the Agency'), under the powers delegated by the European Commission ('the Commission'),

for the action entitled 'Enhance driver behaviour and Public Acceptance of Connected and Autonomous vehicLes (PAsCAL)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ⓘ print format A4 landscape

MODEL ANNEX 4 FOR H2020 GENERAL MGA — MULTI

Associated with document Ref. Ares(2019)2581271 - 12/04/2019

FINANCIAL STATEMENT FOR *[BENEFICIARY [name]/ LINKED THIRD PARTY [name]]* FOR REPORTING PERIOD [reporting period]

	Eligible[1] costs (per budget category)													Receipts	EU contribution			Additional information
	A. Direct personnel costs				B. Direct costs of subcontracting	*[C. Direct costs of fin. support]*	D. Other direct costs			E. Indirect costs[2]	*[F. Costs of …]*		Total costs	Receipts	Reimbursement rate %	Maximum EU contribution[3]	Requested EU contribution	Information for indirect costs :
	A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons *[A.6 Personnel for providing access to research infrastructure]*		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary			*[C.1 Financial support]* *[C.2 Prizes]*	D.1 Travel D.2 Equipment D.3 Other goods and services	*[D.4 Costs of large research infrastructure]*	D.5 Costs of internally invoiced goods and services		*[F.1 Costs of …]*	*[F.2 Costs of …]*		Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3				Costs of in-kind contributions not used on premises
Form of costs[4]	Actual	Unit	Unit		Actual	Actual	Actual	Actual	Unit	Flat-rate[5] 25%	Unit		*[Unit][Lump sum]*					
	a	Total b	No hours	Total c	d	*[e]*	f	*[g]*	Total h	i=0,25 x (a+b+ c+f+*[g]* + h+ *[j 1]*[6] +*[j2]*[6] -p)	No units	Total *[j1]*	Total *[j2]*	k = a+b+c+d+*[e]* +*f* + *[g]* +h+ i + *[j1]* +*[j2]*	l	m	n	o	p
[short name beneficiary/linked third party]																		

The beneficiary/linked third party hereby confirms that:
The information provided is complete, reliable and true.
The costs declared are eligible (see Article 6).
The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).
For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

ⓘ Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

[1] See Article 6 for the eligibility conditions

[2] The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.2.E). If you have received an operating grant during this reporting period, you cannot claim indirect costs unless you can demonstrate that the operating grant does not cover any costs of the action.

[3] This is the *theoretical* amount of EU contribution that the system calculates automatically (by multiplying the reimbursement rate by the total costs declared). The amount you request (in the column 'requested EU contribution') may be less,

[4] See Article 5 for the forms of costs

[5] Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E)

[6] Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- **For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.**
- **For fields in [grey in square brackets]: enter the appropriate data**

TABLE OF CONTENTS

Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the '**Terms of Reference (ToR)**' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[**insert legal name of the auditor**] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the Financial Statement(s)[1] drawn up by the *[Beneficiary] [Linked Third Party]* for the Horizon 2020 grant agreement [insert number of the grant agreement, title of the action, acronym and duration from/to] ('the Agreement'), and

to issue a Certificate on the Financial Statements' ('CFS') referred to in Article 20.4 of the Agreement based on the compulsory reporting template stipulated by the Commission.

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and *[OPTION 1: the European Union, represented by the European Commission ('the Commission')][OPTION 2: the European Atomic Energy Community (Euratom,) represented by the European Commission ('the Commission')][OPTION 3: the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] ('the Agency'), under the powers delegated by the European Commission ('the Commission').]*

The *[Commission] [Agency]* is mentioned as a signatory of the Agreement with the Beneficiary only. The *[European Union][Euratom][Agency]* is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the *[Commission][Agency]* the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement.

The CFS is composed of two separate documents:

- The Terms of Reference ('the ToR') to be signed by the *[Beneficiary] [Linked Third Party]* and the Auditor;

[1] By which costs under the Agreement are declared (see template 'Model Financial Statements' in Annex 4 to the Grant Agreement).

- The Auditor's Independent Report of Factual Findings ('the Report') to be issued on the Auditor's letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures ('the Procedures') to be performed by the Auditor, and the standard factual findings ('the Findings') to be confirmed by the Auditor.

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the Commission *[Agency,]* the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The *[Beneficiary] [Linked Third Party]:*

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the *[Beneficiary's] [Linked Third Party's]* accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the *[Beneficiary's] [Linked Third Party's]* staff and accounting as well as any other relevant records and documentation.

The Auditor:

- *[Option 1 by default:* is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations*]*.
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer:* is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary*]*.
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation:* is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation*]*.

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the *[Beneficiary's] [Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with[2]:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the *[Commission][Agency]* requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]*, and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the Commission*[, the Agency],* the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from [*the European Union*] [*Euratom*] budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the Commission *[, the Agency]*, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by *[*dd Month yyyy*]*.

1.6 Other terms

[*The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.*]

[legal name of the Auditor]	[legal name of the *[Beneficiary][Linked Third Party]*]
[name & function of authorised representative]	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the *[Beneficiary][Linked Third Party]*

[2] Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent Report of Factual Findings on costs declared under Horizon 2020 Research and Innovation Framework Programme

(To be printed on the Auditor's letterhead)

To
[name of contact person(s)], [Position]
[[*Beneficiary's*] [*Linked Third Party's*] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with *[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],*

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial Statement(s)[3] of the *[Beneficiary] [Linked Third Party]* concerning the grant agreement [insert grant agreement reference: number, title of the action and acronym] ('the Agreement'),

with a total cost declared of
[total amount] EUR,

and a total of actual costs and unit costs calculated in accordance with the [*Beneficiary's*] [*Linked Third Party's*] usual cost accounting practices' declared of

[sum of total actual costs and total direct personnel costs declared as unit costs calculated in accordance with the *[Beneficiary's] [Linked Third Party's]* usual cost accounting practices] EUR

and **hereby provide our Independent Report of Factual Findings ('the Report')** using the compulsory report format agreed with you.

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

[3] By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in Annex 4 to the Agreement).

The Procedures were carried out solely to assist the *[Commission] [Agency]* in evaluating whether the *[Beneficiary's] [Linked Third Party's]* costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The *[Commission] [Agency]* draws its own conclusions from the Report and any additional information it may require.

The scope of the Procedures was defined by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the *[Beneficiary's] [Linked Third Party's]* Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):

*If a Finding was not applicable, it must be marked as '**N.A.**' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.*

The reasons of the non-application of a certain Finding must be obvious i.e.

i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;

ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.

….

Exceptions

Apart from the exceptions listed below, the *[Beneficiary] [Linked Third Party]* provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):

- *If the Auditor was not able to successfully complete a procedure requested, it must be marked as '**E**' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.*
- *If the Auditor cannot corroborate a standard finding after having carried out the corresponding procedure, it must also be marked as '**E**' ('Exception') and, where possible, the reasons why the Finding was not fulfilled and its possible impact must be explained here below.*

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.

….

Example (to be removed from the Report):

1. *The Beneficiary was unable to substantiate the Finding number 1 on … because ….*
2. *Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: …*
3. *After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of _____ EUR. The difference can be explained by …*

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

1. *Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because …*
2. *In order to be able to confirm the Finding number 15 we carried out the following additional procedures: ….*

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the *[Beneficiary] [Linked Third Party]* and the [*Commission*] [*Agency*], and only to be submitted to the *[Commission] [Agency]* in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the *[Beneficiary] [Linked Third Party]* or by the *[Commission] [Agency]* for any other purpose, nor may it be distributed to any other parties. The *[Commission] [Agency]* may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the *[Commission] [Agency]* by the *[Beneficiary] [Linked Third Party]* for the Agreement. Therefore, it does not extend to any other of the *[Beneficiary's] [Linked Third Party's]* Financial Statement(s).

There was no conflict of interest[4] between the Auditor and the Beneficiary *[and Linked Third Party]* in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR _____ (including EUR_____ of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]
[name and function of an authorised representative]
[dd Month yyyy]
Signature of the Auditor

[4] A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:
- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The European Commission reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below.

If this certificate relates to a Linked Third Party, any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

The 'result' column has three different options: 'C', 'E' and 'N.A.':

- 'C' stands for 'confirmed' and means that the auditor can confirm the 'standard factual finding' and, therefore, there is no exception to be reported.
- 'E' stands for 'exception' and means that the Auditor carried out the procedures but cannot confirm the 'standard factual finding', or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable),
- 'N.A.' stands for 'not applicable' and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than the euro' the Procedure related to 'beneficiaries with accounts established in euro' is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A	**ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE**		
	The Auditor draws a sample of persons whose costs were declared in the Financial Statement(s) to carry out the procedures indicated in the consecutive points of this section A. (*The sample should be selected randomly so that it is representative. Full coverage is required if there are fewer than 10 people (including employees, natural persons working under a direct contract and personnel seconded by a third party), otherwise the sample should have a minimum of 10 people, or 10% of the total, whichever number is the highest)* The Auditor sampled _____ people out of the total of _____ people.		

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.1	**PERSONNEL COSTS** For the persons included in the sample and working under an employment contract or equivalent act (general procedures for individual actual personnel costs and personnel costs declared as unit costs) To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: o a list of the persons included in the sample indicating the period(s) during which they worked for the action, their position (classification or category) and type of contract; o the payslips of the employees included in the sample; o reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; o information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; o the Beneficiary's usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); o applicable national law on taxes, labour and social security and o any other document that supports the personnel costs declared. The Auditor also verified the eligibility of all components of the retribution (see Article 6 GA) and recalculated the personnel costs for employees included in the sample.	1) The employees were i) directly hired by the Beneficiary in accordance with its national legislation, ii) under the Beneficiary's sole technical supervision and responsibility and iii) remunerated in accordance with the Beneficiary's usual practices.	
		2) Personnel costs were recorded in the Beneficiary's accounts/payroll system.	
		3) Costs were adequately supported and reconciled with the accounts and payroll records.	
		4) Personnel costs did not contain any ineligible elements.	
		5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.	
	Further procedures if 'additional remuneration' is paid To confirm standard factual findings 6-9 listed in the next column, the Auditor: o reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory	6) The Beneficiary paying "additional remuneration" was a non-profit legal entity.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	obligations, the Beneficiary's usual policy on additional remuneration, criteria used for its calculation, the Beneficiary's usual remuneration practice for projects funded under national funding schemes…); o recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, usual remuneration paid for projects funded by national schemes) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 'Productive hours' and A.4 'Time recording system'). *'ADDITIONAL REMUNERATION' MEANS ANY PART OF THE REMUNERATION WHICH EXCEEDS WHAT THE PERSON WOULD BE PAID FOR TIME WORKED IN PROJECTS FUNDED BY NATIONAL SCHEMES.* *IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE QUALIFIES AS "ADDITIONAL REMUNERATION" AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT:* *(A) IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR 8 000/YEAR;* *(B) IF THE PERSON WORKS EXCLUSIVELY ON THE ACTION BUT NOT FULL-TIME OR NOT FOR THE FULL YEAR: UP TO THE CORRESPONDING PRO-RATA AMOUNT OF EUR 8 000, OR* *(C) IF THE PERSON DOES NOT WORK EXCLUSIVELY ON THE ACTION: UP TO A PRO-RATA AMOUNT CALCULATED IN ACCORDANCE TO ARTICLE 6.2.A.1.*	7) The amount of additional remuneration paid corresponded to the Beneficiary's usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.	
		8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.	
		9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).	
	Additional procedures in case "unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices" is applied: Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard	10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	factual findings 10-13 listed in the next column: o obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs;. o reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; o verified the employees included in the sample were charged under the correct category (in accordance with the criteria used by the Beneficiary to establish personnel categories) by reviewing the contract/HR-record or analytical accounting records; o verified that there is no difference between the total amount of personnel costs used in calculating the cost per unit and the total amount of personnel costs recorded in the statutory accounts; o verified whether actual personnel costs were adjusted on the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, objective and supported by documents.	used in all H2020 actions.	
		11) The employees were charged under the correct category.	
		12) Total personnel costs used in calculating the unit costs were consistent with the expenses recorded in the statutory accounts.	
		13) Any estimated or budgeted element used by the Beneficiary in its unit-cost calculation were relevant for calculating personnel costs and corresponded to objective and verifiable information.	
	<u>For natural persons included in the sample and working with the Beneficiary under a direct contract other than an employment contract, such as consultants (no subcontractors).</u> To confirm standard factual findings 14-17 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary: o the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary; o the employment conditions of staff in the same category to compare costs and; o any other document that supports the costs declared and its registration (e.g. invoices, accounting records, etc.).	14) The natural persons worked under conditions similar to those of an employee, in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed.	
		15) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		results were generated by itself.	
		16) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		17) The costs were supported by audit evidence and registered in the accounts.	
	<u>For personnel seconded by a third party and included in the sample (not subcontractors)</u> To confirm standard factual findings 18-21 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary: o their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results; o if there is reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution against payment): any documentation that supports the costs declared (e.g. contract, invoice, bank payment, and proof of registration in its accounting/payroll, etc.) and reconciliation of the Financial Statement(s) with the accounting system (project accounting and general ledger) as well as any proof that the amount invoiced by the third party did not include any profit; o if there is no reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution free of charge): a proof of the actual cost borne by the Third Party for the resource made available free of charge to the Beneficiary such as a statement of costs incurred by the Third Party and proof of the registration in the Third Party's accounting/payroll;	18) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		19) The results of work carried out belong to the Beneficiary, or, if not, the Beneficiary has obtained all necessary rights to fulfil its obligations as if those results were generated by itself..	
		If personnel is seconded against payment: 20) The costs declared were supported with documentation and recorded in the	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	○ any other document that supports the costs declared (e.g. invoices, etc.).	Beneficiary's accounts. The third party did not include any profit.	
		If personnel is seconded free of charge: 21) The costs declared did not exceed the third party's cost as recorded in the accounts of the third party and were supported with documentation.	
A.2	**PRODUCTIVE HOURS** To confirm standard factual findings 22-27 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that: ○ the annual productive hours applied were calculated in accordance with one of the methods described below, ○ the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. If the Beneficiary applied method B, the auditor verified that the correctness in which the total number of hours worked was calculated and that the contracts specified the annual workable hours. If the Beneficiary applied method C, the auditor verified that the 'annual productive hours' applied when calculating the hourly rate were equivalent to at least 90 % of the 'standard annual workable hours'. The Auditor can only do this if the calculation of the standard annual workable	22) The Beneficiary applied method [*choose one option and delete the others*] [**A**: 1720 hours] [**B**: the 'total number of hours worked'] [**C**: 'standard annual productive hours' used correspond to usual accounting practices]	
		23) Productive hours were calculated annually.	
		24) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	hours can be supported by records, such as national legislation, labour agreements, and contracts. *BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS:* ***A**. 1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)* ***B**. THE TOTAL NUMBER OF HOURS WORKED BY THE PERSON FOR THE BENEFICIARY IN THE YEAR (THIS METHOD IS ALSO REFERRED TO AS 'TOTAL NUMBER OF HOURS WORKED' IN THE NEXT COLUMN). THE CALCULATION OF THE TOTAL NUMBER OF HOURS WORKED WAS DONE AS FOLLOWS: ANNUAL WORKABLE HOURS OF THE PERSON ACCORDING TO THE EMPLOYMENT CONTRACT, APPLICABLE LABOUR AGREEMENT OR NATIONAL LAW PLUS OVERTIME WORKED MINUS ABSENCES (SUCH AS SICK LEAVE OR SPECIAL LEAVE).* ***C**. THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'STANDARD ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE STANDARD ANNUAL WORKABLE HOURS.* *'ANNUAL WORKABLE HOURS' MEANS THE PERIOD DURING WHICH THE PERSONNEL MUST BE WORKING, AT THE EMPLOYER'S DISPOSAL AND CARRYING OUT HIS/HER ACTIVITY OR DUTIES UNDER THE EMPLOYMENT CONTRACT, APPLICABLE COLLECTIVE LABOUR AGREEMENT OR NATIONAL WORKING TIME LEGISLATION.*	*If the Beneficiary applied method B.* 25) The calculation of the number of 'annual workable hours', overtime and absences was verifiable based on the documents provided by the Beneficiary. 25.1) The Beneficiary calculates the hourly rates per full financial year following procedure A.3 (method B is not allowed for beneficiaries calculating hourly rates per month).	
		If the Beneficiary applied method C. 26) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		27) The 'annual productive hours' used for calculating the hourly rate were consistent with the usual cost accounting practices of the Beneficiary and were equivalent to at least 90 % of the 'annual workable hours'.	
A.3	**HOURLY PERSONNEL RATES** I) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit costs): If the Beneficiary has a "Certificate on Methodology to calculate unit costs " (CoMUC) approved by the Commission, the Beneficiary provides the Auditor with a description of the approved methodology and the Commission's letter of acceptance. The Auditor verified that the Beneficiary has indeed used the methodology approved. If so, no further verification is necessary. If the Beneficiary does not have a "Certificate on Methodology" (CoMUC) approved by the Commission, or if the methodology approved was not applied, then the Auditor: o reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; o recalculated the unit costs (hourly rates) of staff included in the sample following the results of the procedures carried out in A.1 and A.2. II) For individual hourly rates: The Auditor: o reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates;	28) The Beneficiary applied [*choose one option and delete the other*]: [Option I: "Unit costs (hourly rates) were calculated in accordance with the Beneficiary's usual cost accounting practices"] [Option II: Individual hourly rates were applied] *For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):* 29) The Beneficiary used the Commission-approved methodology to calculate hourly rates. It corresponded to the organisation's usual cost accounting practices and was applied consistently for all	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	○ recalculated the hourly rates of staff included in the sample (recalculation of all hourly rates if the Beneficiary uses annual rates, recalculation of three months selected randomly for every year and person if the Beneficiary uses monthly rates) following the results of the procedures carried out in A.1 and A.2; ○ (only in case of monthly rates) confirmed that the time spent on parental leave is not deducted, and that, if parts of the basic remuneration are generated over a period longer than a month, the Beneficiary has included only the share which is generated in the month. *"UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES":* *IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF THE CATEGORY TO WHICH THE EMPLOYEE BELONGS VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF FTE AND THE ANNUAL TOTAL PRODUCTIVE HOURS OF THE SAME CATEGORY CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH PROCEDURE A.2.* *HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:* *IT IS CALCULATED FOLLOWING ONE OF THE TWO OPTIONS BELOW:* *A) [OPTION BY DEFAULT] BY DIVIDING THE ACTUAL ANNUAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2 (FULL FINANCIAL YEAR HOURLY RATE);* *B) BY DIVIDING THE ACTUAL MONTHLY AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY 1/12 OF THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.(MONTHLY HOURLY RATE).*	activities irrespective of the source of funding.	
		For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission: 30) The unit costs re-calculated by the Auditor were the same as the rates applied by the Beneficiary.	
		For option II concerning individual hourly rates: 31) The individual rates re-calculated by the Auditor were the same as the rates applied by the Beneficiary. 31.1) The Beneficiary used only one option (per full financial year or per month) throughout each financial year examined. 31.2) The hourly rates do not include additional remuneration.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.4	**TIME RECORDING SYSTEM** To verify that the time recording system ensures the fulfilment of all minimum requirements and that the hours declared for the action were correct, accurate and properly authorised and supported by documentation, the Auditor made the following checks for the persons included in the sample that declare time as worked for the action on the basis of time records: o description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); o its actual implementation; o time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; o the hours declared were worked within the project period; o there were no hours declared as worked for the action if HR-records showed absence due to holidays or sickness (further cross-checks with travels are carried out in B.1 below) ; o the hours charged to the action matched those in the time recording system. *ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).*	32) All persons recorded their time dedicated to the action on a **daily/ weekly/ monthly** basis using a **paper/computer-based** system. (*delete the answers that are not applicable)*	
		33) Their time-records were authorised at least monthly by the project manager or other superior.	
		34) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.	
		35) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<u>If the persons are working exclusively for the action and without time records</u> For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.	36) The exclusive dedication is supported by a declaration signed by the Beneficiary and by any other evidence gathered.	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
B	**COSTS OF SUBCONTRACTING**		
B.1	**The Auditor obtained the detail/breakdown of subcontracting costs and sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). To confirm standard factual findings 37-41 listed in the next column, the Auditor reviewed the following for the items included in the sample: o the use of subcontractors was foreseen in Annex 1; o subcontracting costs were declared in the subcontracting category of the Financial Statement; o supporting documents on the selection and award procedure were followed; o the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the subcontract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment). In particular, i. if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the subcontracting complied with the Terms and Conditions of the Agreement. ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement..	37) The use of claimed subcontracting costs was foreseen in Annex 1 and costs were declared in the Financial Statements under the subcontracting category.	
		38) There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. Subcontracts were awarded in accordance with the principle of best value for money. *(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption "Exceptions" of the Report. The Commission will analyse this information to evaluate whether these costs might be accepted as eligible)*	
		39) The subcontracts were not awarded to other Beneficiaries	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	For the items included in the sample the Auditor also verified that: o the subcontracts were not awarded to other Beneficiaries in the consortium; o there were signed agreements between the Beneficiary and the subcontractor; o there was evidence that the services were provided by subcontractor;	of the consortium.	
		40) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.	
		41) There was evidence that the services were provided by the subcontractors.	
C	**COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES**		
C.1	**The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). The Auditor verified that the following minimum conditions were met: a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1; b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were respected.	42) All minimum conditions were met	

D	OTHER ACTUAL DIRECT COSTS		
D.1	**COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest*). The Auditor inspected the sample and verified that: o travel and subsistence costs were consistent with the Beneficiary's usual policy for travel. In this context, the Beneficiary provided evidence of its normal policy for travel costs (e.g. use of first class tickets, reimbursement by the Beneficiary on the basis of actual costs, a lump sum or per diem) to enable the Auditor to compare the travel costs charged with this policy; o travel costs are correctly identified and allocated to the action (e.g. trips are directly linked to the action) by reviewing relevant supporting documents such as minutes of meetings, workshops or conferences, their registration in the correct project account, their consistency with time records or with the dates/duration of the workshop/conference; o no ineligible costs or excessive or reckless expenditure was declared (see Article 6.5 MGA).	43) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		44) There was a link between the trip and the action.	
		45) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		46) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	**DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest*). For "equipment, infrastructure or other assets" [from now on called "asset(s)"] selected in the sample the Auditor verified that: o the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures;	47) Procurement rules, principles and guides were followed.	
		48) There was a link between the grant agreement and the asset charged to the action.	
		49) The asset charged to the action was traceable to the accounting records and the underlying documents.	

	○ they were correctly allocated to the action (with supporting documents such as delivery note invoice or any other proof demonstrating the link to the action) ○ they were entered in the accounting system; ○ the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table); The Auditor recalculated the depreciation costs and verified that they were in line with the applicable rules in the Beneficiary's country and with the Beneficiary's usual accounting policy (e.g. depreciation calculated on the acquisition value). The Auditor verified that no ineligible costs such as deductible VAT, exchange rate losses, excessive or reckless expenditure were declared (see Article 6.5 GA).	50) The depreciation method used to charge the asset to the action was in line with the applicable rules of the Beneficiary's country and the Beneficiary's usual accounting policy. 51) The amount charged corresponded to the actual usage for the action. 52) No ineligible costs or excessive or reckless expenditure were declared.	
D.3	**COSTS OF OTHER GOODS AND SERVICES** **The Auditor sampled _____ cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). For the purchase of goods, works or services included in the sample the Auditor verified that: ○ the contracts did not cover tasks described in Annex 1; ○ they were correctly identified, allocated to the proper action, entered in the accounting system (traceable to underlying documents such as purchase orders, invoices and accounting); ○ the goods were not placed in the inventory of durable equipment; ○ the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices; ○ no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA). In addition, the Auditor verified that these goods and services were acquired in conformity with	53) Contracts for works or services did not cover tasks described in Annex 1. 54) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment. 55) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported. 56) No ineligible costs or excessive or reckless expenditure were declared. For internal invoices/charges only the cost element was charged, without any mark-ups.	

	the Beneficiary's internal guidelines and procedures, in particular: o if Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement. o if the Beneficiary did not fall into the category above, the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement. For the items included in the sample the Auditor also verified that: o the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the contract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Auditor also verified that the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment); *SUCH GOODS AND SERVICES INCLUDE, FOR INSTANCE, CONSUMABLES AND SUPPLIES, DISSEMINATION (INCLUDING OPEN ACCESS), PROTECTION OF RESULTS, SPECIFIC EVALUATION OF THE ACTION IF IT IS REQUIRED BY THE AGREEMENT, CERTIFICATES ON THE FINANCIAL STATEMENTS IF THEY ARE REQUIRED BY THE AGREEMENT AND CERTIFICATES ON THE METHODOLOGY, TRANSLATIONS, REPRODUCTION.*	57) Procurement rules, principles and guides were followed. There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. The purchases were made in accordance with the principle of best value for money. *(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption "Exceptions" of the Report. The Commission will analyse this information to evaluate whether these costs might be accepted as eligible)*	
D.4	**AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE** The Auditor ensured the existence of a positive ex-ante assessment (issued by the EC Services) of the cost accounting methodology of the Beneficiary allowing it to apply the guidelines on direct costing for large research infrastructures in Horizon 2020.	58) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex-ante assessment report.	

	In the cases that a positive ex-ante assessment has been issued *(see the standard factual findings 58-59 on the next column)***,** The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment; ***In the cases that a positive ex-ante assessment has NOT been issued*** *(see the standard factual findings 60 on the next column),* The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category; ***In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes*** *(see the standard factual findings 60 on the next column),* • The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations.	59) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly. 60) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.	
D.5	**Costs of internally invoiced goods and services** **The Auditor sampled cost items selected randomly** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest*). To confirm standard factual findings 61-65 listed in the next column, the Auditor: ○ obtained a description of the Beneficiary's usual cost accounting practice to calculate costs of internally invoiced goods and services (unit costs); ○ reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; ○ ensured that the methodology to calculate unit costs is being used in a consistent manner, based on objective criteria, regardless of the source of funding; ○ verified that any ineligible items or any costs claimed under other budget categories, in particular indirect costs, have not been taken into account when calculating the costs of	61) The costs of internally invoiced goods and services included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. 62) The cost accounting practices used to calculate the costs of internally invoiced goods and services were applied by the Beneficiary in a consistent manner based on objective criteria regardless of the source of funding. 63) The unit cost is calculated using the actual costs for the good or service recorded in the Beneficiary's accounts, excluding any ineligible cost or costs included in other	

	internally invoiced goods and services (see Article 6 GA); ○ verified whether actual costs of internally invoiced goods and services were adjusted on the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, and correspond to objective and verifiable information. ○ verified that any costs of items which are not directly linked to the production of the invoiced goods or service (e.g. supporting services like cleaning, general accountancy, administrative support, etc. not directly used for production of the good or service) have not been taken into account when calculating the costs of internally invoiced goods and services. ○ verified that any costs of items used for calculating the costs internally invoiced goods and services are supported by audit evidence and registered in the accounts.	budget categories. 64) The unit cost excludes any costs of items which are not directly linked to the production of the invoiced goods or service. 65) The costs items used for calculating the actual costs of internally invoiced goods and services were relevant, reasonable and correspond to objective and verifiable information.	
E	**USE OF EXCHANGE RATES**		
E.1	a) For Beneficiaries with accounts established in a currency other than euros **The Auditor sampled _____ cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest)*: *COSTS RECORDED IN THE ACCOUNTS IN A CURRENCY OTHER THAN EURO SHALL BE CONVERTED INTO EURO AT THE AVERAGE OF THE DAILY EXCHANGE RATES PUBLISHED IN THE C SERIES OF OFFICIAL JOURNAL OF THE EUROPEAN UNION (https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.* *IF NO DAILY EURO EXCHANGE RATE IS PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION FOR THE CURRENCY IN QUESTION, CONVERSION SHALL BE MADE AT THE AVERAGE OF THE MONTHLY ACCOUNTING RATES ESTABLISHED BY THE COMMISSION AND PUBLISHED ON ITS WEBSITE (http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm),*	66) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.	

	DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.		
	b) For Beneficiaries with accounts established in euros **The Auditor sampled _____ cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement** (*full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest)*: *COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL ACCOUNTING PRACTICES.*	67) The Beneficiary applied its usual accounting practices.	

[legal name of the audit firm]
[name and function of an authorised representative]
[dd Month yyyy]
<Signature of the Auditor>

ANNEX 6

MODEL FOR THE CERTIFICATE ON THE METHODOLOGY

- **For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.**
- **For fields in [grey in square brackets]: enter the appropriate data.**

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Terms of reference for an audit engagement for a methodology certificate in connection with one or more grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the '**Terms of Reference (ToR)**' under which

[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]

agrees to engage

[**insert legal name of the auditor**] ('the Auditor')

to produce an independent report of factual findings ('the Report') concerning the *[Beneficiary's] [Linked Third Party's]* usual accounting practices for calculating and claiming direct personnel costs declared as unit costs ('the Methodology') in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] ('the Agreement(s)')

The Agreement(s) has(have) been concluded between the Beneficiary and *[OPTION 1: the European Union, represented by the European Commission ('the Commission')][OPTION 2: the European Atomic Energy Community (Euratom,) represented by the European Commission ('the Commission')][OPTION 3: the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] ('the Agency'), under the powers delegated by the European Commission ('the Commission').]*.

The *[Commission] [Agency]* is mentioned as a signatory of the Agreement with the Beneficiary only. The *[European Union] [Euratom] [Agency]* is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries *[and linked third parties]* that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the *[Commission] [Agency]*, for approval, a certificate on the methodology ('CoMUC') stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference ('the ToR') to be signed by the *[Beneficiary] [Linked Third Party]* and the Auditor;

- the Auditor's Independent Report of Factual Findings ('the Report') issued on the Auditor's letterhead, dated, stamped and signed by the Auditor which includes; the standard statements ('the Statements') evaluated and signed by the *[Beneficiary] [Linked Third Party]*, the agreed-upon procedures ('the Procedures') performed by the Auditor and the standard factual findings

('the Findings') assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the *[Beneficiary's] [Linked Third Party's]* usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the *[Beneficiary] [Linked Third Party]* and the Auditor.

The *[Beneficiary] [Linked Third Party]:*

- is responsible for preparing financial statements for the Agreement(s) ('the Financial Statements') in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the *[Beneficiary's] [Linked Third Party's]* accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading 'Statements to be made by the Beneficiary/ Linked Third Party' in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the *[Beneficiary] [Linked Third Party]* providing full and free access to the *[Beneficiary's] [Linked Third Party's]* staff and to its accounting and other relevant records.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].*
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].*
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].*

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the Beneficiary's *[and Linked Third Party's]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with[1]:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]* that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the Commission, *[the Agency]*, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from *[the European Union] [Euratom]* budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the Commission*[, the Agency]*, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]	[name & title of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the *[Beneficiary] [Linked Third Party]*

[1] Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent report of factual findings on the methodology concerning grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on letterhead paper of the auditor)

To
[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with *[OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')]*,

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the *[Beneficiary's] [Linked Third Party's]* usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the *[Beneficiary] [Linked Third Party]*, the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the Commission uses to draw conclusions regarding the acceptability of the Methodology applied by the *[Beneficiary] [Linked Third Party]*.

The Report covers the methodology used from [dd Month yyyy]. In the event that the *[Beneficiary] [Linked Third Party]* changes this methodology, the Report will not be applicable to any Financial Statement[1] submitted thereafter.

The scope of the Procedures and the definition of the standard statements and findings were determined solely by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence.

Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not give a statement of assurance on the costs declared on the basis of the *[Beneficiary's] [Linked Third Party's]* Methodology. Had we carried out additional procedures or had we performed an audit or review in accordance with these standards, other matters might have come to its attention and would have been included in the Report.

Exceptions

Apart from the exceptions listed below, the *[Beneficiary] [Linked Third Party]* agreed with the standard Statements and provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and corroborate the standard Findings.

List here any exception and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, also indicate the corresponding amount.

…..

Explanation of possible exceptions in the form of examples (to be removed from the Report):

i. the [Beneficiary] [Linked Third Party] did not agree with the standard Statement number … because…;

ii. the Auditor could not carry out the procedure … established because …. (e.g. due to the inability to reconcile key information or the unavailability or inconsistency of data);

iii. the Auditor could not confirm or corroborate the standard Finding number … because ….

Remarks

We would like to add the following remarks relevant for the proper understanding of the Methodology applied by the [Beneficiary] [Linked Third Party] or the results reported:

Example (to be removed from the Report):

Regarding the methodology applied to calculate hourly rates …

Regarding standard Finding 15 it has to be noted that …

The [Beneficiary] [Linked Third Party] explained the deviation from the benchmark statement XXIV concerning time recording for personnel with no exclusive dedication to the action in the following manner: …

Annexes

Please provide the following documents to the auditor and annex them to the report when submitting this CoMUC to the Commission:

[1] Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;
2. Brief description of the time recording system in place;
3. An example of the time records used by the [*Beneficiary] [Linked Third Party*];
4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
5. A summary sheet with the hourly rate for direct personnel declared by the [*Beneficiary*] [*Linked Third Party*] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
6. A comparative table summarising for each person selected in the sample a) the time claimed by the [*Beneficiary*] [*Linked Third Party*] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the Commission by the [*Beneficiary*] [*Linked Third Party*] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [*Beneficiary*] [*Linked Third Party*] or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [*Beneficiary*] [*Linked Third Party*].

No conflict of interest[2] exists between the Auditor and the Beneficiary *[and the Linked Third Party*] that could have a bearing on the Report. The total fee paid to the Auditor for producing the Report was EUR _____ (including EUR _____ of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.

Yours sincerely

[legal name of the Auditor]
[name and title of the authorised representative]
[dd Month yyyy]
Signature of the Auditor

[2] A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:
- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The Commission reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
A. Use of the Methodology I. The cost accounting practice described below has been in use since *[*dd Month yyyy*]*. II. The next planned alteration to the methodology used by the Beneficiary will be from [dd Month yyyy*]*.	**Procedure:** ✓ The Auditor checked these dates against the documentation the Beneficiary has provided. **Factual finding:** 1. The dates provided by the Beneficiary were consistent with the documentation.
B. Description of the Methodology III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures. *[Please describe the methodology your entity uses to calculate personnel costs, productive hours and hourly rates, present your description to the Auditor and annex it to this certificate]* *[If the statement of section "B. Description of the methodology" cannot be endorsed by the Beneficiary or there is no written methodology to calculate unit costs it should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings:* - *…]*	**Procedure:** ✓ The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology. **Factual finding:** 2. The brief description was consistent with the relevant manuals, internal guidance and/or other documentary evidence the Auditor has reviewed. 3. The methodology was generally applied by the Beneficiary as part of its usual costs accounting practices.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
C. **Personnel costs** General IV. The unit costs (hourly rates) are limited to salaries including during parental leave, social security contributions, taxes and other costs included in the remuneration required under national law and the employment contract or equivalent appointing act; V. Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility; VI. The Beneficiary remunerates its employees in accordance with its usual practices. This means that personnel costs are charged in line with the Beneficiary's usual payroll policy (e.g. salary policy, overtime policy, variable pay) and no special conditions exist for employees assigned to tasks relating to the European Union or Euratom, unless explicitly provided for in the grant agreement(s); VII. The Beneficiary allocates its employees to the relevant group/category/cost centre for the purpose of the unit cost calculation in line with the usual cost accounting practice; VIII. Personnel costs are based on the payroll system and accounting system. IX. Any exceptional adjustments of actual personnel costs resulted from relevant budgeted or estimated elements and were based on objective and verifiable information. *[Please describe the 'budgeted or estimated elements' and their relevance to personnel costs, and explain how they were reasonable and based on objective and verifiable information, present your explanation to the Auditor and annex it to this certificate].* X. Personnel costs claimed do not contain any of the following ineligible costs: costs related to return on capital; debt and debt service charges; provisions for future losses or debts; interest owed; doubtful debts; currency exchange losses; bank costs charged by the Beneficiary's bank for transfers from the Commission/Agency; excessive or reckless expenditure; deductible VAT or costs incurred during suspension of the implementation of the action. XI. Personnel costs were not declared under another EU or Euratom grant	**Procedure:** *The Auditor draws a sample of employees to carry out the procedures indicated in this section C and the following sections D to F.* *[The Auditor has drawn a random sample of 10 employees assigned to Horizon 2020 action(s). If fewer than 10 employees are assigned to the Horizon 2020 action(s), the Auditor has selected all employees assigned to the Horizon 2020 action(s) complemented by other employees irrespective of their assignments until he has reached 10 employees.].* For this sample: ✓ the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax , labour and social security law and any other documents corroborating the personnel costs claimed; ✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: i. they were employed directly by the Beneficiary in accordance with applicable national legislation; ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
(including grants awarded by a Member State and financed by the EU budget and grants awarded by bodies other than the Commission/Agency for the purpose of implementing the EU or Euratom budget in the same period, unless the Beneficiary can demonstrate that the operating grant does not cover any costs of the action). <u>If additional remuneration as referred to in the grant agreement(s) is paid</u> XII. The Beneficiary is a non-profit legal entity; XIII. The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant work or expertise is required; XIV. The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding; XV. The additional remuneration included in the personnel costs used to calculate the hourly rates for the grant agreement(s) is capped at EUR 8 000 per full-time equivalent (reduced proportionately if the employee is not assigned exclusively to the action). *[If certain statement(s) of section "C. Personnel costs" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings:* *- …]*	✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information; ✓ if additional remuneration has been claimed, the Auditor verified that the Beneficiary was a non-profit legal entity, that the amount was capped at EUR 8 000 per full-time equivalent and that it was reduced proportionately for employees not assigned exclusively to the action(s). ✓ the Auditor recalculated the personnel costs for the employees in the sample. **Factual finding:** 4. All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation. 5. The employees in the sample were employed directly by the Beneficiary in accordance with applicable national law and were working under its sole supervision and responsibility. 6. Their employment contracts were in line with the Beneficiary's usual policy; 7. Personnel costs were duly documented and consisted solely of salaries, social security contributions (pension contributions, health insurance, unemployment fund contributions, etc.), taxes and other statutory costs included in the remuneration (holiday pay, thirteenth month's pay, etc.); 8. The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 9. To the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, those elements were relevant for calculating the personnel costs and correspond to objective and verifiable information. The budgeted or estimated elements used are: — (indicate the elements and their values). 10. Personnel costs contained no ineligible elements; 11. Specific conditions for eligibility were fulfilled when additional

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Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
	remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8 000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).
D. Productive hours XVI. The number of productive hours per full-time employee applied is *[delete as appropriate]*: A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time). B. the total number of hours worked in the year by a person for the Beneficiary C. the standard number of annual hours generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the standard annual workable hours. <u>If method B is applied</u> XVII. The calculation of the total number of hours worked was done as follows: annual workable hours of the person according to the employment contract, applicable labour agreement or national law plus overtime worked minus absences (such as sick leave and special leave). XVIII. 'Annual workable hours' are hours during which the personnel must be working, at the employer's disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation. XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours.	**Procedure (same sample basis as for Section C: Personnel costs):** ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct. ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts. ✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90 % of the standard number of working hours per year. **Factual finding:** <u>General</u> 12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column. 13. The number of productive hours per year per full-time employee was accurate. <u>If method B is applied</u> 14. The number of 'annual workable hours', overtime and absences was

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
<u>If method C is applied</u> XX. The standard number of productive hours per year is that of a full-time equivalent. XXI. The number of productive hours per year on which the hourly rate is based i) corresponds to the Beneficiary's usual accounting practices; ii) is at least 90% of the standard number of workable (working) hours per year. XXII. Standard workable (working) hours are hours during which personnel are at the Beneficiary's disposal preforming the duties described in the relevant employment contract, collective labour agreement or national labour legislation. The number of standard annual workable (working) hours that the Beneficiary claims is supported by labour contracts, national legislation and other documentary evidence. *[If certain statement(s) of section "D. Productive hours" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor:* - *…]*	verifiable based on the documents provided by the Beneficiary and the calculation of the total number of hours worked was accurate. 15. The contract specified the working time enabling to calculate the annual workable hours. <u>If method C is applied</u> 16. The calculation of the number of productive hours per year corresponded to the usual costs accounting practice of the Beneficiary. 17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary. 18. The number of productive hours per year used for the calculation of the hourly rate was at least 90% of the number of workable (working) hours per year.
E. Hourly rates The hourly rates are correct because: XXIII. Hourly rates are correctly calculated since they result from dividing annual personnel costs by the productive hours of a given year and group (e.g. staff category or department or cost centre depending on the methodology applied) and they are in line with the statements made in section C. and D. above. *[If the statement of section 'E. Hourly rates' cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor:* - *…]*	**Procedure** ✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. ✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated. For 10 employees selected at random (same sample basis as Section C: Personnel costs): ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. **Factual finding:**

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
	19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.
F. Time recording XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a **daily/weekly/monthly** basis *[delete as appropriate]* using a **paper/computer-based system** *[delete as appropriate]*; XXV. For persons exclusively assigned to one Horizon 2020 activity the Beneficiary has either signed a declaration to that effect or has put arrangements in place to record their working time; XXVI. Records of time worked have been signed by the person concerned (on paper or electronically) and approved by the action manager or line manager at least monthly; XXVII. Measures are in place to prevent staff from: i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and iv. recording hours worked outside the action period. XXVIII. No working time was recorded outside the action period; XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates. *[Please provide a brief description of the time recording system in place together with the measures applied to ensure its reliability to the Auditor and annex it to the*	**Procedure** ✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. The Auditor reviewed the time records of the random sample of 10 employees referred to under Section C: Personnel costs, and verified in particular: ✓ that time records were available for all persons with not exclusive assignment to the action; ✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled; ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates; ✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period; ✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that

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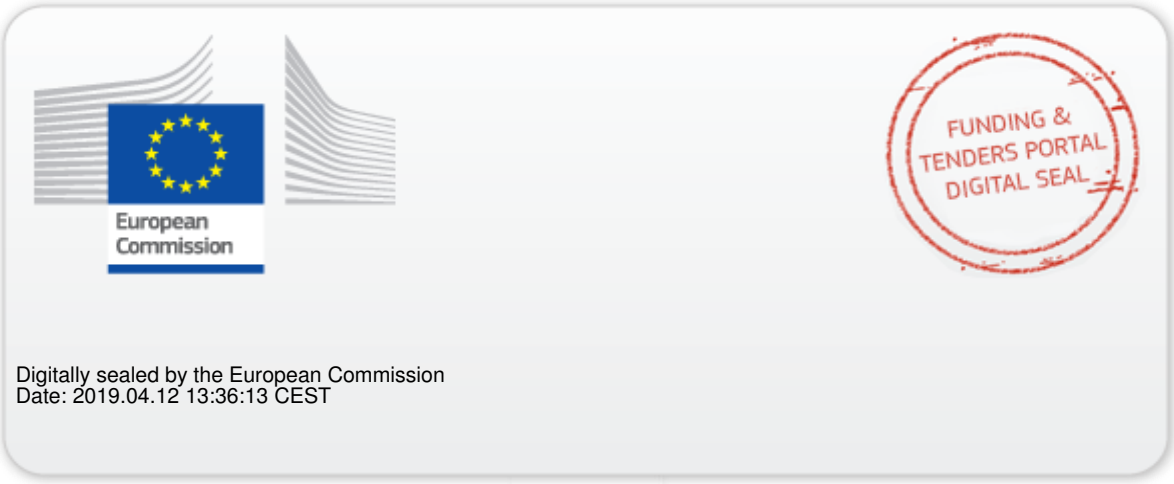
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
present certificate[1]]. *[If certain statement(s) of section "F. Time recording" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor:* - *…]*	no time worked outside the action period was charged to the action. **Factual finding:** 20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements. 21. For the random sample time was recorded or, in the case of employees working exclusively for the action, either a signed declaration or time records were available; 22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly. 23. Working time claimed for the action occurred in the periods claimed; 24. No more hours were claimed than the number productive hours used to calculate the hourly personnel rates; 25. There is proof that the Beneficiary has checked that working time has not been claimed twice, that it is consistent with absence records and the number of productive hours per year, and that no working time has been claimed outside the action period. 26. Working time claimed is consistent with that on record at the human-resources department.

[1] The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as it information flow up to its use for the preparation of the Financial Statements.

Please explain any discrepancies in the body of the Report.	
Statements to be made by Beneficiary	**Procedures to be carried out and Findings to be confirmed by the Auditor**
[official name of the *[Beneficiary] [Linked Third Party]**]*** ***[name and title of authorised representative]*** ***[dd Month yyyy]*** ***<Signature of the*** *[Beneficiary] [Linked Third Party]>*	***[official name of the Auditor]*** ***[name and title of authorised representative]*** ***[dd Month yyyy]*** ***<Signature*** *of the Auditor>*



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