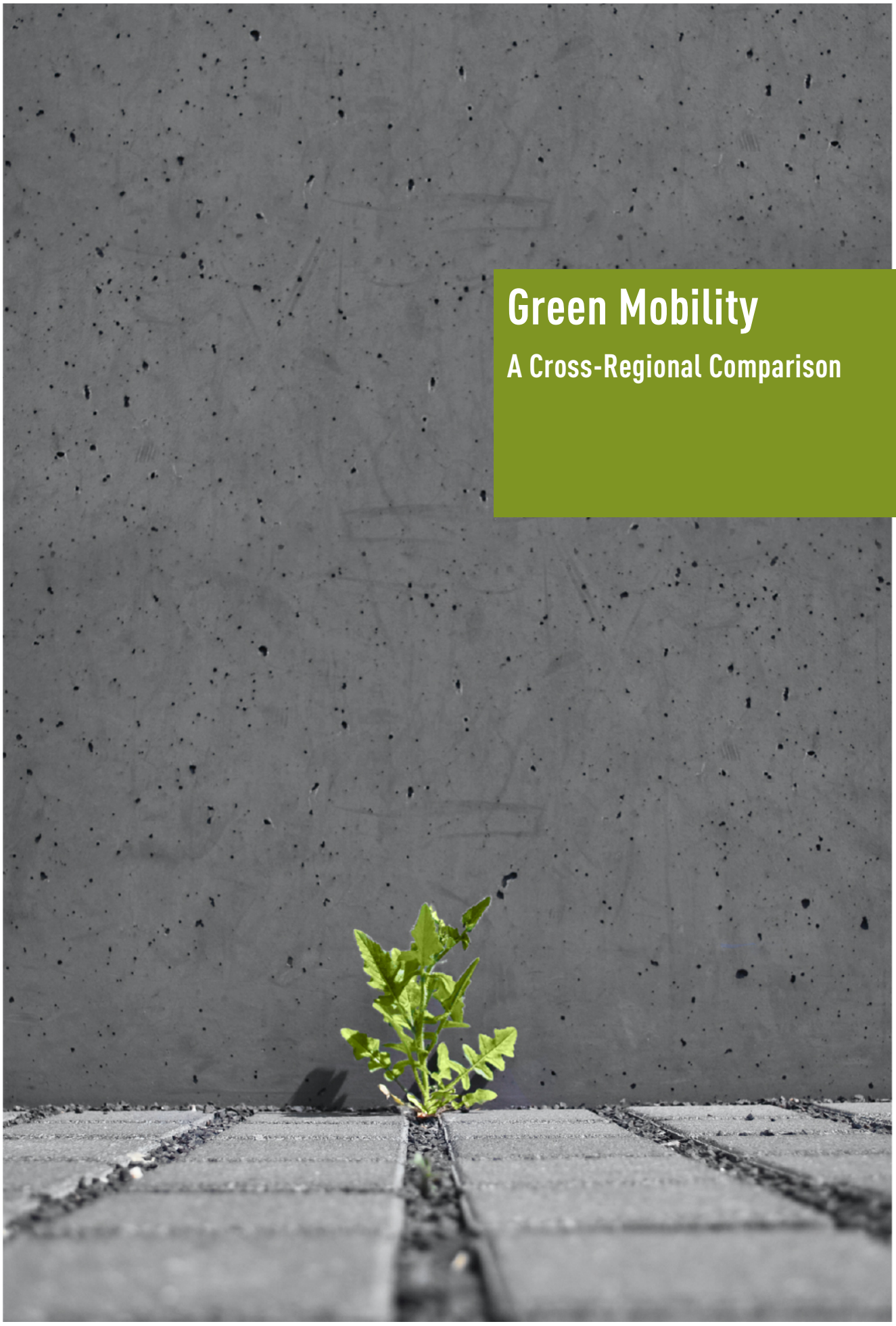

# Green Mobility

## A Cross-Regional Comparison

The report on the comparative analysis of electromobility RTDI infrastructures, RDCs and supporting policies is prepared as part of the ELMO$^S$ project (www.future-mobility.eu). It consolidates our findings from the regional analysis in a concise set of challenges regions are facing in their efforts to accelerate the market uptake of sustainable mobility solutions for the sake of smart and sustainable growth.


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Electromobility Solutions for Cities and Regions


FUNDED BY

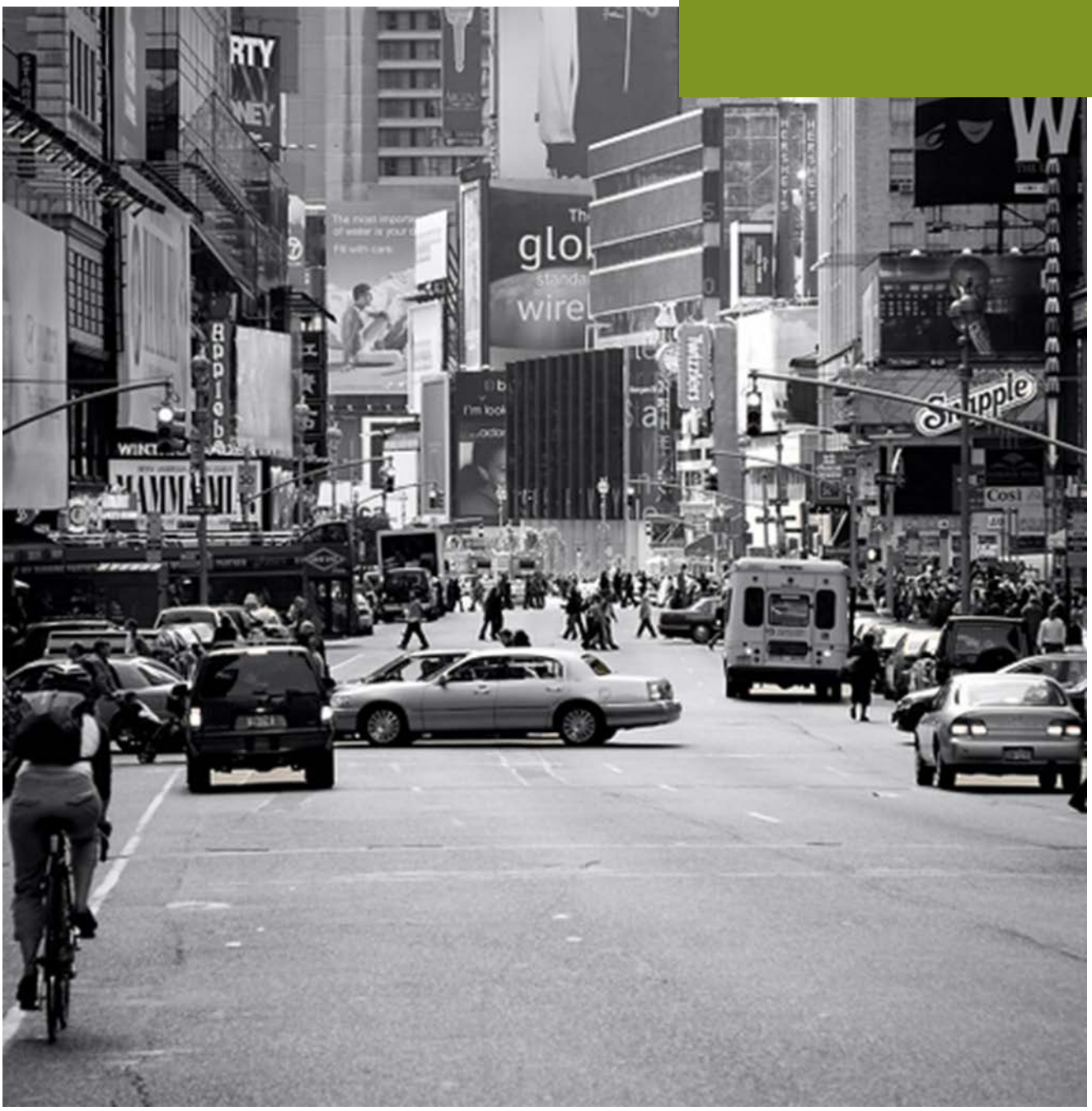
CAPACITIES

# CONTENT

# Abbreviations

| | |
|---|---|
| AID | Automotive industrial data |
| BEV | Battery electric vehicles |
| $CO_2$ | Carbon dioxide |
| EC | European Commission |
| EV | Electric vehicle |
| EVI | Electric vehicle initiative |
| EVSE | Electric vehicle supply equipment |
| GDP | Gross Domestic Product |
| ICT | Information & Communication Technologies |
| HEV | Hybrid electric vehicles |
| OEM(s) | Original equipment manufacturer(s) |
| PHEV | Plug-in hybrid electric vehicles |
| RDA | Regional Development Agency |
| RDC(s) | Research-driven cluster(s) |
| R&D | Research and development |
| RTDI | Research, technological development and innovation |
| VWK | Vorarlberger Kraftwerke |

# 1 INTRODUCTION



## 1.1 WHY DO WE NEED ELECTROMOBILITY?

Contrary to many other sectors, greenhouse gas emissions of the transport sector are still increasing, and are predicted to grow further. At the same time a high and increasing volume of traffic, large numbers of commuters, together with congestions is a growing problem for many cities and regions. Forasmuch, the improvement and sustainability of urban transport systems is a necessity for the quality of life, wellbeing and safety of citizens.

**«Electrification of transport, i.e. electromobility, means the embedding of electric vehicles in a wider urban mobility concept.»**

In the coming years, electric vehicles (EVs) could play a significant role in the paradigm shift towards sustainable mobility. If this vehicles run on renewable energies, they could substantially contribute to reduce $CO_2$ as well as noise emissions. They offer promising opportunities for the future development of «green mobility» solutions for cities and regions. However, the uptake of e-mobility depends on

- Appropriate regional infrastructures;
- A shift in mobility patterns from vehicle «ownership» to «usage»;
- Close cooperation between the three e-mobility constituent sectors «Automotive», «Green Energy» and «Information & Communication Technologies» (ICT);
- Intelligent vehicle-use concepts embedded in the urban transport environment.

Against this background **ELMO$^S$ – Electromobility Solutions for Cities and Regions** – strives to promote more sustainable mobility through the development of electromobility solutions for cities and regions.

The project aims at delivering concepts for a better exchange of electromobility knowledge at regional and EU level, concepts for new business models and cross-border field tests.

**12%** of total EU emissions of carbon dioxide ($CO_2$) stem from cars.

Electric vehicles (EVs) are defined as battery electric vehicles (BEV), hybrid electric vehicles (HEV) and plug-in hybrid electric vehicles (HPEV).

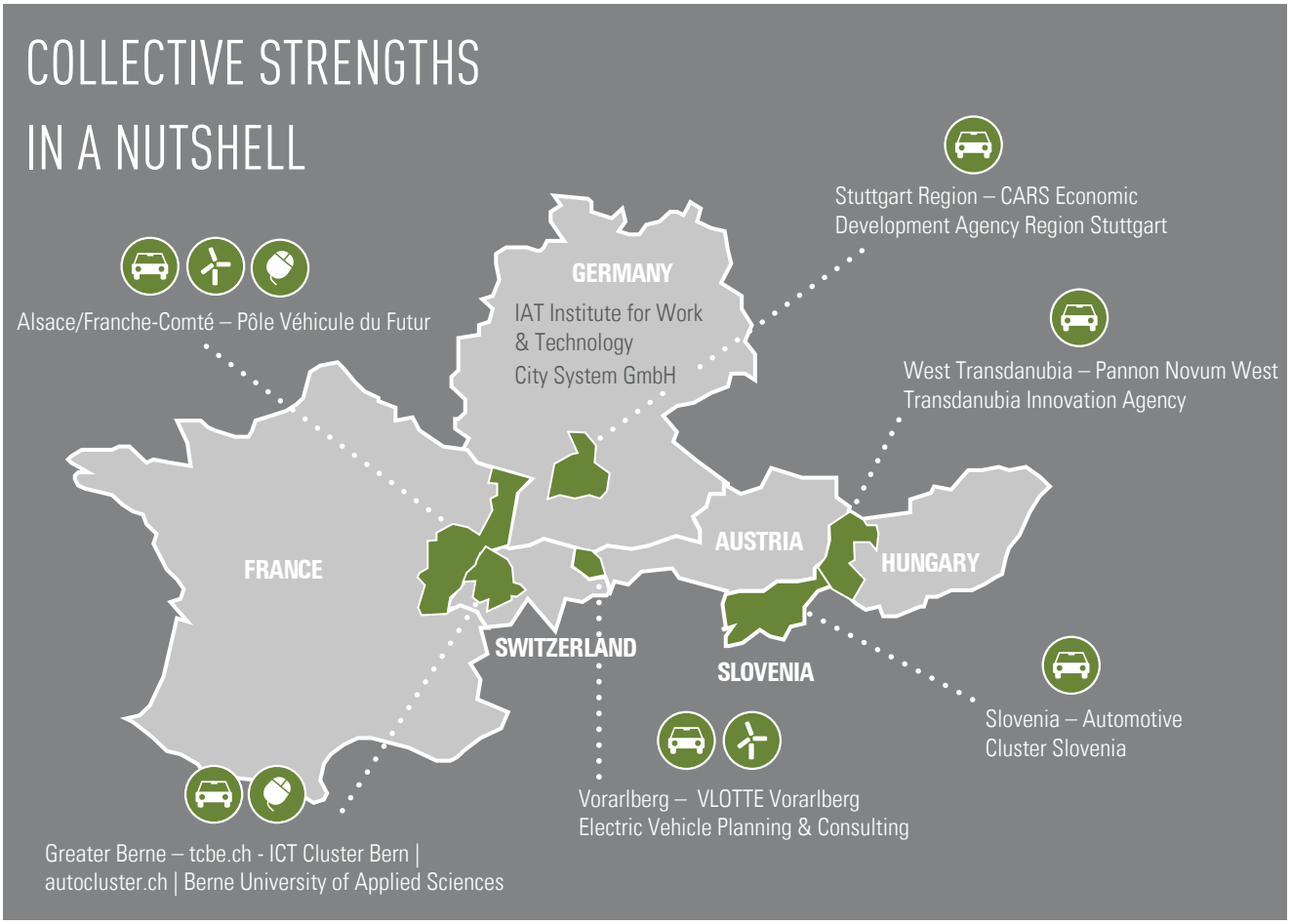
Pooling, connecting and applying so far scattered knowledge in the field of electromobility will play a pivotal role in advancing regions' capacities to drive sustainable transport-related economy for the sake of smart and sustainable growth.

Aiming at integrating research agendas and conflating so far isolated pilot actions in transnational electromobility solutions and cross-border field trials, 10 partners from 6 neighbouring regions including 6 research-driven clusters (RDCs) join forces. The moderate size of the consortium along with the geographic and cultural proximity is of great value: The four regions Alsace Franche-Comté, Greater Berne, Stuttgart and Vorarlberg offer a strong cultural and historical coherence, both in mentality as well as e.g. in the nature of academic life, performance and citizens mobility behaviour. Likewise, this applies to the two eastern regions Slovenia and West Transdanubia.

Following an integrated innovation approach that combines product and process innovations with service, design and social innovations, is only be achieved in a close regional and transnational collaboration of RDCs, enterprises, public authorities and users while making use of synergies and complementarities between the regions.

To fully unfold the potential for «smart specialisation» through cross-regional collaboration, one needs to take into account RDCs' different degrees of maturity, varying regional infrastructures and earlier experiences in the field of green mobility solutions. A first step has been taken by gathering and analysing available knowledge in the regions, on RDCs competitiveness and innovativeness, mapping regional RTDI infrastructures, financial actors and instruments as well as related policies and action plans.

The resulting regional SWOT analyses form the basis for this comparative report, which serves on the one hand the identification of synergies and complementarities. On the other hand it helps to identify challenges and opportunities to be addressed by joint actions.



## 1.2 ELECTROMOBILITY – STATE OF PLAY

The electrification of transport (electromobility) and burgeoning of EV industry cannot be understood by simply looking at cars. Rather, it is the interplay of various private and public stakeholders from automotive, energy and ICT industry, research organisations to public authorities and policy makers as well as citizens.

Since 2010, European original equipment manufactures introduced 16 EV models driving the growth of EV market and a greater variety of EV models is being offered each month. For example, Audi, BMW, Mercedes Benz, Volkswagen, Citroen, Peugeot, Volvo, Skoda and Lada, plan to release 15 new models between 2013 and 2016 (Proff & Kilian: 2012).

During 2011, German drivers purchased 1'858 EVs, 1'796 were sold in France, 1'547 in Norway, and 1'170 were purchased in Britain (EC 2013). According to the Automotive Industrial Data (AID) newsletter, EVs only made up 0.23% of new car sales in Europe in the first quarter of 2013. Those numbers make EVs only a small fraction of the vehicles on the roads today. Although the current EV market is small and ambitious policy targets are most likely to be missed, the outlook is encouraging. For example, Pike Research forecasts 1.8 million BEVs to be on Europe's roads by 2020, along with 1.2 PHEVs and 1.7 HEVs. Germany, France, Norway, the UK, the Netherlands and Sweden are anticipated to be the top six European countries for BEVs on the road in 2020.

Presently, the automotive industry predicts that in 2025 electrically chargeable vehicles will make up 2% to 8% of the European market, depending on how quickly the various technological, infrastructure and socio-economic challenges can be addressed. Projections by the Electric Vehicle Initiative (EVI) based on announced goals of its member countries show that US will maintain the lead in the number of EVs on the road, introducing additional 1 million vehicles by 2015. China could also become an important market with its set target of 5 million vehicles and 10 million charging points by 2020. France expects to have 2 million and Germany 1 million vehicles by 2020, UK 1.55 million and Spain 2.5 million.


Global EV Stock 2012

**180'000+**

*(0.02% of total passenger cars)*

Shares

**11% Europe**

**24% Japan**

**38% USA**

*(Source: EVI 2013, Global EV Outlook)*

Annual Sales Forecast 2020

**827'000 EVs**

*(Market growth from 0.7% of the market in 2012 to 4% in 2020; Source: Pike Research)*


## AUSTRIA

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 250'000 | 489 | 12'000 |

## GERMANY

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 1'000'000 | 1'937 | 150'000 |

## FRANCE

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 2'000'000 | 1'600 | 97'000 |

## HUNGARY

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| - | 7 | 7'000 |

## NETHERLANDS

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 200'000 | 1'700 | 32'00 |

## SLOVENIA

| EV Target | EVSE 2011 | EVES Target |
|---|---|---|
| 14'000 | 80 | 3'000 |

## SPAIN

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 2'500'000 | 1'356 | 82'000 |

## UK

| EV Target | EVSE 2011 | EVSE Target |
|---|---|---|
| 1'550'000 | 703 | 122'000 |

However, EV technology and associated services must pass through several stages of market development, optimization and scale-up. Moreover, consumer acceptance, utility readiness and EV infrastructures are subject for improvement.

The increasing availability of vehicle charging infrastructure that enables vehicles to charge at home, at the workplace, and in public places is expected to facilitate market growth. Being in its nascent stage, just as EVs, the market for charging infrastructures, also referred to as **Electric Vehicle Supply Equipment (EVSE)**, has untested business models, suffers from use cases of the charging stations and lacks detailed knowledge of driver behaviour.

As of November 2012, about **15'000 EV charging stations** had been installed in Europe. But EV charging has become complicated with different standards in use in various countries. A common standard for charging EVs in Europe was only introduced recently, suitable for both, AC and DC charging. So far, «AC charging» (or slow charging) which provides alternating current to the vehicle's battery from an external charger (e.g. a standard household socket) is the most common mode of charging. Charging times range from 4 to 12 hours for a full charge. Fast charging stations, also known as «DC quick charging», provide a direct current of electricity to the vehicle's battery from an external charger with charging time from 0.5 to 2 hours. The situation for EVSE varies largely across Europe (see table right). Germany, France, the Netherlands, Spain, Austria and the UK are leading countries. The increase in charging stations (including national targets) is part of an eight billion Euro «Clean Power for Transport Package» launched by the European Commission in January 2013. A minimum of 10% of charging stations should be publicly available.

**The current market conditions can be summarised as «vicious circle» where investors do not invest in infrastructure as there are not EVs, while OEMs do not offer EVs at competitive prices as there is insufficient demand. And consumers do not purchase EVs due to high prices and a lack of dedicated infrastructures.**

## 1.3 METHODOLOGY

This comparative report builds upon the regional reports and SWOTs analysis of Alsace/Franche-Comté (France), Stuttgart Region (Germany), Espace Mittelland (Switzerland), Vorarlberg (Austria), West Transdanubia (Hungary) and Slovenia. Data has been collected by means of written questionnaires to project partners (cluster managers, innovation agencies and e-mobility initiatives).

The regional reports offer a detailed description of the regions' strengths in the automotive, ICT and green energy sector, followed by an assessment of regional policies and action plans from a multilevel perspective including the impact of EU policies on regional undertakings. The regional RTDI infrastructure including the examination of electromobility-related research facilities, ongoing R&D projects as well as financial actors and instruments builds another key aspect. Next, RDCs economic foundation (e.g. cluster composition, balance of SMEs and large companies), competitiveness and innovation dynamics (e.g. role of different innovation types, number of start-ups/spin-offs) were assessed. The regional SWOT analyses centred on the following questions:

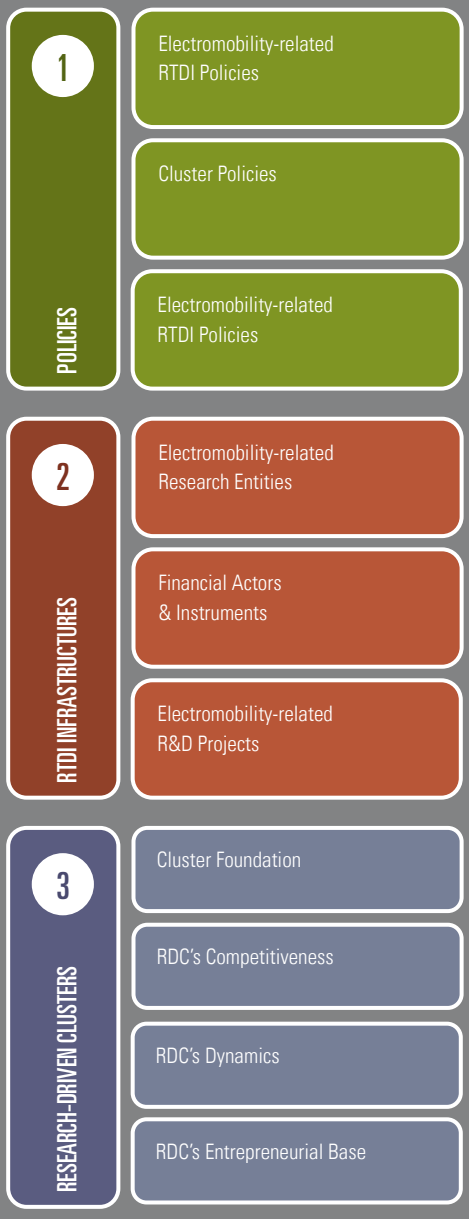
- **RETAIN:** Which aspects would you want to keep or improve?
- **ENABLE:** Which aspects would you like to develop or strengthen?
- **ELIMINATE:** Which aspects would you like to abandon or replace?
- **AVOID:** Which aspects would you like to circumvent/stay clear off?

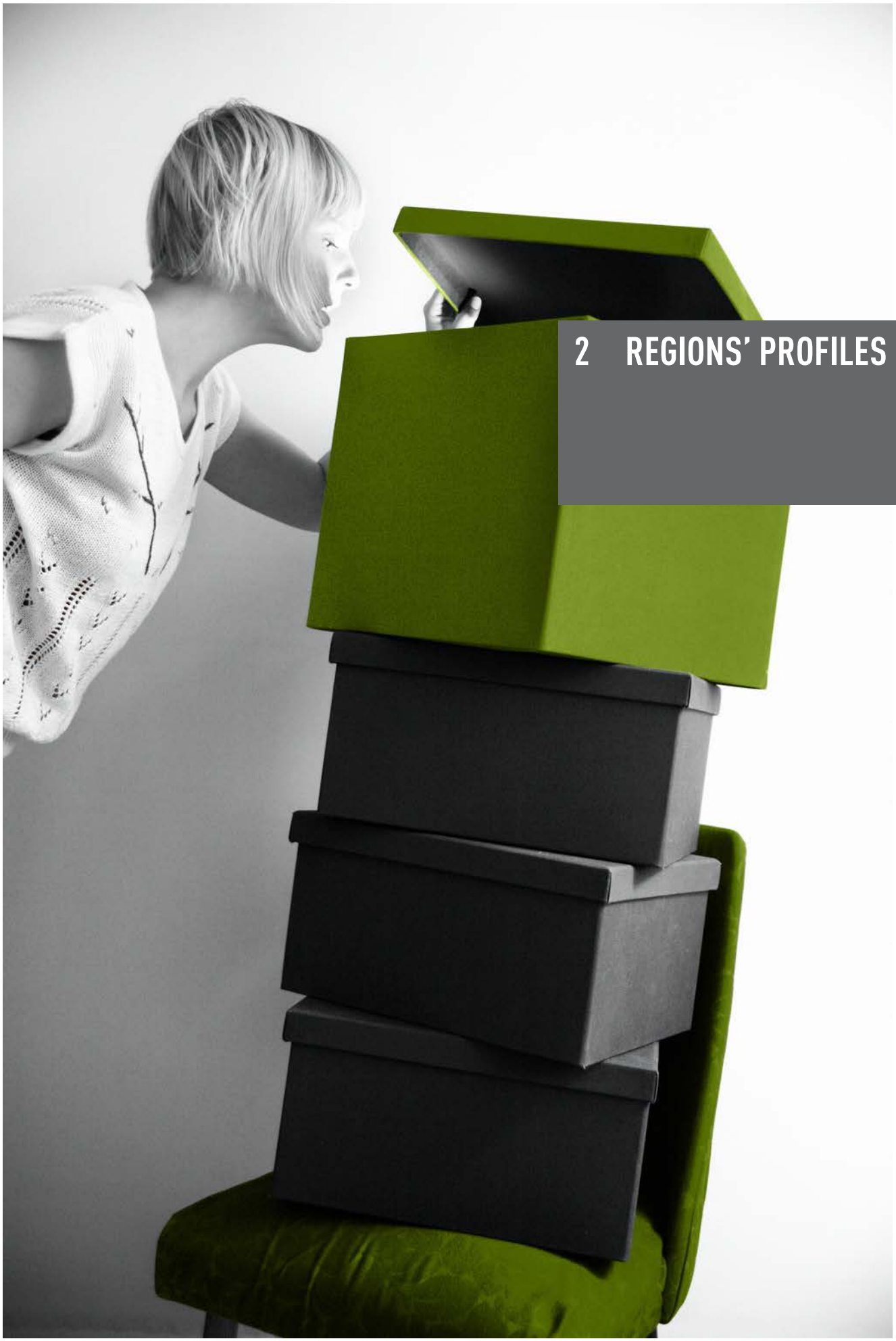
Specifically, they were examined along the three research dimensions «Policies», «RTDI Infrastructures» and «RDCs», as is depicted in the illustration on the right.

The comparative analysis results the identification of complementarities and synergies between regions and research-driven clusters (RDCs), areas of mutual learning, regions' potential for smart specialisation as well as priorities for future joint actions.

The latter is based on the identification of challenges ELMO[5] regions are facing in their ambition to accelerate the adoption of green mobility solutions that were classified by (i) addressing thematic or (ii) strategic areas or concern (iii) influencing factors.

In several iterations the classified and ranked challenges were further consolidated leading to the deduction of a first set of thematic and strategic priorities as starting point for the formulation of joint actions.

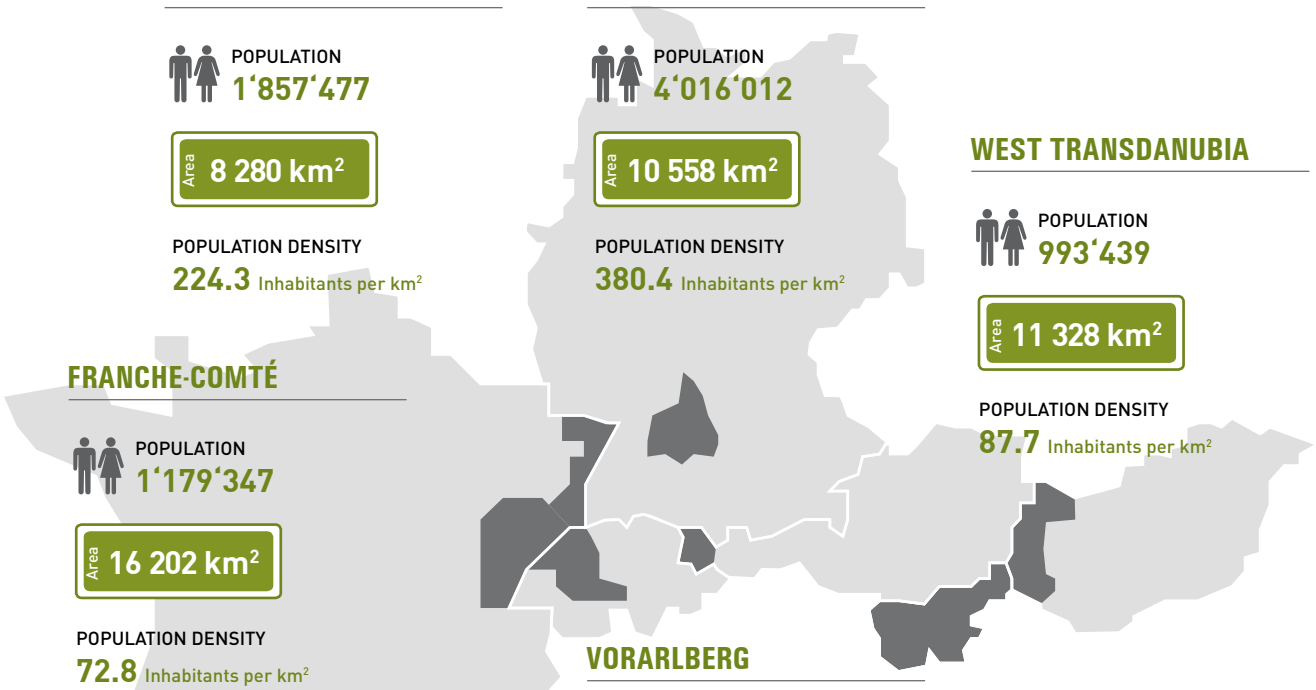




# 2 REGIONS' PROFILES

# 2.1 BASIC INFORMATION – A STATISTICAL OVERVIEW

Regions' opportunities for future research-driven economic development in e-mobility, their specific requirements for green mobility solutions and associated challenges are influenced by settlement structures as well as research infrastructures and economic conditions. In the following the ELMO$^S$ regions are briefly introduced.



## ALSACE

POPULATION
1'857'477

Area 8 280 km²

POPULATION DENSITY
224.3 Inhabitants per km²

## STUTTGART REGION

POPULATION
4'016'012

Area 10 558 km²

POPULATION DENSITY
380.4 Inhabitants per km²

## WEST TRANSDANUBIA

POPULATION
993'439

Area 11 328 km²

POPULATION DENSITY
87.7 Inhabitants per km²

## FRANCHE-COMTÉ

POPULATION
1'179'347

Area 16 202 km²

POPULATION DENSITY
72.8 Inhabitants per km²

## VORARLBERG

POPULATION
371'741

Area 2 601 km²

POPULATION DENSITY
142.9 Inhabitants per km²

## ESPACE MITTELLAND

POPULATION
1'770'429

Area 10 062 km²

POPULATION DENSITY
176.0 Inhabitants per km²

## SLOVENIA

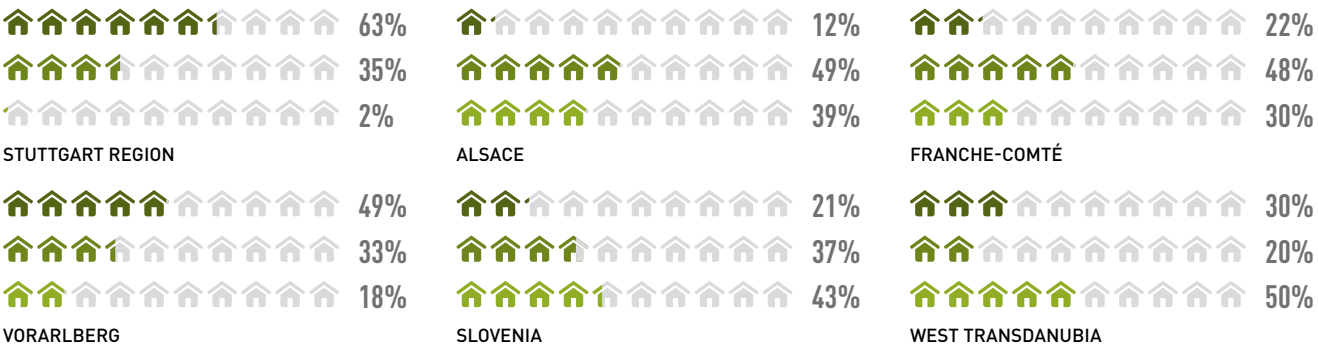
POPULATION
2'055'496

Area 20 273 km²

POPULATION DENSITY
101.4 Inhabitants per km²

## SHARE OF HOUSEHOLDS BY AREA TYPE

(No data available for Espace Mittelland) Urban Area Intermediate Area Rural Area = 10%



# [ SNAPSHOT] REGIONAL ECONOMY

## GROSS DOMESTIC PRODUCT PER CAPITA (2011)

ESPACE MITTELLAND
49.942 €

STUTTGART REGION
37.000 €

VORARLBERG
36.200 €

ALSACE
27.700 €

EU-27
24.500 €

FRANCHE-COMTÉ
23.700 €

SLOVENIA
17.400 €

WEST TRANSDANUBIA
9.700 €

Source: EUROSTAT [nama_r_e2gdp]

## UNEMPLOYMENT RATE (2012)

| | | |
|---|---|---|
| ESPACE MITTELLAND | 2.8% | (2005: 4.0%) |
| STUTTGART REGION | 4.1% | (2005: 7.2%) |
| VORARLBERG | 5.6% | (2005: 5.3%) |
| ALSACE | 9.2% | (2005: 7.0%) |
| EU-27 | 10.5% | (2005: 8.9%) |
| FRANCHE-COMTÉ | 9.9% | (2005: 7.3%) |
| SLOVENIA | 13.0% | (2005: 6.5%) |
| WEST TRANSDANUBIA | 7.8% | (2005: 5.9%) |

Source: National Statistics Offices, EUROSTAT

## TOTAL EMPLOYMENT (2011)

ESPACE MITTELLAND
980'700
23.9% | 71.3% | 4.8%

STUTTGART REGION
2'016'200
35.8% | 63.0% | 1.2%

VORARLBERG
188'100
35.5% | 61.7% | 2.9%

SLOVENIA
936'100
31.5% | 59.9% | 8.6%

ALSACE
842'600
28.5% | 70.4% | 1.0%

FRANCHE-COMTÉ
477'400
33.7% | 62.4% | 3.9%

WEST TRANSDANUBIA
412'300
39.4% | 54.9% | 5.7%

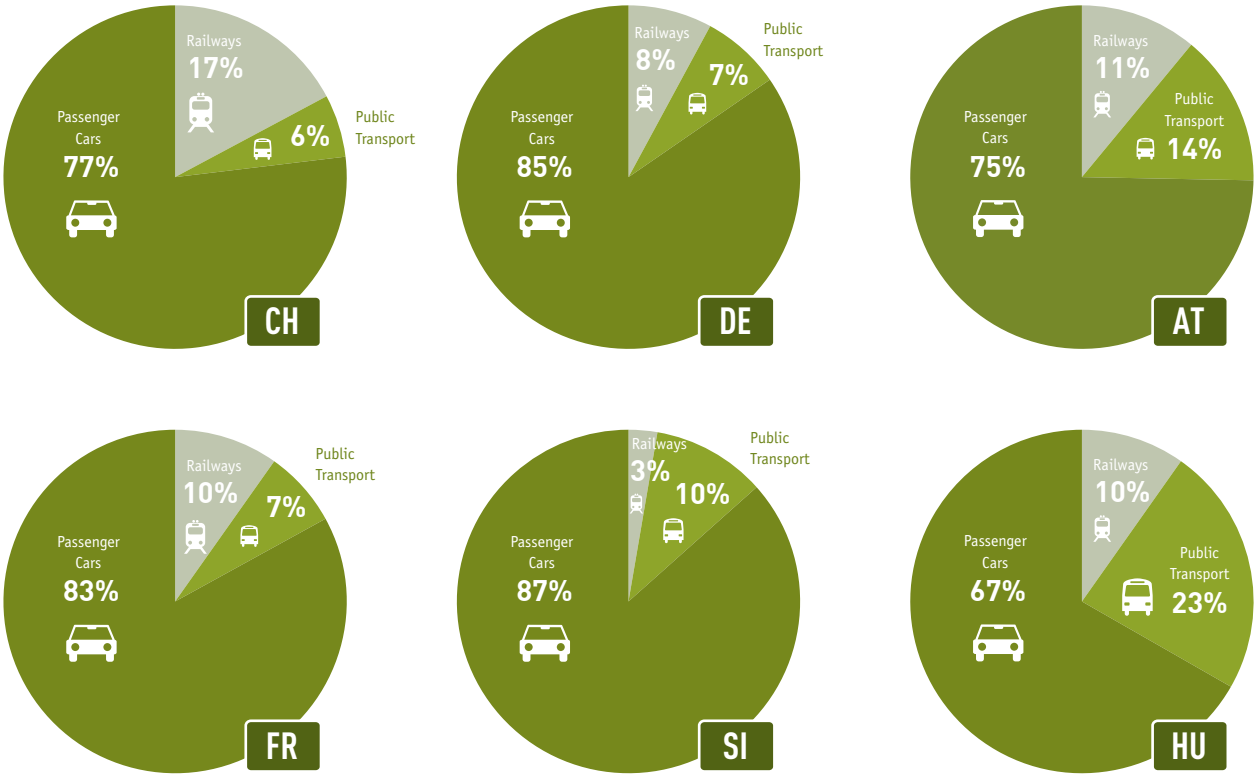
= 200'000 employees

**Shares of Total Employment**
- Primary sector
- Secondary sector
- Tertiary sector

Source: EUROSTAT

# [ SNAPSHOT ] TRANSPORT

MODAL SPLIT PASSANGER TRANSPORT (2010, % of person kilometres)




Source: EUROSTAT [tran_r_vehst]

**Motorisation Rate (2011)**

**Espace Mittelland**

525 Cars per 1'000 Inhabitants

921'000 Total Registered Passenger Cars

**Stuttgart Region**

551 Cars per 1'000 Inhabitants

2'204'000 Total Registered Passenger Cars

**Vorarlberg**

514 Cars per 1'000 Inhabitants

190'000 Total Registered Passenger Cars

**Alsace/Franche-Comté**

526 Cars per 1'000 Inhabitants

1'586'000 Total Registered Passenger Cars

**West Transdanubia**

323 Cars per 1'000 Inhabitants

321'000 Total Registered Passenger Cars

**Slovenia**

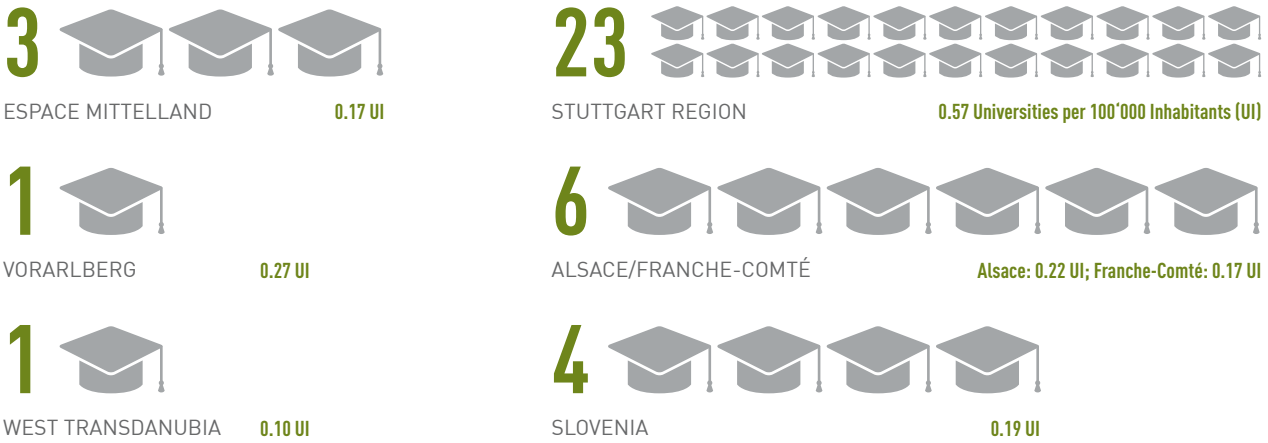
521 Cars per 1'000 Inhabitants

1'067'000 Total Registered Passenger Cars

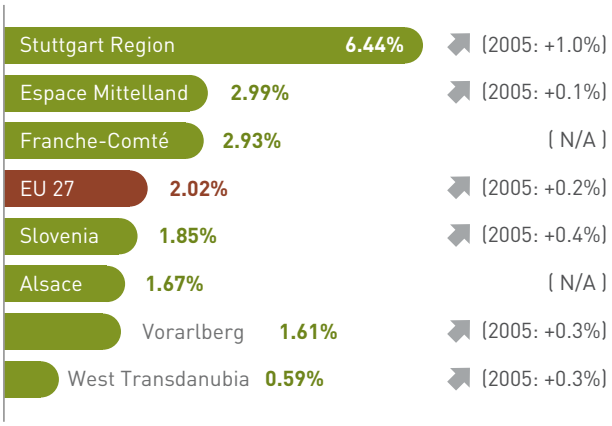
Source: EUROSTAT [tran_r_vehst]

# [ SNAPSHOT ] SCIENCE AND TECHNOLOGY

## Universities/Academia (2012)

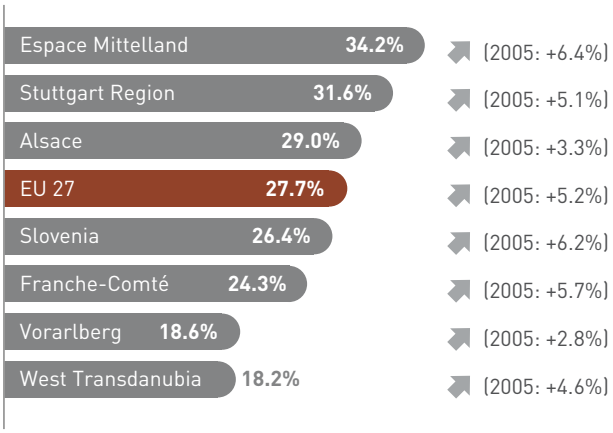



## R&D Intensity (2009) – R&D Expenditure as % of GDP




Source: EUROSTAT [hrst_st_ract]

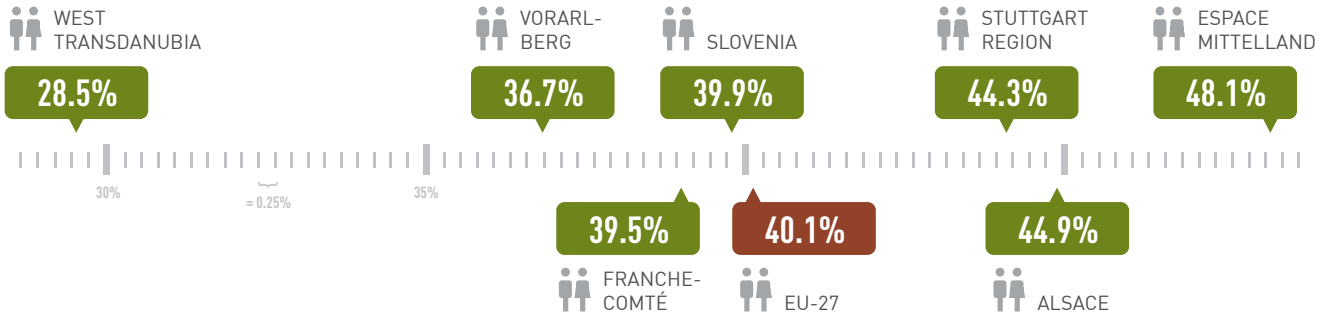
## Share of Population with Tertiary Education Attainment (2012)*




Source: EUROSTAT [edat_lfse_11]

*Persons aged 25-64

## Human Resources in Science & Technology (2011) *




Source: EUROSTAT [hrst_st_ract]

*Share of EAP

The figures on the left illustrate the regions' developments for science and technology indicators. The domains covered are research infrastructure, research and development (R&D), human resources in science and technology (HRST) and patents.

## Research Infrastructure

With 23 universities including universities of applied sciences and other academic research organisations, Stuttgart Region is by far at the top position in absolute numbers. Alsace and Franche-Comté rank second with 6 universities, whereas three universities are located in Espace Mittelland and only one university in Vorarlberg and West Transdanubia. However, taking a look at the universities density (UD), i.e. the number of universities per million inhabitants, it becomes evident that Vorarlberg with an density of 0.27 ranks second after Stuttgart Region with 0.57. Espace Mittelland and Franche-Comté show an equal density of 0.17 slightly below Slovenia with 0.19. West Transdanubia ranks lowest with a recorded value of 0.10.

## Research and Development Intensity

The EU-27 had an R&D intensity ratio of 2.02% in 2009. In other words, expenditure on R&D was equivalent to 2.01% of the GDP. The most R&D-intensive region is Stuttgart Region with a ratio of 6.44%, followed at some distance by Espace Mittelland (2.99%) and Franche-Comté (2.93%). All three regions are well above the EU-27 average, whereas Vorarlberg, Alsace, West Transdanubia and Slovenia rank below the EU-27 average. In particular, this applies to West Transdanubia the least R&D-intensive region. With a business sector R&D intensity Vorarlberg is slightly above the EU-27 ratio of 1.25%, just as Stuttgart Region (5.9%) and Franche-Comté (2.6%). Alsace (0.9%) and West Transdanubia shows a significantly lower value.

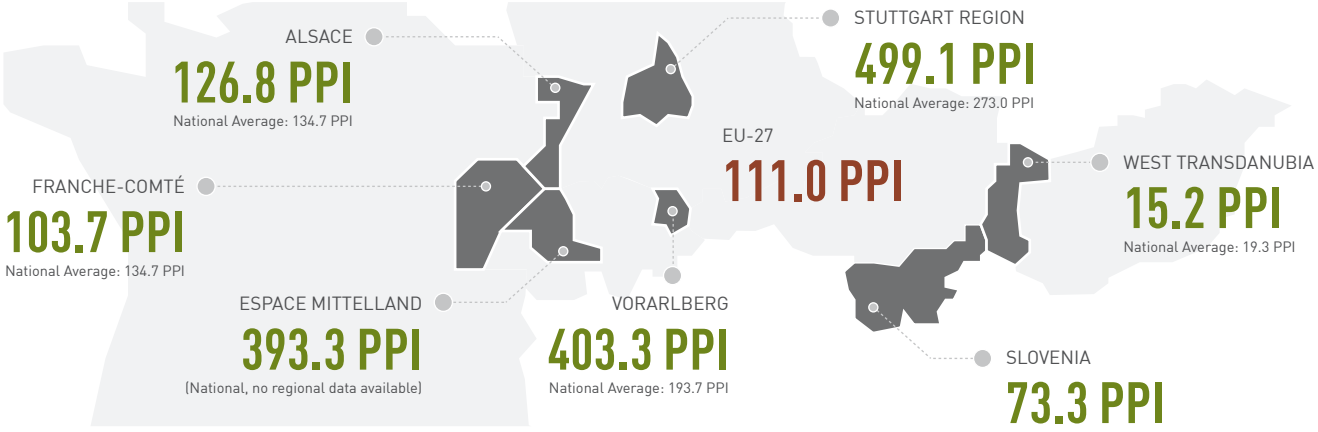
## Human Resource in Science and Technology (HRST)

The stock of HRST can be used as an indicator to determine how developed the knowledge-based economy is. In 2012, Espace Mittelland shows the highest share of population with tertiary education (34.2%), followed by Stuttgart Region (31.6%) and Alsace (29%). All three regions exceed the EU-27 ratio of 27.7%, whereas the other four regions show lower values. These numbers correspond with the recorded values of HRST relative to the size of the economically active population. In 2011, Espace Mittelland ranked top among the ELMO$^{S}$ regions with a ratio of 48.1%, followed by Alsace (44.9%) and Stuttgart Region (44.3%), while EU-27 recorded a ratio of 40.1%. Slovenia, Franche-Comté and Vorarlberg are slightly, and West Transdanubia clearly below EU-27 average.

## Patents per Million of Inhabitants (PPI)

Interpreted carefully, patent counts can be used as proxy for regions' inventiveness. In 2009, Stuttgart Region, by far, was the most inventive EMO$^{S}$ region, followed by Vorarlberg and Switzerland. All three plus Alsace are above the EU-27 ration of 111.0 PPI. Here also, West Transdanubia ranks considerably below EU-27 with 15.2 PPI, as does Slovenia. Franche-Comté is slightly below EU-27.

**Patens per Million Inhabitants (2009)**

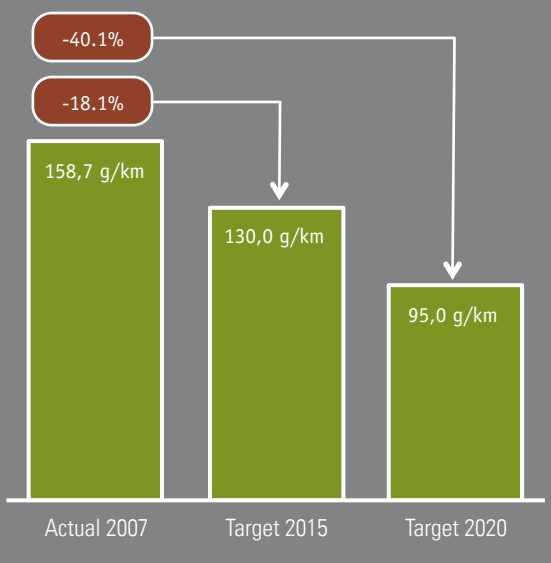


## 2.2 ELECTROMOBILITY SECTORS

The **automotive sector (NACE 29)** includes the manufacture of motor vehicles for transporting passengers or freight, including the manufacture of various parts, accessories, trailers and semi-trailers.

The **energy sector** comprises the activity of providing electric power, natural gas and steam (NACE 35) and therefore, includes the operation of electric and gas utilities, which generate, control and distribute electric power or gas.

**EU - Cars $CO_2$ Emission Targets**




Source: : Regulation (EC) No 443/2009

The introduction of EVs is seen as one of the most important trends in **automotive industry** as it moves towards sustainable mobility. Shortages of resources in combination with the targets for the reduction of $CO_2$ emissions in Europe (see figure below left) and growing environmental awareness of citizens are the main factors behind this development. Hence, the automotive value chain is subject of redesign:

- Previously hard boundaries between car manufactures and suppliers in the value chain dissolve as electric drives and high performance batteries are needed.
- New players are entering the value chain, reshaping the value creation process, including the emergence of circular value creation systems.
- The roles of market players differentiate as large OEMs enter the green energy market and electricity suppliers engage in e-mobility services.
- Inter-sectoral collaborations gain in importance and broaden the value chain. They bring about partnerships of automotive industry, electricity suppliers and ICT sector, which formerly had little in common.
- Business model and behavioural innovation is at least as important as technological innovation for the market penetration of EVs.

The **energy sector** is key to backup the sustainability of EVs through the production and distribution of «green energy» including new modes of delivery.

Charging stations in private and public sector connect vehicles to the power grid. EVs representing mobile loads must be charged at different times and locations. Simultaneous locally concentrated charging of EVs could, however, cause local peak loads and thus, grid overloads. Consequently, integration of EVs in the grid requires intelligent control. In addition, the increased injection of renewable energies requires a new alignment of the power infrastructure and storage capacities, including decentralised energy supply.

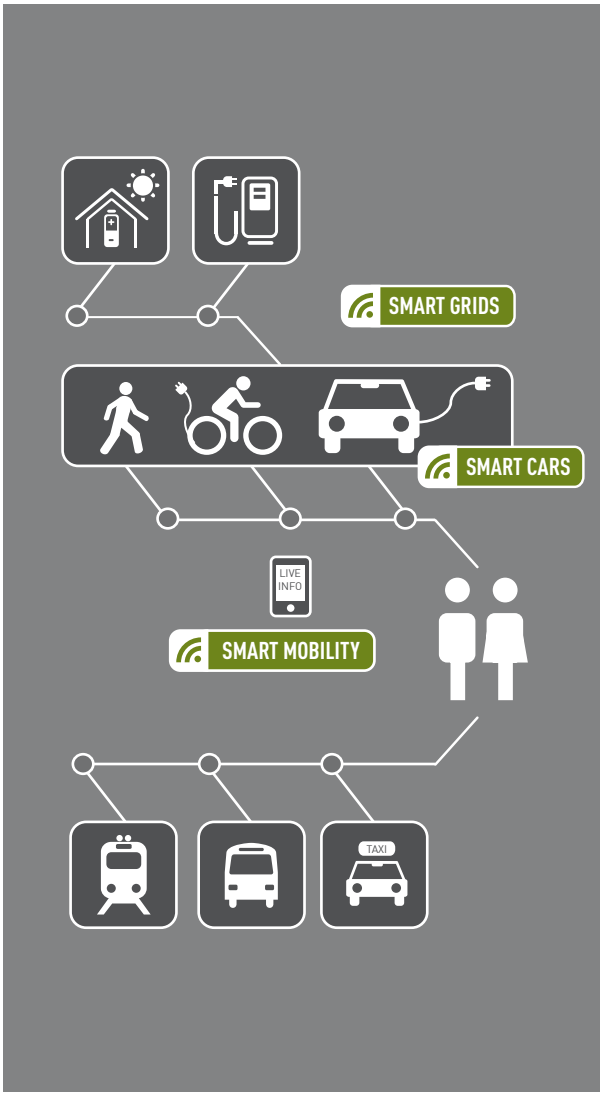
Against this background the EV charging value chain will make use of the existing value chain for electricity production and distribution as a foundation, but needs to integrate new, consecutive value chain elements: the infrastructure owner and the charging station operator and ICT service provider. In this regard, customers' easy and seamless access to charging infrastructures and related services is a key issue for the success of electromobility in Europe and requires adequate ICT solutions.

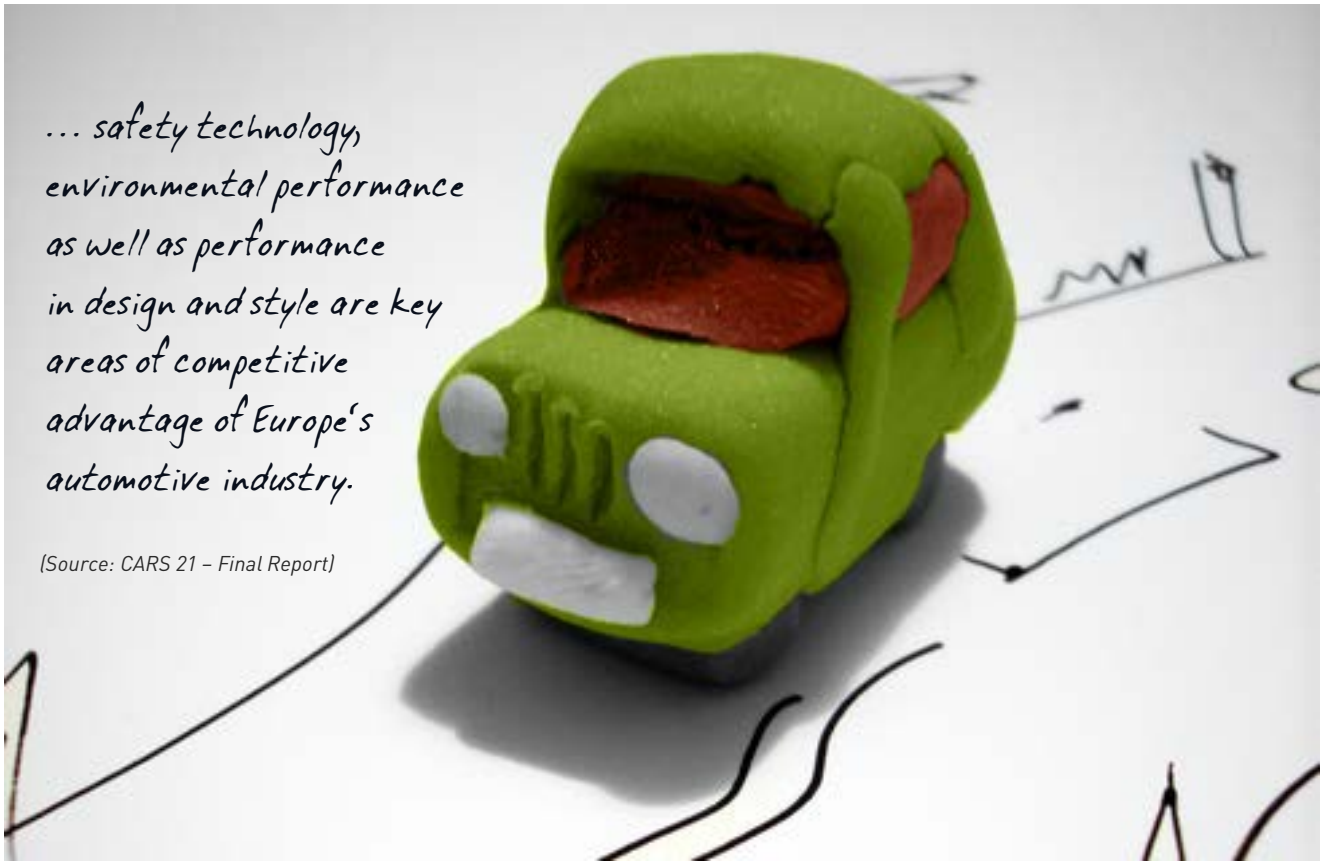
**Information and communication technologies (ICT)** are key enabling technologies underpinning innovation and competitiveness in many public and private sectors, and also electromobility. Today, high-tech conventional vehicles already have up to 40% computer controlled components and are enabler as well as driver of 60% of current vehicle innovations. ICTs share of value creation in vehicles is expected to increase in the future. Electromobility has a double impact on the sector. First, it necessitates a new ICT architecture inside and outside the vehicle. But at the same time it opens new business opportunities for new entrants and for new business models. The meta-themes in the field of ICT for electromobility arise at the intersection of automotive and energy sector and play a crucial role in a variety of areas:

- **Smart mobility** including customer-centred services
- **Smart grids** including grid integration (i.e. bi-directional charging, grid communication)
- **Smart cars** including new ICT system architectures as well as transport system integration (e.g. vehicle-to-vehicle, ranging from requirements management to design and construction, from motor controls to innovative battery management solutions to series development and production.

Electromobility will make ICT in cars much more important. It is to be expected that skills and competences will shift, and structures for added value will change.

**ICT sector comprises telecommunication (NACE 61) including carrier services, computer programming, consulting and related activities (NACE 62) as well as information service activities (NACE 63).**






## 2.2.1 Automotive Sector

**Alsace/Franche-Comté** and **Stuttgart Region** have a long tradition in car manufacturing. Today, both regions are European hubs for the automotive industry attracting a broad range of players, from large multinational Original Equipment Manufacturers (OEMs) such as PSA Peugeot-Citroën, Daimler AG and Porsche AG to international and regional suppliers. Internationally established suppliers such as Faurecia, Schrader, Delfingen, Lisi, Timken or Mark IV are based in Alsace/Franche-Comté dealing with operations on both the domestic and international markets. Some 400 suppliers are located in Stuttgart region, companies of different sizes ranging from SMEs to global players like Bosch, from small automotive-design offices to Bertrandt AG, a leading engineering company.

The concentration of head offices in **Alsace/Franche-Comté** spawns a whole set of small industrial suppliers and service companies, which can be considered as the backbone of the regional economy. This group of small or very small enterprises find themselves in a paradoxical position being large providers of regional jobs thanks to innovation, while at the same time remaining financially very fragile and dependent upon unbalanced relationships with large companies. The regional expertise offers the full range of competencies required to design and produce a vehicle, with a focus on drive systems and car components. It is complemented by some other skills that involve non-industrial enterprises: telecommunications, smart sensors and systems, mobility services, etc. Some thirty firms are working on the development of new motorisation system, with special emphasis on «electric engines». The economic downturn in Europe strongly affects the regional automotive sector: loss of employment (downsizing) and closure of businesses or plants.

Different from other automotive regions, in **Stuttgart Region** many suppliers still are independent companies, which are not part of any corporate group. Robert Bosch GmbH, Mahle GmbH, Behr GmbH & Co. KG, Eberspächer GmbH & Co. KG and Mann+Hummel GmbH, all headquartered in Stuttgart, are listed in the group of «Top-100-Automotive-Suppliers 2010». Although faced with a major drop in automotive sales in 2009, Stuttgart Region, in contrast to Alsace/Franche-Comté, recovered fast from the crisis not at least because of its healthy mid-size-companies with their own capital and innovative products.

In 2012, the European industry as a whole was operating at only about 60 to 65% of capacity, German luxury car manufactures like BWM and Mercedes continue to thrive and are operating at capacity.

For long machine industry dominated the regional industry structure in **West Transdanubia**. Its importance has even increased and shifted towards automotive industry through OEMs investments in the region. For example, Opel's (General Motors) investment in the production plant in Szentgotthárd and Audi's investment in Györ doubled the domestic production capacity during the mid of the last decade. In 2010, 96 companies were registered in West Transdanubia, of which more than half are micro-enterprises. Besides, large multinational TIER1 suppliers as well as Hungarian and international TIER2 suppliers are located in the region. These companies invest also in R&D activities. More recently, three new OEMs in the field of electric mobility emerged, namely Antro Kht, Moveo Zrt and Wilisits Engineering.

In contrast, the Swiss and Slovenian automotive sector are characterised by a strong supplier industry. In Switzerland 300 automotive suppliers, of which one-third is located in **Espace Mittelland**, contribute to an important export volume of the Swiss economy. They employ around 34'000 people and perform an export turnover of Euro 13'000 Mio. Swiss know-how and automotive technology are featured in almost every vehicle produced for the global market. Over 60% of the companies are SMEs, of which the bigger operate worldwide and two are even among the 100 biggest suppliers worldwide. It is in particular the high-tech suppliers that drive the automotive sector. The spectrum of parts and components ranges from simple screws to crankshafts, automatic systems, protective coatings, hi-tech cables, steering systems, throttles, electronic, and special aluminium components.

**Slovenia's** automotive suppliers grew from a small group of unrelated businesses and institutions into a closely linked network of development partners to world's leading OEMs. The sector encompasses many TIER 1 and 2 suppliers. Today, Slovenian automotive industry unifies 85 companies, above 600 contractors and knowledge institutions with more than 24'500 employees and 147'000 people indirectly related to the sector. The region's competencies in vehicle hybridization and electrification, radical lowering of consumption in internal combustion motors, mechatronic systems, and light-construction vehicles in particular offer large potential for innovative green mobility solutions.

Though **Vorarlberg** is not a typical location of the automotive sector there nevertheless are some important suppliers (e.g. Hirschmann Automotive GmbH, ELKO König, ELB From, Henn), developing and providing products and services for conventional automotive industry. Thiem edrives, in contrast, is a company that deals with solutions and products for the electromobility industry. They produce drive systems (electro engines) and inverters for electric bikes, electric fun vehicles or electric cars.

## Passenger Car Registrations 2012 per 1'000 Population

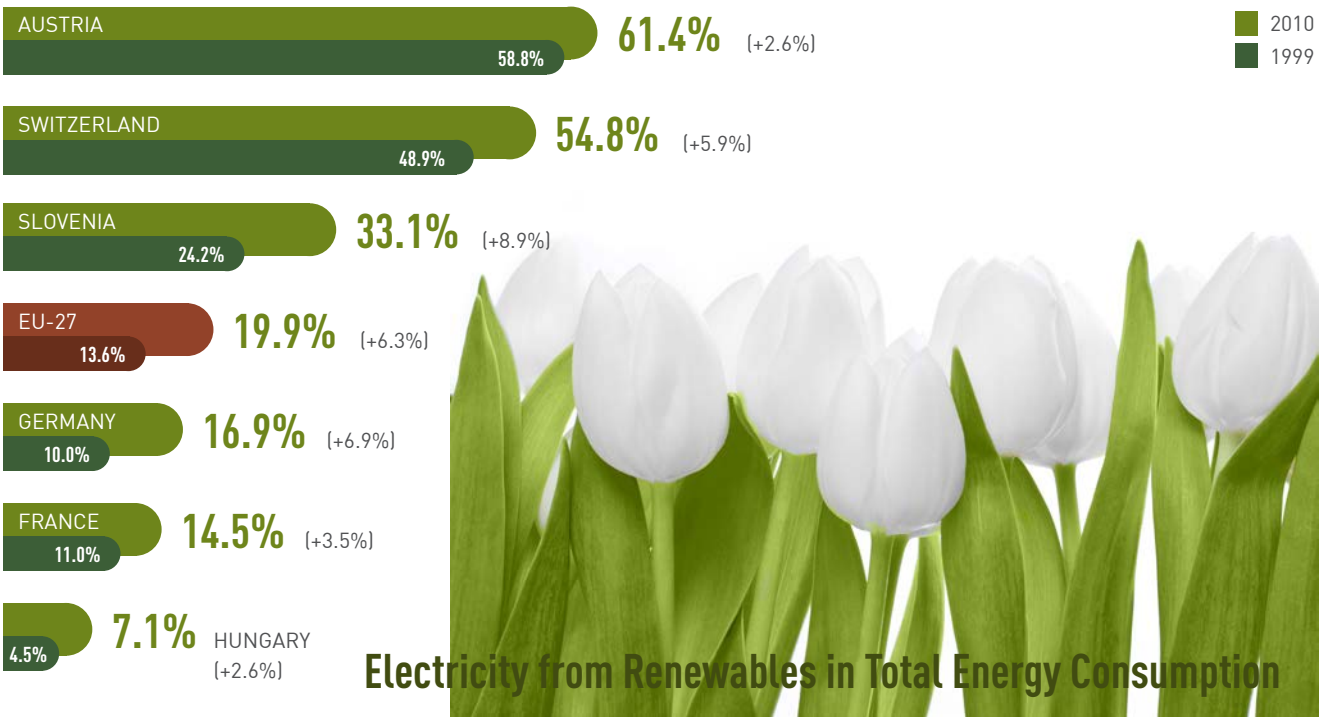
## 2.2.2 Green Energy

Electric vehicles are just a part of the overall system of electric mobility. It has to be considered that although electric vehicles have only few direct emissions, all rely on energy created through electricity generation, and will usually emit pollution and generate waste, unless energy is generated by renewable source power plants. Renewable energy or «green energy» includes hydroelectricity, biomass, wind, solar, tidal and geothermal energies. According to the recent «Energy, transport and environment indicators» pocket book (Eurostat 2011), the share of electricity from renewables in total electricity consumption varies considerably across EU-27. As regards the ELMO[5] regions, for example, in Austria and Switzerland the share of electricity from renewable sources in gross final energy consumption increased to 61.4% and 54.8% in 2010. Slovenia still achieved a share of 33.1%, while Germany, France and Hungary are below the EU-27 average (see figure below).

These numbers illustrate that energy supply industry has to actively progress the development of renewable energy, in particular, and needs to join forces with the ICT sector to accelerate delivery of smart grids.

Contrary to the other regions where electromobility is foremost driven by automotive industry, in **Vorarlberg** it is the energy sector. Renewable energies and energy efficiency are important business areas of Vorarlberg's energy sector with its four energy utilities. By 2050, the region envisages to produce more green energy than it consumes. Illwerke VKW, the largest electricity provider in the region, generates electricity exclusively from hydroelectric and other renewable energy sources. «Peak energy» is produced with so-called pumped-storage plants for the international market. In addition, the company operates «over-the-river» hydroelectric power plants located along the rivers.

The other three regional energy providers operate hydro power plants, too. Besides they produce electricity with a biogas plant, photovoltaic and a micro gas turbine. Over three-thirds of the sold electricity in the region comes form hydropower. Wind and biomass contribute with 4%. The sector also expels a high export rate with 52% of energy exported to neighbouring countries like Germany, Switzerland and Lichtenstein.




Electricity from Renewables in Total Energy Consumption

Case Study

# SUCCESSFUL CITIZENS INVOLVEMENT « VWK PHOTOVOLTAIC SHARES »

In 2012 the local energy supplier Vorarlberger Kraftwerke (VKW) built 40 photovoltaic (PV) plants with a total capacity of 1,400 $kW_{peak}$ on roofs of real estates of the Federal State Vorarlberg and VWK's own buildings. These plants produce annually about 1.4 million kWh, equivalent to the consumption of 500 average households in Vorarlberg.

## KEY CUSTOMERS

VWK PV Shares as ethnical investment offer citizens the possibility to contribute to sustainable energy generation although not having the possibility of building their own PV power plant either because they live for rent or their house is not suitable for the installation of a PV power plant.

## HOW IT WORKS

For a one-off amount of Euro 1'400 per share plus an annual service fee of Euro 15, interested parties can buy shares of the PV power plant. The customer can purchase up to 10 shares, which corresponds to the typical size of a standard home PV power plant. For each share and the duration of 20 years shareholders receive a guaranteed bonus credit on their electricity bill with a value of 450 kWh per year. The bonus credit is calculated based on the VWK's commodity price prevailing at the time. It includes electricity duty, grid usage charge and VAT. In addition, VWK takes responsibility for the projection, management, processing and maintenance of the PV power plants and ensures a capital and yield guarantee.

## CUSTOMERS' ADDED VALUE

Contrary to other PV sharing projects, in which the customer simply buys a part of the power plant, VKW's approach allows the customer to directly profit from the annual production of all PV power plants:

At the end of the year the yield of all PV power plants is determined and an average production calculated. This forms the basis for the calculation of the bonus credit. In years with high solar irradiation intensity the yield of the power plants is significantly higher. The resulting average surplus will be credited to the shareholders in addition to the guaranteed 450 kWh per year. Furthermore, VKW guarantees well running systems and high electricity yields through remote systems monitoring.

## A SUCCESS STORY

VWK's PV Shares were sold out within a few days. In total 1'000 citizens committed themselves to green energy production. The successful launch of the PV shares as is reflected in its wide public recognition and acceptance, prompted VWK to engage in negotiations with other municipalities and institutions to facilitate further PV projects to offer more PV shares.

## CONTACT

Vorarlberger Kraftwerk AG
Weidachstr. 6, AT-6900 Bregenz
www.vkw.de

## 2.2.3 Information & Communication Technologies (ICT)

The ICT sector produces about 5% of European GDP, with a market value of Euro 660 billion annually, while it contributes far more to overall growth and productivity as a large amount of investments is (in)directly connected to this sector.

Under ICT, numerous key-enabling technologies are summarized as part of several value chains. ICT supports as one of the key segments also the sector of electromobility. In the areas of smart mobility with the focus on offers which are «energy efficient», «low-emission related» and/or «cost-effective» ICT is regarded less than the developer of new infrastructures, but rather than the optimizer of the use of existing services such as car sharing and/or rent a bike etc. Moreover, smart grid uses along and/or digital ICT to gather on information about the users' and costumers' behaviour. Smart grid comprises the communicative networking and control of power generators, storage, electrical loads etc. And finally, ICT can be found in the smart cars themselves, which include ICT system architecture. This constantly is under construction to achieve better and more innovative solutions (e.g. batteries) for the daily and practical use of EVs.

ICT is a strong economic sector in the regions **Alsace/Franche-Comté, Espace Mittelland** and partially in the **Stuttgart Region**. With regards to the latter, ICT is addressed in several regional projects, as supportive activity. The region **West Transdanubia,** in its own terms, handles ICT as extremely important, but cannot be referred to as an expert region in that field.

About 20% of all firms in the region **Alsace/ Franche-Comté** are involved in the ICT sector. Thus, several local relevant skills and resources lie in ICT, especially with the focus on smart mobility and mobility services. Information and Communication Technologies are also strongly represented in the public research in Alsace/Franche-Comté. Companies such as Parkeon (car part management services), Orange Lab (telecommunication and travel) as well as Photline (optical modulation solutions) are electromobility-related entities in ICT.

The ICT sector in **Greater Berne** is – regarding the employees in the sector – with 3.4 % slightly below the national average of 4%. The productivity of the ICT sector in Switzerland is above average, 4% employees generate 4.9% of the GDP. 2010 this made 28.2 billion Swiss Francs. Considering at whole Switzerland the service sector is the most important in ICT, with approx. 53%. However, ICT with a focus on smart grid solutions in field-test, applied research and application testing makes up the main goals of the R&D projects in the region **Espace Mittelland**. Though, the city of Berne has 10% a higher share of GPD generated by the ICT sector than most of the rest of Switzerland. Moreover, Berne disposes of an ICT cluster (tcbe.ch), which was already founded in 1996.

As previously lined out, ICT also seems to be a larger topic in the region of **Stuttgart.** The hint for this is several RTDI policy measures and R&D projects in the past years. One noteworthy example is the project called «ICT for electromobility». It focuses ICT-based mobility and integration of EVs in energy systems (grids).

Generally, ICT seems to be good integrated as cross-technology into the electromobility sector in several ELMO$^{s}$ regions. Even though, there still is a demand on further development, especially in **Slovenia** and the region **West Transdanubia**.


Case Study

## SUCCESSFUL MOBILITY CONCEPT « CAR2GO »

### BACKGROUND

As the number of vehicles on the road and the individual mobility needs rise, the infrastructure and quality of life in cities are put under strain. Not to forget the negative impact of congestion problems on the economic performance of cities and regions. The E-car2go initiative provides an intelligent mobility solution based on electrical vehicles, which ultimately have a positive impact on the volume of traffic and the transport related emissions in the city of Stuttgart.

### THE SOLUTION

The car2go concept of Daimler combines rental and sharing services in a convenient value proposition, which makes vehicles available anywhere and anytime for the members of the system. A registered customer can identify the location of the nearest available car2go vehicle on a smartphone or the Internet and can pick the vehicle up via the membership card. If wanted, vehicles can be reserved in advance as well. Afterwards, the driver can leave the vehicle at any public parking spot, which means almost anywhere in the city. The usage is billed per minute and the invoicing is carried out automatically by direct debit.

In November 2014 almost 6'000 car2go were available in 14 European cities. Customers pay a one-time registration fee of € 19 including the member card plus 29 Cent per minute and a maximum of 14.90 €/hour. In addition, each kilometer starting with the 21st costs 0.51€/km extra. The electric car2go models have a range of 135 km. The car2go offers an additional service for long-distance trips or transporting bulky loads as well. The members who apply for a Europcar partner card can also rent vehicles from the company's entire product range at a 15 percent discount on the best available daily rate, thus helping the users with all of their mobility needs.

In Stuttgart car2go is operating Germany's biggest all-electric fleet, encompassing a total of 360 battery-electric smart fortwos. By the end of 2013, EnBW, the largest regional utility supplier, was operating 500 charging points in the Stuttgart region. The partners of car2go project are the state of Baden-Württemberg, the city of Stuttgart, EnBW Energie Baden-Württemberg AG, and Stuttgarter Straßenbahnen AG. As in other car2go locations, the service in Stuttgart is jointly organised by Daimler's car2go subsidiary and the Europcar vehicle rental company.

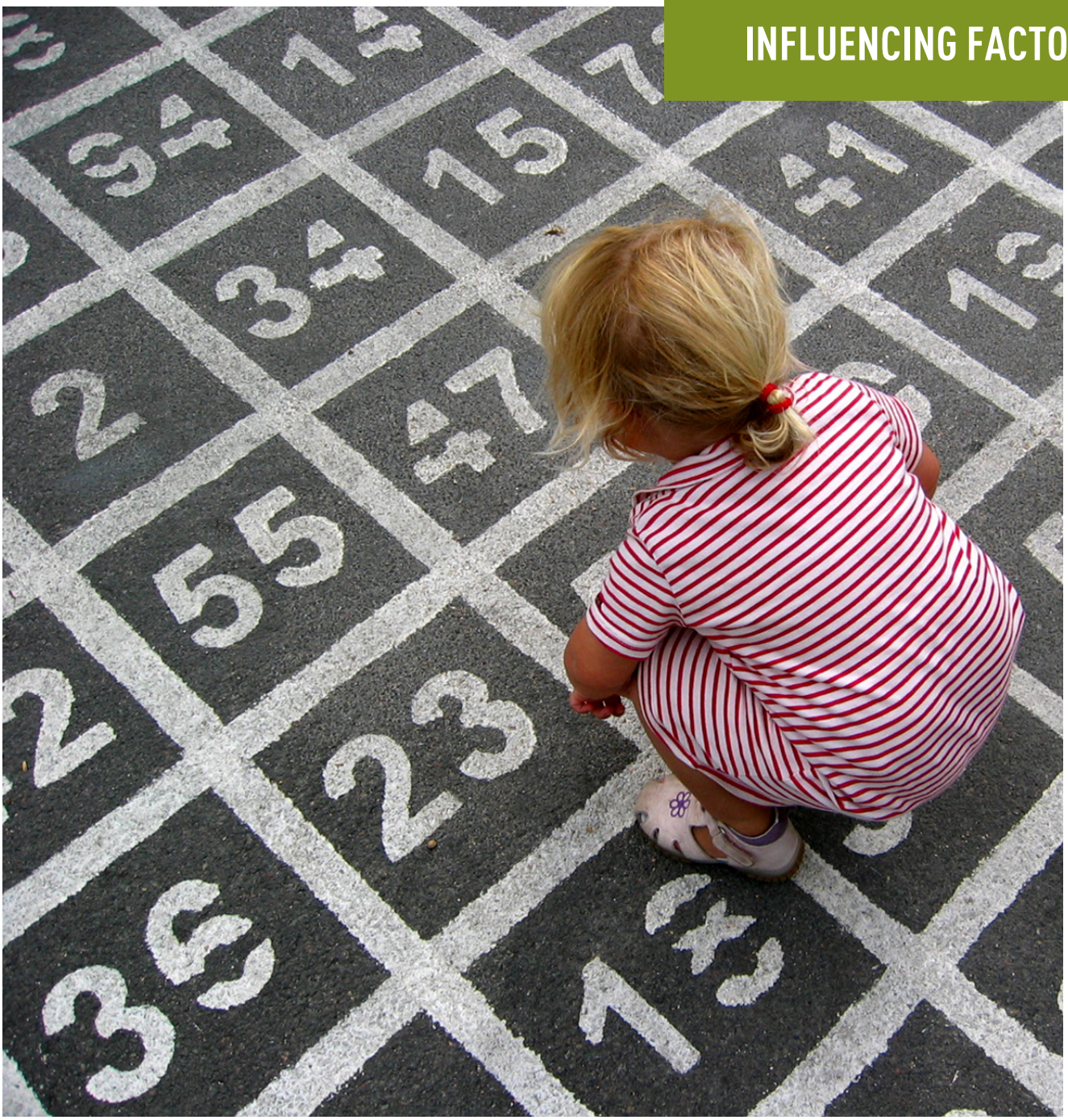
### FACTS

| | |
|---|---|
| Foundation | 2008 |
| Location | Ulm |
| Customers | 900'000 |
| Coverage | 30 European and North American cities |

### CONTACT

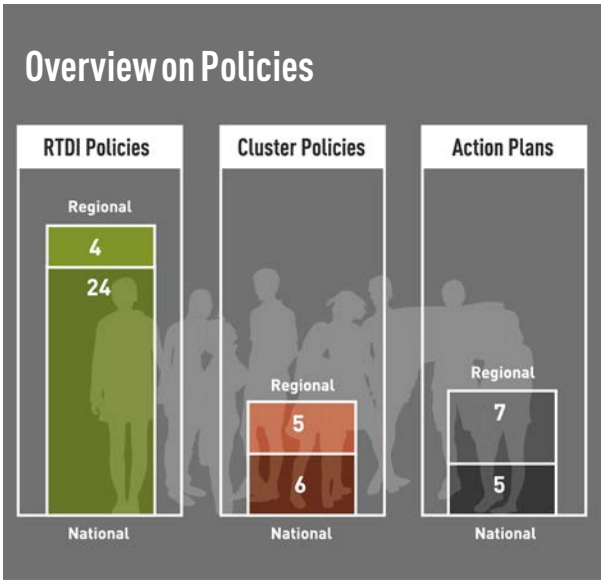
Wirtschaftsförderung Region Stuttgart (WRS)
Rolf Rainer, rolf.reiner@region-stuttgart.de

# 3 FRAMEWORK CONDITIONS AS INFLUENCING FACTOR



# 3.1 POLICIES AT DIFFERENT LEVELS

**MULTILEVEL GOVERNANCE** is used to describe situations in which governance and policy-making transferred from the national to other levels; either upward to a supranational arena (i.e. EU), downward to local or regional contexts, or sideways to other networks of actors than traditionally in control of policy formation.




Many actors are involved in the formulation and implementation of RTDI and cluster policies, requiring efficient coordination mechanisms to be established. Therefore it is essential, to take into consideration the **multilevel policy governance** role in making RTDI and cluster policy interventions more efficient. As a matter of fact, interdependency of EU, Member States, regions and actors grows with the progress of globalisation; it follows that all of the basic factors that facilitate successful R&D and innovation can be affected by efficient and well-directed policies carried out by the EU, its Member States and European regions.

At all governance levels policy makers need to explore novel strategies and approaches to cope with the challenges posed by complex and rapidly changing socio-economic political environments, including globalisation, environmental challenges, changing innovation processes, and so on. The regional dimension is of key importance in innovation policies because interactive learning and innovation processes are often spatially bound, and are strengthened and improved by geographic proximity. With respect to ELMO$^{S}$, Research, Technological Development and Innovation (RTDI) and Cluster Policies establish conditions to boost investment in research and development, innovation, resource efficiency and the uptake of sustainable green mobility.

Against this background, the subsequent chapters compare electromobility-related RTDI and Cluster Policies as well as of Action Plans implemented in the six partnering regions.

## 3.1.1 RTDI Policies

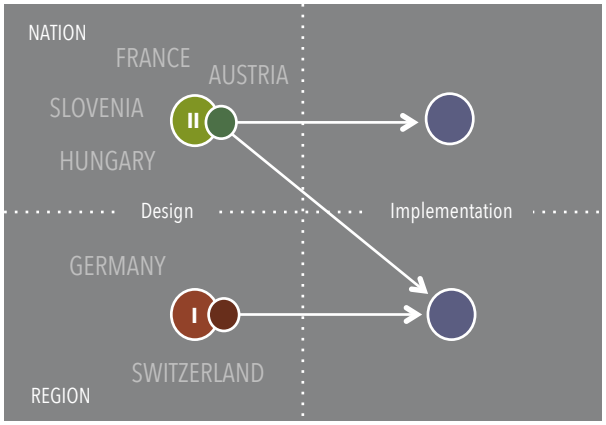
RTDI programmes and measures provide a structural framework for the funding or other ways of support of a number of projects or initiatives. In most cases this framework is outlined in written programme guidelines or similar documents binding for the authority responsible for and entrusted with the programme. Generally, these documents set out the goals, rational and responsibilities of the actors involved, define activities supported by RTDI programmes, and so on. They have a limited timespan and are initiated and governed by one or more responsible authorities (e.g. key actors such as agencies, ministries or research councils).

**The purpose of the RTDI policy mapping was not to capture all RTDI programmes at national and regional level, but those related to electromobility and/or one of the three electromobility-constituent sectors Automotive, ICT and (Green) Energy.**

In total 4 regional and 24 national policy measures related to electromobility have been identified. Subject to the responsible governance level, two distinct types of policy production can be distinguished: Firstly, countries where policies are designed and implemented at the regional and national level. Second, countries where RTDI policies are solely designed at the national level, but implemented at national and regional level («top-down approach»). While the former applies to Germany and Switzerland, the latter is characteristic for France with its unitary state system plus Austria, Slovenia and Hungary.

According to the mode of policy production, in **Alsace/Franche-Comté, Slovenia, Vorarlberg** and **West Transdanubia** regional RTDI actions, linked to electromobility are implemented «top-down» (see table «Overview on RTDI Policies»), limiting the possibilities for policy formulation at the regional level. Compared to these regions in **Stuttgart Region** and **Espace Mittelland** electromobility related RTDI policies are also designed by the regional/cantonal government, which allows to formulate more targeted policy measures and enhances the flexibility to respond to actual region-specific needs.

**Research, Technological Development and Innovation (RTDI) policies are understood as a form of public support of RTDI activities.**




Basis for structural actions in **Alsace/Franche-Comté** – including regional innovation policy – is the CPER State-Region agreement (Contrat de Projet Etat Région). Under this agreement various electormobility-related RTDI programmes have been set-up by the French Government. For example, the «ANR, Non-Thematic Research Programme 2011-2013» focusing on innovative technologies, «FUI, the French Single Inter-Ministry Fund» addressing competitive clusters and the «ADEME» programme which intends to stimulate, coordinate and facilitate environment protection and energy management. Responding to the recent financial crisis, the French «Investments for the Future» programme consists of a wide range of instruments in favour of innovation such as the development of world-class research units (including automotive, ICT, green energy).

# Overview on RTDI Policies

| | Scope* | | Sectors** | | | | | Target Groups*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | R | T | ICT | E | M | O | B | R | RDC | RE | O | Duration |
| **Alsace/Franche-Comté** | | | | | | | | | | | | | |
| ANR Non-Thematic Research Programme 2011-2013 | ● | | | | | | ● | ● | ● | ● | | | 2011 - 2013 |
| FUI RTDI Projects | ● | | | | | | ● | ● | ● | ● | | | 2009 - 2011 |
| FUI RTDI Innovation Platforms | ● | | no sectorial focus | | | | | not specified | | | | | 2009 - 2011 |
| PREDIT 4 | ● | | ● | | | ● | | ● | ● | ● | ● | | 2008 - 2012 |
| ADEME Research Programme 2007-2010 | ● | | ● | ● | ● | ● | | ● | ● | ● | ● | | since 2007 |
| «Investments for the Future» Programme | ● | | no secrorial focus | | | | | ● | ● | ● | ● | ● | since 2009 |
| **Espace Mittelland** | | | | | | | | | | | | | |
| Economic Strategy 2025 Canton Berne | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | 2011 - 2025 |
| Swiss Energy Strategy 2050 | ● | | ● | | ● | | | ● | ● | ● | ● | | 2011 - 2050 |
| Swiss Nation Mobility Policy | ● | | ● | | | | | not specified | | | | | ongoing |
| **Slovenia** | | | | | | | | | | | | | |
| Centres of Excellence | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | 2009 - 2013 |
| Competence Centres | ● | | no sectorial focus | | | | | ● | ● | ● | ● | | 2010 - 2014 |
| Development Centres of the Slovene economy | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | 2010 - 2014 |
| Financial Incentives Programme for Electric Vehicles | ● | | ● | ● | ● | ● | | ● | ● | | | ● | 2012 |
| **Stuttgart Region** | | | | | | | | | | | | | |
| Pilot Regions e-Mobility | ● | | ● | ● | ● | ● | ● | ● | ● | | | | 2009 - 2014 |
| Funding Programmes e-Mobility I | ● | | ● | ● | ● | ● | ● | ● | ● | | | ● | 2009 - 2014 |
| Funding Programmes e-Mobility II | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | 2009 - 2014 |
| Several funding programmes e-mobility | ● | | | ● | ● | ● | | ● | ● | | | | 2012 - 2014 |
| «Showcase e-Mobility» Programme | ● | | ● | ● | ● | ● | | ● | ● | | ● | ● | 2012 - 2015 |
| State Initiative E-Mobility Baden-Württemberg | | ● | ● | ● | ● | ● | | ● | ● | ● | ● | | 2009 - 2016 |
| Sustainable Mobile Region Stuttgart | | ● | ● | ● | | ● | | ● | ● | | ● | ● | 2012 - 2014 |
| Model Region for Sustainable Mobility | | ● | ● | ● | ● | | | ● | ● | | | ● | 2012 - 2017 |
| ICT for Electromobility Programme | ● | | | ● | ● | ● | | ● | ● | | | | 2009 - 2014 |
| **Vorarlberg** | | | | | | | | | | | | | |
| Model Region VLOTTE | ● | | ● | ● | ● | ● | | | ● | | ● | ● | 2009 - 2011 |
| Smart Cities - FIT for SET | ● | | ● | ● | ● | ● | | ● | ● | ● | ● | ● | 2011 - 2012 |
| Model Regions for Electromobility | ● | | ● | ● | ● | ● | | ● | ● | ● | ● | | since 2009 |
| Technological lighthouses of Electromobility | ● | | ● | ● | ● | ● | | ● | ● | ● | ● | | 2009 - 2010 |
| Sustainable Mobility Cycling 2011 | ● | | ● | | ● | ● | | | | | ● | ● | since 2011 |
| **West Transdanubia** | | | | | | | | | | | | | |
| New Széchenyi Plan | ● | | ● | ● | ● | | | ● | ● | ● | | | 2011 - 2013 |

* N = national R = Regional

** T = Transport ICT = Information & Communication Technologies E = Energy M = e-Mobility O = Other

*** B = Business R = Research Organisations/Researchers RDC = Research-driven Cluster RE = Region O = Other

Contrary to Alsace/Franche-Comté the RTDI in the region **Espace Mittelland** is fostered on national and regional level, but mainly found in an indirect form. It is less detailed with respect to thematic priorities. RTDI programmes for electromobility are included in the economic strategy and in the guidelines on mobility development (national mobility policy). Key policy stakeholders are the National Government, Cantonal Government and in contrast to Alsace/Franche-Comté also private initiatives. At this stage, three policy measures relate to electromobility have been formulated, of which one is restricted to the Canton of Berne, namely the Economic Strategy 2025 of the canton Berne. It aims at innovation in clean-tech and knowledge transfer. The two national programmes «Energy Strategy 2050» and the general «Mobility Policy» focus on sustainable mobility and basically address the transport and energy sector.

Being essentially of horizontal nature, **Slovenian** policies are less focused on specific thematic or sectorial priorities, but address the overall development of research and knowledge. Key governmental stakeholders is the Ministry for Higher Education, Science and Technology (MHEST), responsible for RTDI policies, the Ministry of Economy, the «Office for Development and European Affairs» and the «Office for Local Self-Management and Regional Development», which in charge of innovation policies Examples for related policies are the «Centres of Excellence» programme focusing on priority technological areas and horizontal linkages and the «Competence Centres» programme supports the strengthening technological development capabilities.

In comparison, **Stuttgart Region,** with its complementary RTDI policies at the different government levels is the pioneer among the ELMO[5] regions, when it comes to fostering electromobility by RTDI policies. Stuttgart can distinguish between two types of innovation policies: First and most important, policies designed at national and implemented at regional level (e.g. «Leading Edge Cluster competition», «Electromobility Model Regions Program», and «Showcase Electromobility»). Second, policies designed and implemented at regional level complementing national policies with a strong focus on the support of SMEs. Nevertheless, the national government is the main source of funding and support for innovation activities. National RTDI policies follow the long-term «Hightech Strategy 2020 for Germany» under which the «National Electromobility Development Plan» and the Industry-Science Research Alliance have been established. In addition, the «National Platform E-Mobility» was launched as an advisory board and think-tank in support of the overall national strategic RTDI planning. At the federal state level of Baden-Wuerttemberg, RDTI policies are based on the «State Initiative E-Mobility», transforming national visions to the State's objectives. At the regional level, the State's roadmap is complemented by a regional roadmap on sustainable mobility integrating e-mobility development into the overall traffic planning for the region. Policies implemented within the region focus on the support of research and demonstration efforts, both in the public and private sector. The large number of RTDI policies in Stuttgart Region are broken down to single activities such as «Pilot Regions eMobility». This activity focuses on the daily use of EVs and its contribution to national environmental targets. Summarizing, the Stuttgart Region is a good example of a multilevel governance structure.

As with Alsace/Franche-Comté and Slovenia, national programmes are of utmost importance for **Vorarlberg** as concerns RTDI in electromobility. Key policy actor is the «Energy and Climate Fund Austria», an organisation represented by the Federal Ministries of Agriculture and Infrastructure. Under this framework the «Model Region VLOTTE» was established prioritising infrastructures for electromobility, including electric cars and charging stations, new business and mobility models plus green energy production systems (e.g. PV and small hydro power plants). The programme «Model Regions for Electromobility» was launched to spread electric vehicles to commercial and private use in urban surroundings with at least 100,000 inhabitants. «Smart Cities» programme aimed at creating a district/city in Austria adopting a zero emission.

Being confronted with the transition from a socialistic to a democratic regime, economic development in **West Transdanubia** was during the past 15 years concerned with other factors than RTDI. Compared to the other regions the regional innovation system is less developed. As in France, RTDI policies are highly centralised leaving limited regional autonomy in RTDI policies resulting in a dependence on national frameworks. Correspondingly, the national «New Széchenyi Plan» is the only programme related to electromobility.

## 3.1.2 Cluster Policies

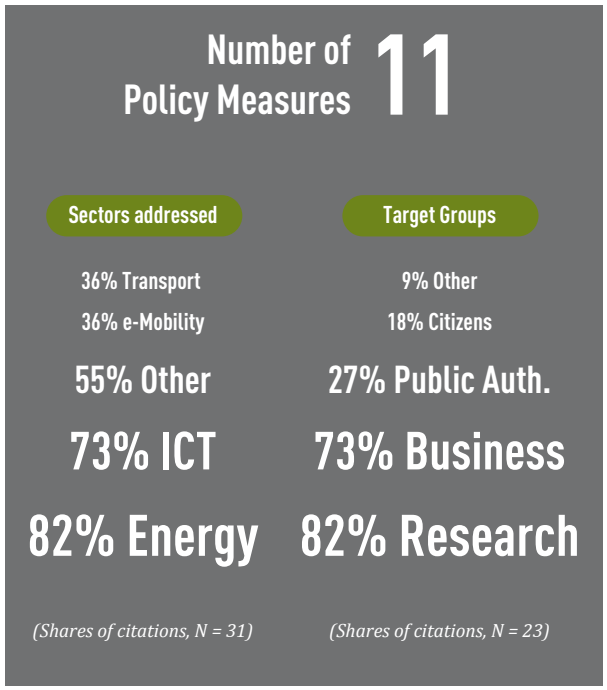
Cluster policies by means of **facilitating policies** are directed towards the enhancement of specific conditions that could improve clusters' performance. **Traditional framework policies**, such as SME policies, research and innovation policies, and regional policy often use the cluster approach to increase the efficiency of a specific instrument. And **development policies** strive for creating, mobilising or strengthening business strategies and cooperation between organisations and people through knowledge sharing at regional or cluster level.

Striving for more evidence-based cluster policy in view of a new generation of improved and excellent clusters, the purpose of this mapping was to collect information on regions' priority areas, cluster-related policy instruments and measures.

In total 11 cluster policies measures were identified, of which 6 have been formulated by the national government and 5 by the regional/federal state government. As with RTDI policies, the main governance level responsible for cluster policies is determined by the political system in the respective country: With regard to **Alsace/Franche-Comté, Slovenia, Vorarlberg** and **West Transdanubia** cluster policies are in the responsibility of the national governments, whilst in the case of **Stuttgart Region** both, the national and regional governments are in charge of policy formulation. As regards **Espace Mittelland** cluster policies are assigned to the cantonal governance level.

With different foci all **electromobility-constituent sectors** are addressed within the framework of cluster policies, whereas ICT and Energy are the sectors most frequently cited. Unlike the other ELMO$^S$ regions, no specific sector has been defined by the French national cluster policies as point of reference for Alsace/Franche-Comté. Three national policy measures in Germany, Austria and Hungary plus one regional instrument relevant to Stuttgart Region are directed towards electromobility. Irrespective of the governance level, nearly all identified policies have research organisations as their target groups – 9 out of 11. The other major target group is private business entities with a share of 73 percent of citations. Only a minority of cluster programmes name public authorities and citizens as target groups.

**Cluster policies can broadly be defined as specific governmental efforts to support clusters including facilitating policies, traditional framework policies and development policies.**




Concerning concrete actions defined in the programmes the majority of programmes support cluster governance structures, alongside business entities and sector-specific research activities. However, each programme is based on different principles, follows different approaches and has different objectives according to its political and economic framework.

The **French** cluster policy, for example, distinguishes between competitiveness clusters and regional clusters. Competitive clusters are vibrant thematic world-

## Overview on Cluster Policies

| | Scope* | | Sectors** | | | | | Target Groups*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | R | T | ICT | E | M | O | B | R | P | C | O | Duration |
| **Alsace/Franche-Comté** | | | | | | | | | | | | | |
| Competitiveness Clusters | ● | | no sectorial focus | | | | | not specified | | | | | 2011 - 2013 |
| Regional Clusters | ● | | no sectorial focus | | | | | ● | ● | ● | | | 2009 - 2011 |
| **Espace Mittelland** | | | | | | | | | | | | | |
| Cluster Strategy Economic Development Agency | | ● | | ● | ● | | ● | not specified | | | | | since 1997 |
| Regional Innovation Policy Canton Fribourg | | ● | | | ● | | | ● | ● | | | | 2008 - 2011 |
| Sectorial Cluster Promotion | | ● | | ● | ● | | ● | ● | ● | | | | 2008 - 2011 |
| **Slovenia** | | | | | | | | | | | | | |
| Cluster Development Programme | ● | | ● | ● | ● | | ● | ● | ● | | | | 1999 - 2004 |
| **Stuttgart Region** | | | | | | | | | | | | | |
| Leading Edge Cluster Competition | ● | | | ● | ● | ● | ● | ● | ● | | | | 2007 - 2017 |
| Cluster Initiative Baden-Wuertemberg | | ● | ● | ● | ● | | ● | ● | ● | ● | | | 2010 - 2014 |
| State Initiative e-Mobility I | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | 2010 - 2014 |
| **Vorarlberg** | | | | | | | | | | | | | |
| Model Region VLOTTE | ● | | ● | ● | ● | ● | | | ● | | ● | ● | 2009 - 2011 |
| **West Transdanubia** | | | | | | | | | | | | | |
| New Széchenyi Plan - Cluster Development | ● | | ● | ● | ● | ● | | ● | ● | | | | 2012 - 2013 |

* N = national R = regional
** B = Business R = Research P = Public Authorities C = Citizens O = Other
*** T = Transport ICT = Information & Communication Technologies E = Energy M = e-Mobility O = Other

class clusters set up at the national level. The 71 clusters are working on future-oriented sustainable fields of activity such as aeronautics, agro-food, renewable energy, ICT, health etc. Pole Véhicule du Future in the region **Alsace/Franche-Comté** is one of them. Competitive clusters adopt a 5-year strategic plan based on the «Triple Helix» approach and are meant to set up collaborative RTDI projects and promote an innovative environment. In this context, a strong priority is given to SMEs. Their future focus will be on market-driven projects, which create homegrown jobs. Regional cluster clusters, in contrast, targeted co-operations between larger and smaller companies, accompanied by research entities and education centres. They focus on the revitalization of the countryside.

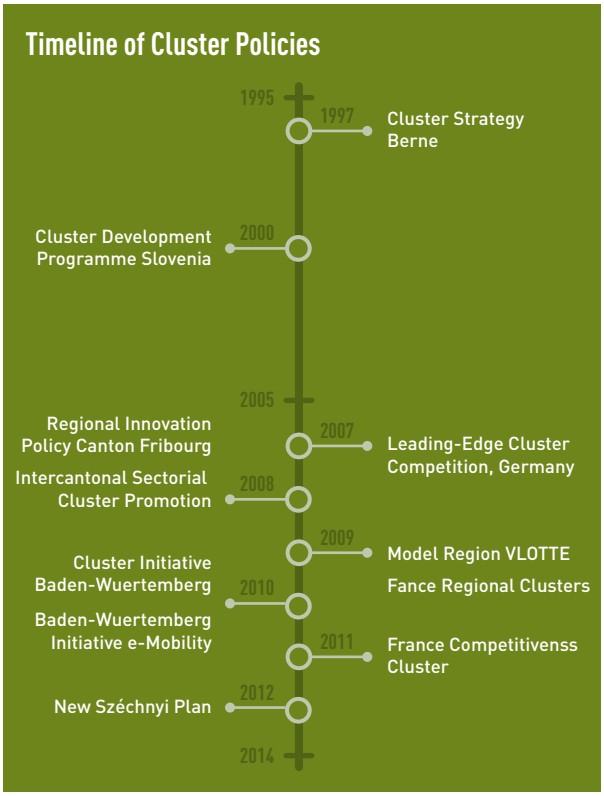
Unlike France, in **Switzerland** no national cluster programmes have been established but three cantonal measures relevant for **Espace Mittelland,** namely the «Cluster Strategy Economic Development Agency Berne», the «Regional Innovation Policy Canton Fribourg» and the «Intercantonal Implementation Programme» of the intergovernmental conference. These programmes are directed towards the economic development of the region by stressing the importance of cluster activities, while being less specific as the French policies with regard to the concrete actions. Founded in 1996, tcbe.ch – ICT Cluster Berne, was one of the first clusters in the region initiated as a bottom-up initiative.

The national cluster development programme in **Slovenia** was launched in 2000; in 2004 18 clusters were operational, bringing together 350 companies and 40 education/research institutes. Unfortunately, the clusters were not sufficient and with the change of the government in 2004 the cluster support programme ended. The clusters which could establish themselves during the previous period such as the automotive cluster in Slovenia were able to apply further R&D funds, but not for own operational costs. The lack of support given for cluster management structures and the fact that no further cluster programmes were initiated is what clearly distinguishes Slovenia from the other ELMO$^{S}$ regions.

Compared to the other regions, **Germany** can be considered as one of the precursor for cluster policies in Europe. First policies in Germany were launched in the mid 1990ies resulting in a number of support programmes at the national, federal-state and regional level combing bottom-up and top-down approaches. Since then the cluster landscape has gradually changed in response to new challenges. Contrary to Slovenia, both recent leading national cluster programmes – «Leading-Edge Cluster Competition» (2007-2017) and «go-cluster» (since 2012) – consider cluster management excellence as one of the key success factors of the cluster approach. With regard to **Stuttgart Region** and under the responsibility of the Ministry of Finance and Economy, the national policies are complemented by the cluster policy of the Federal State of Baden-Wuertemberg. The first regional cluster competition was launched in 2008, the second in 2011. In total 26 statewide cluster organisations were established. With the support of the Federal State this policy was supplement by the establishment of a State Agency for e-mobility and fuel cell technologies, the e-mobile BW GmbH. It became the State's cluster management organisation for e-mobility and successfully applied for one of Germany's leading edge clusters. «CARS – Clusterinitiative Automotive Region Stutt-gart», arose from the preparation of the regional strategy «Strategy 2020». The European Commission has twice awarded the regional cluster policies in Stuttgart. Nowadays, CARS and e-mobility BW GmbH are coordinating all large-scale e-mobility demonstration projects in Baden-Württemberg.

For **West Transdanubia** the establishment of regional cluster initiatives was the first step of the implementation of technology and knowledge-based programmes at the regional level. From 2000 to 2005 five cluster initiatives were initiated in five sectors in the most advanced industrialised centres such as Györ, Sopron, Szombathely, and Zalaegerszeg. Although two of these were less successful, the overall experience led to the formation of further clusters. The establishment of cluster organisations has been key in advancing the regional innovation systems. For example, in 2006 «Pannon Cluster» was established to coordinate the cluster activities in West Transdanubia. The aim was to intensify the investment in West Transdanubia by supporting the cooperation and exchange activities of 23 industrial parks in the region. In 2012 a new application was set up as part of the New Széchenyi Plan, called «Development of Entrepreneurial Co-operation and Clusters», which can be regarded as a further fund for the development of the accredited clusters. The key policy actor of the plan is the «National Development Agency» addressing mainly the sectors of transport, ICT and e-mobility.

In comparison to the other ELMO$^S$ regions, **Vorarlberg** disposes only one so-called cluster that deals with timber architecture. Thus, there is no official cluster in Vorarlberg relating to e-mobility. VLOTTE, which is not an official cluster, nevertheless, focuses on the clustering of electromobility in the region. The Austrian government originated the project VLOTTE in 2009 as a model region in e-mobility. The main project idea was the support of implementation of EVs in the region for several years. One of the major outcomes are the construction of power plants distributing the energy to the changing infrastructure including charging stations, which are located at public hot spots.



## 3.1.3 Action Plans

**Electrification** of mobility means embedding electric vehicles in a wider intermodal green transport system taking into account new usage patterns.

In general, regional and national **Electromobility Action Plans (EAPs)** comprise a vision and strategy for electrification of mobility or in a wider sense sustainable green mobility, define thematic priorities, objectives, actions and measures while outlining the potential of electric/future mobility, challenges ahead and regional/national strengths.

By mapping regional and national Action Plans, ELMOs strived to gather information on the knowledge, competencies and experiences available in the region to compare strategies, activities and measures defined and goals achieved to identify good practices, areas of mutual learning, complementarities between the participating regions and areas for future activities to be defined in the Joint Action Plan.

With the exception of **West Transdanubia**, action plans have been implemented in all regions at different governance levels: Due to the centralised unitary state system in France, for **Alsace/Franche-Comté** the decisive governance level is the nation and related national action plans such as «Electric and Hybrid Electric Vehicles Development National Plan» launched in 2009 by the French Ministry of Transport with the assistance of national agencies, local authorities and major private companies in the automotive sector. Likewise, national action plans have been implemented in **Slovenia**, where the Ministry of Environment and Spatial Planning functions as implementing unit. In addition, with the «Sustainable Electromobility Plan» (SEP), more recently Ljubljana became the first city in the country with a municipal action plan for electromobility.

In contrast, the federal state system in Germany led to the implementation of action plans at all governance levels which are of importance to **Stuttgart Region**. The «National E-Mobility Development Plan» is complemented by the «Roadmap Electromobility» introduced

### Overview on Action Plans

| | Scope* | | Target Groups** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | R | B | R | P | C | CL | O | Duration | Budget (Mio €) |
| **Alsace/Franche-Comté** | | | | | | | | | | |
| EV and HEV National Development Plan | ● | | ● | ● | ● | ● | ● | ● | 2009 - 2030 | 400 |
| **Espace Mittelland** | | | | | | | | | | |
| Swiss Roadmap Electromobility | ● | | ● | ● | ● | ● | | | Since 2001 | n/a |
| Association Inergie | | ● | ● | | ● | ● | | | | n/a |
| E-Mobility Economic Area Thun | | ● | ● | | | ● | | | 2011– 2025 | n/a |
| **Slovenia** | | | | | | | | | | |
| National Efficiency Energy Action Plan | ● | | ● | | ● | ● | | | 2008 – 2016 | 409 |
| National Renewable Energy Action Plan | ● | | ● | ● | | ● | | | 2010 – 2020 | n/a |
| **Stuttgart Region** | | | | | | | | | | |
| National E-Mobility Development Plan | ● | | ● | ● | ● | ● | ● | ● | 2008 - 2020 | 2,300 |
| Roadmap Electromobility Baden-Wuertemberg | | ● | ● | ● | ● | ● | ● | | 2009 - 2020 | 800 |
| Roadmap Sustainable Mobility Region Stuttgart | | ● | ● | ● | ● | ● | ● | | 2011 - 2020 | 18 |
| **Vorarlberg** | | | | | | | | | | |
| Energy-Future Vorarlberg | | ● | ● | ● | ● | ● | ● | ● | 2009 - 2050 | n/a |
| 101 Grandchild Qualified Measures | | ● | ● | ● | ● | ● | ● | | 2011 - 2020 | n/a |
| Vision Rhine Valley | | ● | ● | ● | ● | ● | | | Since 2004 | n/a |
| **West Transdanubia (none)** | | | | | | | | | | |

* N = national R = regional ** B = Business R = Research P = Public Authorities C = Citizens CL = Cluster O = Other

## ACTION PLANS VISIONS

**Vorarlberg** shall produce more green energy within the region then the consumption is in 2020.

Making **Stuttgart Region** the most sustainable transport region in Germany

The region of **Thun** shall become the Swiss competence centre for e-mobility and renewable engery.

**France** will take the opportunity of the development of EV and HEV to tackle climate change and to help restructuring the whole sector, fostering innovation for green growth that creates jobs and achieves sustainability.

**Slovenia** will achieve a 25%-share of renewable energy sources in gross final energy consumption and a 10%-share in transport.

Making e-mobility work all over **Baden Wuertemberg** from 2020 onwards

**Germany** shall become a lead market for electric mobility solutions.

Electric mobility - towards a sustainable modernisation of the **Swiss** transport system

by the federal state of Baden Wuertemberg and the regional action plan «Roadmap Sustainable Mobility». Analogous this applies to **Espace Mittelland** with the «Swiss Road-map to Electromobility» plus the two regional action plans «Association Inergie» and «E-Mobility Economic Area Thun».

Contrary to the other regions, the region is the most relevant governance level in the case of **Vorarlberg**. At this layer the action plan «Energy Future Vorarlberg 2050» has been implemented, which is supplemented by two further regional action plans, namely the «Vision Rhine Valley» and «101 Grandchild qualified Measures till 2020».

Further differences among the regions exist with regard to the **target groups** of the action plans. While the relevant action plans for Alsace/Franche-Comté, Stuttgart region, Vorarlberg as well as the Swiss national action plan, likewise, address enterprises, research, citizens, public authorities and cluster, in Espace Mittelland both regional action plans exclude research organisations and one public authorities. A slightly different picture occurs in Slovenia where one action plan excludes research and the other public authorities.

The **thematic priorities** covered by the action plans are rather divers and include among others the following aspects:

- Establishment of charging infrastructures and smart grid solutions
- Development of batteries and energy storage, EV and HEV
- New mobility business models
- Fleet management
- Consumer incentives
- Demonstration projects
- Renewable energy sources and efficient energy usage

## 3.1.4 Policy Assessment

SWOT analysis is a proven strategic planning tool, geared towards internal factors (strengths and weakness) and external factors (threats and opportunities) as basis for thinking about and setting strategic goals and objectives. In the framework of ELMO[S] an alternative approach was chosen to make cluster managers to critically reflect on the interplay of RTDI, Cluster Policies and Action Plans. Based on the «goals grid approach» the 2x2 matrix on the right was used. The matrix is constructed by yes/no (Y/N) answers to the questions «Do you have it?» and «Do you want it?». The interplay of answers defines the basic categories:

- If you want something you already have, the objective is to **retain** it.
- If you want something you do not have, the objective is to develop/strengthen **(enable)** it.
- If there is something you have, but do not want, the objective is to get rid of it **(eliminate)**.
- If there is something you do not want and do not have, the objective is to **avoid** it.

The results of the policy assessment are summarised on the next page. It becomes evident that to some extend factors to be retained in one region first need to be enabled in another. For example, Stuttgart Region wishes to retain the well-established multilevel governance, whereas West Transdanubia wishes to develop such governance structures through national and regional electromobility strategies plus related action plans. Subject to the development stage of policies, some similarities between the regions exist with respect to streamlining policies, commitment to electromobility and targeted policies.

### 2x2 Assessment Matrix

| DO YOU WANT IT? \ DO YOU HAVE IT? | Y | N |
|---|---|---|
| Y | **Retain**<br>Which aspects would you want to keep or improve? | **Enable**<br>Which aspects would you like to develop or strengthen? |
| N | **Eliminate**<br>Which aspects would you want to abandon or replace? | **Avoid**<br>Which aspects would you like to circumvent/stay clear off? |

Case Study

### SLOVENIAN PLATTFORM SMART GRIDS

Large European countries are investing significant resources in the development of smart grid demonstration projects, mainly in connection to smart meters.

The concept SmartGrids means a change of the concept of operation and design of the power system. That is, an electricity network that can intelligently integrate the actions of all users connected to it in order to efficiently deliver sustainable, economic and secure electricity supplies.

The Slovenian platform is operating since 2006 as an initiative of Slovenian SmartGrids members from the Slovenian Ministry of the Economy, the Ministry of Higher Education, Science and Technology, the University of Ljubljana and the Electric Power Research Institute Milan Vidmar. The national electricity network technology platform is an important instrument that allows the country to begin serious and organised action in the field of exploiting alternative technologies and resources. The direct transfer of practical experience from more developed countries in this field is, of course, very helpful, but countries such as Slovenia have to find their own way and, with their own highly qualified personnel, develop their own technologies and solutions that will best fulfil specific national requirements. The education of experts for the SmartGrids vision is another crucial issue on the way to success.

Further information

www.smartgrids.si

| | RETAIN | ENABLE |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – Variety of RTDI research programmes available through the whole innovation process<br>– Better links between public research and innovative businesses<br>– Comprehensive action plan to develop e-mobility | – Capacity to assist firms in their innovation activities<br>– Clear strategic vision and commitments to promote e-mobility |
| ESPACE MITTELLAND | – Political direction to renewable energy and sustainable transport<br>– Field tests as action plan<br>– Openness to different technological trends in national policy | – Positioning certain e-mobility uses as one solution to the CO2-problem<br>– Give intermodality a strong political profile<br>– Stronger political emphasis on e-mobility |
| SLOVENIA | – Government support for e-mobility<br>– Cooperation between industry and academia<br>– Acting as «open system» with clear demands for new members | – More calls for proposals<br>– Availability of R&D financial resources<br>– Encourage the e-mobility |
| STUTTGART REGION | – Strong multilevel governance<br>– Regional coordination of national, state and regional programmes<br>– Cooperation of leading regions in Germany & Europe | – Streamlined funding mechanisms for SMEs |
| VORARLBERG | – Positive spirit concerning «Energy Future Vorarlberg»<br>– Awareness for e-mobility<br>– External recognition of Vorarlberg / VLOTTE | – R&D in e-mobility and energy-efficiency<br>– Regional funding of electromobility<br>– Raising awareness for e-mobility |
| WEST TRANSDANUBIA | – Strenghten vehicular innovation capacities by fundings<br>– Supporting zero emission transportation modes in the region<br>– Regional e-vehicle development strategy | – Developing Hungary's long term e-mobility strategy<br>– Developing WTD regional e-mobility strategy<br>– Developing regional e-mobility action plan |

| | ELIMINATE | AVOID |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – Complexity of the innovation system (e.g. programmes, actors)<br>– «Red Tape» | – Unrealistic RTDI policies concerning businesses' needs and mode of operation<br>– RTDI policies that don't respect the «good value for money» principle in public funding |
| ESPACE MITTELLAND | – Lack of useful policies for sustainable mobility<br>– Lack of regional e-mobility policies<br>– Political fear of a form of mobility using energy by proposing sensible ways of using e-mobility | – Policies allowing arbitrary development not putting emphasis on sustainable mobility<br>– Too much mobility<br>– Poor incentives |
| SLOVENIA | – Reference strategy replace for intensive strategy | – Low cost countries in Eastern Europe and Asia |
| STUTTGART REGION | – Conflicting targets (national/regional or business/-public) | – Direct subsidy schemes for end-users |
| VORARLBERG | – Opinion of citizens concerning TCO for mobility<br>– Opinion of industry and craft concerning TCO for mobility | – Structures with top-down strategies from OEMs and industry<br>– Lobbying for existing structures in automotive sector |
| WEST TRANSDANUBIA | – Bureaucracy<br>– Slow decision making at the governmental level<br>– In long term (15-20 years): non zero emission public transportation modes in the major regional cities | – Introduction foreign e-mobility solutions without adaptation to the regional capabilities<br>– Cluster weakening competitions<br>– Diversity of the e-mobility infrastructures (different maker, different (charging) system) |

# 3.2 FINANCIAL ACTORS & INSTRUMENTS

The allocation of financial resources to RTDI plays a decisive role in driving innovation in electromobility. It is therefore essential, to get a detailed overview of financial actors investing in innovation activities in the area of electromobility and such focusing on one or more of the electromobility-constituent sectors Automotive, ICT and (Green) Energy.

Collecting information on financial actors, instruments, volumes, investment size, scope and beneficiaries allows for a better alignment of public and private investment in RTDI within the region and across regions as well as an improved utilisation of EU structural funds.

In total 81 financial instruments at the regional, cross-regional and national levels are available for the stakeholders in the regions. The core characteristics of these instruments can be summarised as follows (see figure at the bottom page):

- The most prevalent instruments are more transitional ones, such as bank loans followed by risk/venture capital.
- Newer instruments such as seed funds, crowd funds and mezzanine capital are rather an exception than the norm.
- Likewise, business angel investments are rather rare.
- Guarantees and other instruments (including public funds) can be found more often.

**SEED FUNDS**

Seed capital is the initial capital used to start a business. It usually comes from the founder's personal assets or investments by friends and family, but can also come from outside angel investors.

**CROWD FUNDING**

Funding of a company by selling small amounts of equity to many investors, i.e. a collective effort of pooling financial resources; it addresses the equity gap between loans from family/friends and informal investors.

**MEZZANINE CAPITAL**

A hybrid of debt and equity financing that is typically used to finance the expansion of existing companies. It gives the lender the rights to convert to an ownership or equity interest in the company if the loan is not paid back in time and in completely.

**BUSINESS ANGELS**

An Angle Investor, also referred to as «Informal Investor» is a high net worth individual who invests in a business venture, providing capital for start-up or expansion, either in exchange for convertible dept or equity. They are thought of as bridges between loans from family and venture capital.

**GUARANTEES**

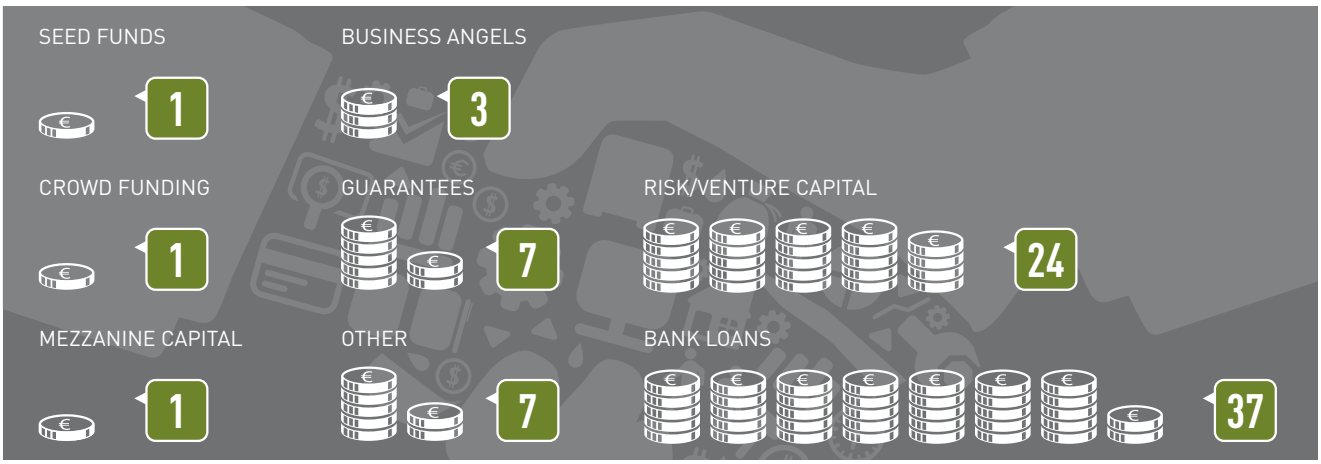
A promise made by a third party (e.g. bank, region) to provide payment on a bond, loan, or other liability in the event of default.

**RISK/VENTURE CAPITAL**

Investment funds allocated to speculative activity. Risk capital refers to funds used for high-risk/high-reward investments. These funds are made available for start-ups and small businesses with exceptional growth potential.

**BANK LOAN**

A debt-financing obligation issued by a bank or similar financial institution to a company or individual.

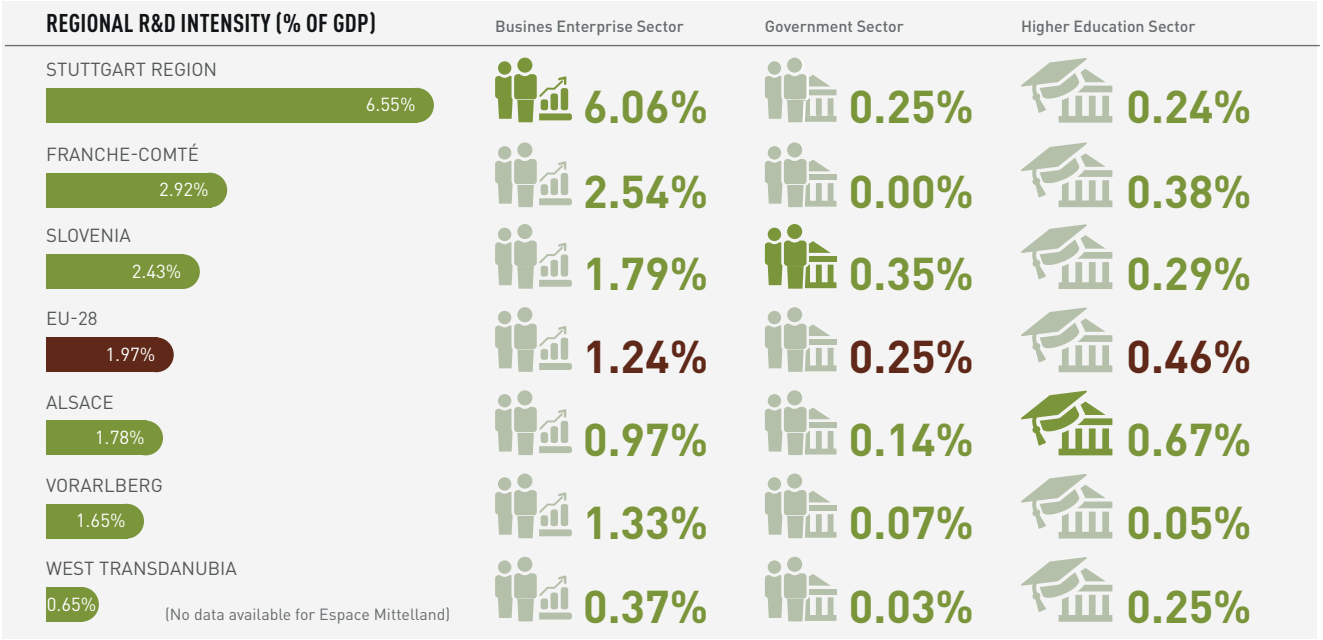


### 3.2.1 Funding Opportunities in the Regions

The diversity and scope of RTDI funding instruments vary considerably between the regions. The infrastructures in **Alsace/Franche-Comté** and **Stuttgart Region** offer a broad spectrum of funding opportunities at regional, cross-regional and national level, whereas Vorarlberg's infrastructure is less diversified but also offers instruments at all governance levels. In **Slovenia** and **Espace Mittelland** no region-specific instruments are available, but national instruments. **West Transdanubia** finds itself in the constraint situation of not having established electromobility related RTDI funding instruments so far.

As the figure below illustrates, regional R&D intensity (R&D expenditure as % of GDP) correspond with the financial instruments available in the regions. In **Stuttgart Region**, for example, the business enterprise sector R&D intensity is by far the highest and is well above the government and higher education sector. Accordingly, loans, seed capital, business angle investment mezzanine and risk capital are the most important finance instruments. Overall, business enterprise expenditure sums up to 7 billion Euro/year. Although on lower levels, this also applies partly to **Franche-Comté** and **Slovenia**.

The three regions vary, however, with respect to the public funding: While in **Stuttgart Region** public finance instruments complement the private investment scene, in **Franche-Comté** the regional public instruments are not available. More recently, however, national public financial support for innovation gained renewed interest. In this context OSED as key public body plays a decisive role as «public bank for innovation». Innovation cheques (direct fund to support innovation) and research tax credit by means of tax discounts for companies carrying out RTDI are the most important public instruments in **Alsace** and **Franche-Comté**. In addition Alsace is the region with the highest R&D intensity of the higher education sector. In contrast, **Slovenia** shows the highest level of government sector R&D intensity of all regions. Examples of related financial instruments are the Slovenian Environmental Public Fund and the general purpose Slovene Enterprise Fund. In **Vorarlberg** there are parallels with Stuttgart Region and Franche-Comté insofar as companies own budgets and bank loans are the most important financial instruments. More sophisticated forms of finance such as business angle investment, mezzanine, and venture capital on the other hand are perceived as too complex and therefore not applicable.

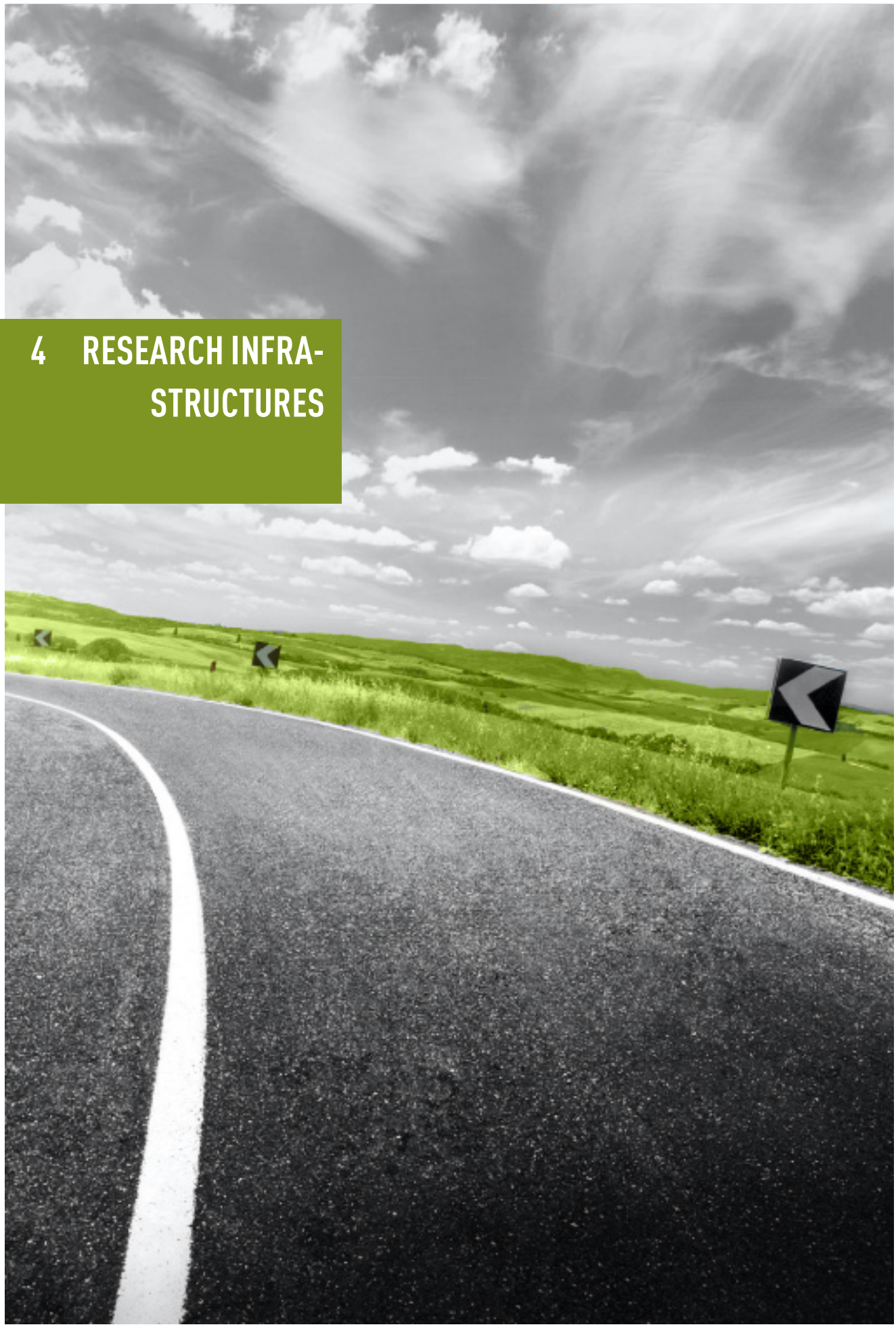


## 3.2.2 Assessment of Funding Structures

| | RETAIN | ENABLE |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – Strong support to SMEs<br>– Variety of financial instruments available<br>– Non-specific schemes (not bound to one unique business area) | – Rationalisation of the whole innovation ecosystem |
| ESPACE MITTELLAND | – Security that spoken money is available<br>– Financing through KTI<br>– Local development agencies and technoparks (renting cheap space) | – More venture capital |
| SLOVENIA | – Support from government for e-mobility<br>– Wide scope of different instruments and support institutions | – Differentiated forms of financing |
| STUTTGART REGION | – Business Angel activities<br>– State programmes | – Saving banks engagement<br>– Crowd financing |
| VORARLBERG | – National funding for electromobility for industry and crafts<br>– Explanation of TCO in consulting activities | – Regional Funding for electromobility for citizens<br>– Regional Funding for electromobility for companies and municipalities<br>– Development of simple suitable financing methods |
| WEST TRANSDANUBIA | – Regional Business Angel Club<br>– Governmental support by high intensity (>75%) funds | – Visibility of Business Angels<br>– Supporting cooperation between financial actors |

| | ELIMINATE | AVOID |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – High complexity of public and private financial instruments available<br>– Lack of instruments specifically designed for medium-sized businesses | |
| ESPACE MITTELLAND | – Administrative obstacles (especially for smaller projects) | – Subsidies |
| SLOVENIA | – Preparing instruments only for large companies, smaller ones due to the required conditions can not get along | – High financial input |
| STUTTGART REGION | – Lack of transparency | – Foreign VC (e.g. from Asia) |
| VORARLBERG | | – Complicate financing instruments (e.g. Mezzanine financing) |
| WEST TRANSDANUBIA | – Differenciated fundings in the different regions of Hungary (most supported are the eastern, less the western and central regions)<br>– Difficulties on SME side to get bank loans for RTDI aims | – Bridging institutions do not consider the demand for services<br>– Problems in financial innovation activities of SME sector |

# 4 RESEARCH INFRA-STRUCTURES



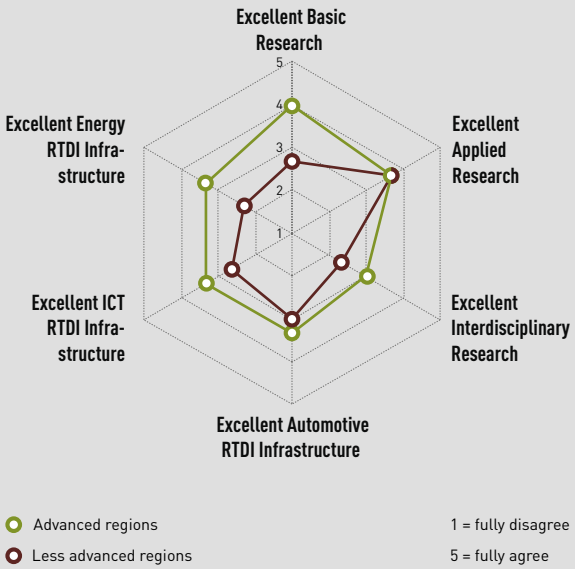
# 4.1 THE ROLE OF RTDI INFRASTRUCTURES

While electromobility gained considerable momentum, it is yet unclear, if its deployment is economically viable in the medium to long term. Electromobility as an emerging sector in its infancies still faces significant hurdles, which need to be overcome to reach greater market presence.

First, electromobility can be characterised as **systemic innovation** primarily driven by environmental considerations. It equally requires product, process, design, service and social innovation as well as their sound interplay. Hence, electromobility necessitates an integrated (i.e. systemic) view on the innovation process with its various stakeholders and sectoral intersections. A core challenge in facilitating this new sector is seen in the establishment of new and strong value networks based on vital collaboration across sectors and regions. Second, **research, technological development and innovation (RTDI)** plus demonstration are key activities for countries and regions seeking to help innovation to reach full market potential. Third, **research infrastructures** play an increasing role in the advancement of knowledge and technology and their exploitation. Accordingly, an innovative regional infrastructure serves the needs of enterprises to bring their innovations to market and to drive enterprises competitiveness and regions' welfare. Against this background, mapping the electromobility-related RTDI infrastructure in the region not only provides an overview of the current state of play, but also allows for a matching of the supply and the demand side within the region and between regions.

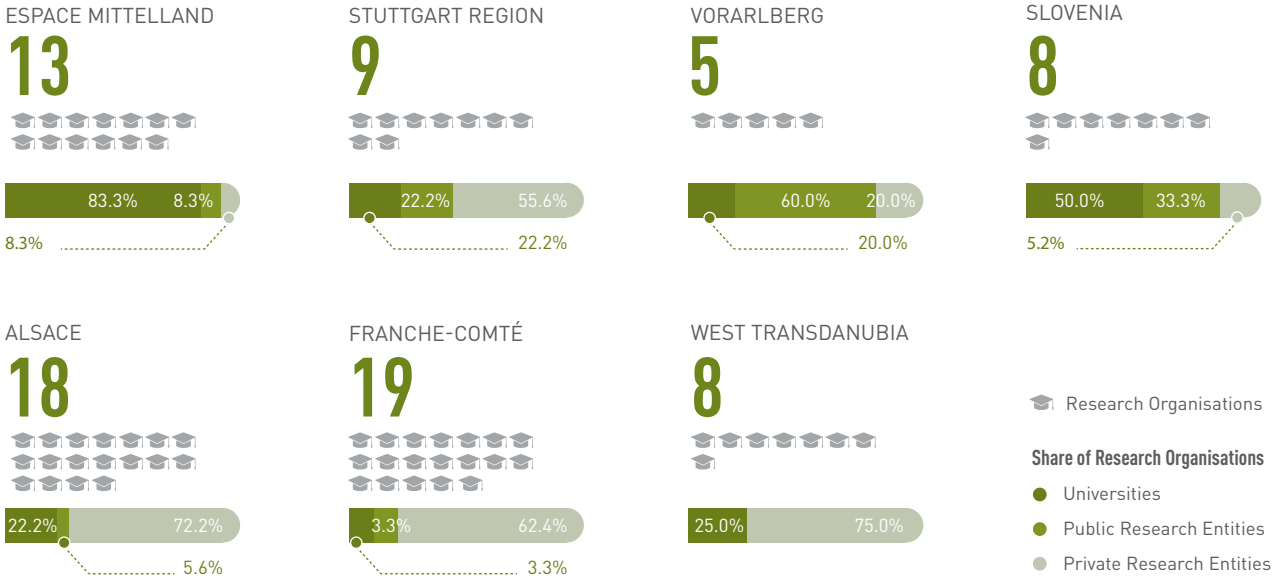
**Research infrastructures refer to facilities, resources and related services used by the scientific community to conduct research in their respective field.**

## Overview RTDI Excellence Mean

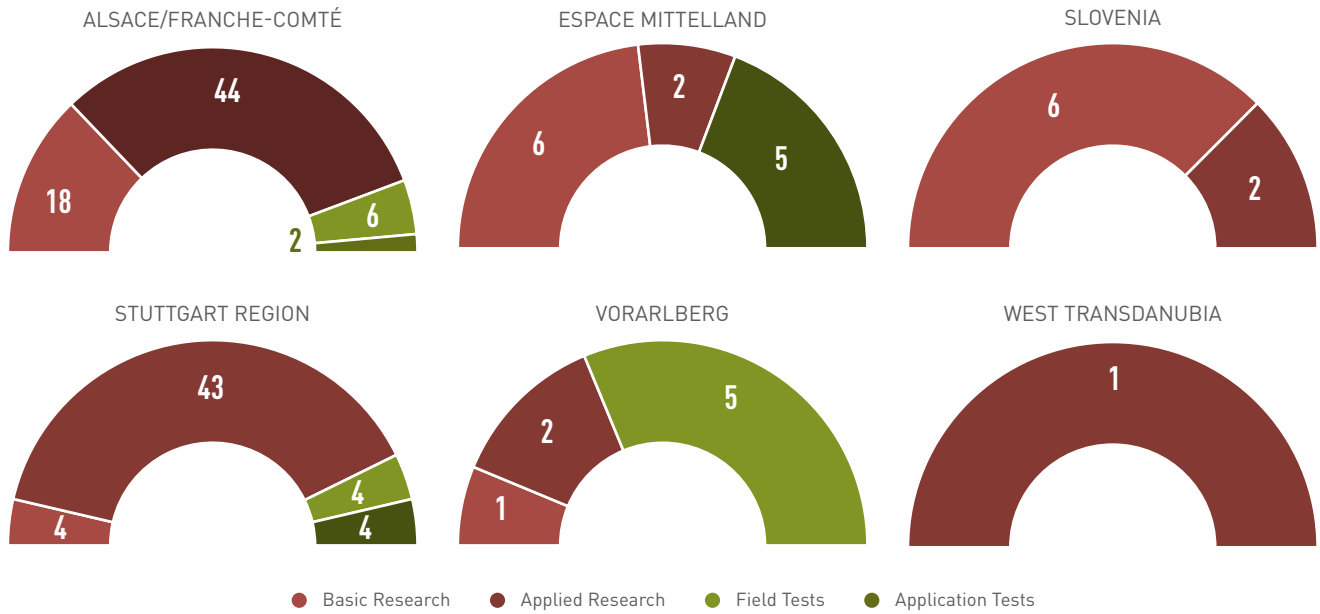


# [ SNAPSHOT ] REGIONAL RTDI INFRASTRUCTURES

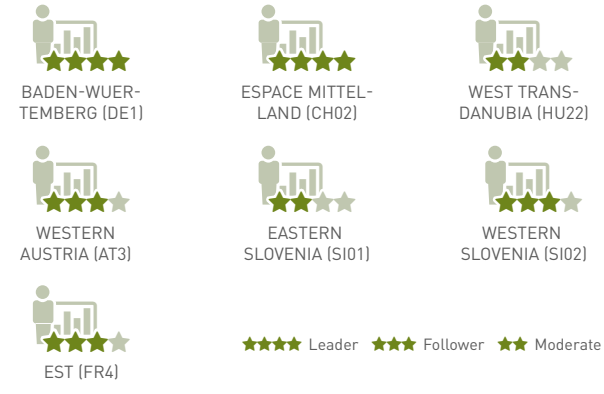
## Electromobility-related Research Entities



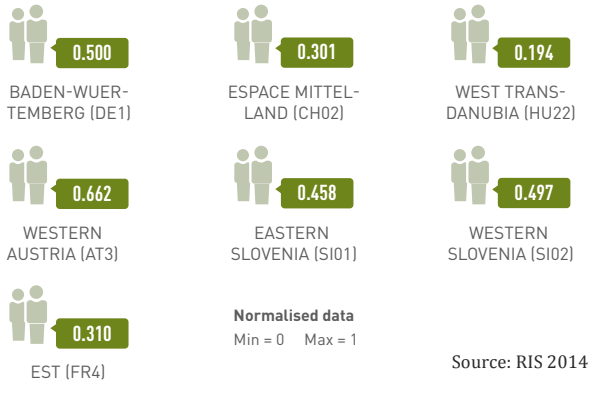

## Ongoing Electromobility-related Research Projects




## Regional Innovation Performance Groups




## Innovative SMEs collaborating with Others




Source: RIS 2014

## 4.2 RESEARCH ENTITIES – AN OVERVIEW

In total **80 electromobility-related research entities** have been identified in the six participating regions. While all three types of research entities (universities, public and private research entities), to a greater or less extent, are involved in basic as well as applied research, universities are also engaged in higher-education training and education contributing to the future availability of highly skilled human resources in the region.

As illustrated in the figure on the previous page, Alsace and Franche-Comté rank first with 18 and 19 research organisations, followed by Espace Mittelland with 13 entities. At a distance Stuttgart Region, Slovenia and West Transdanubia follow. In Vorarlberg as the smallest region only five research organisations are located (see figure on previous page).

The regions vary, however, not only in the number of research entities, but also with regard to their **composition**. Accounting for 75.0 and 72.2 percent, **private research organisations** are of utmost importance in West Transdanubia and Alsace/Franche-Comté. Although at a lower level, likewise, this applies to Stuttgart Region, with private research organisations constituting more than half of all RTDI entities. In Espace Mittelland, Slovenia and Vorarlberg private research entities play only a minor role. With a share of 83.3 percent Espace Mittelland has the most pronounced landscape of higher education, i.e. **universities and universities of applied sciences**, followed by Alsace and Stuttgart Region (both 22.2%). All other regions fall – in absolute numbers and shares – behind the former three. Except for West Transdanubia, one to two **public research entities** are found in all regions, while their share is highest in Vorarlberg (60%) followed by Slovenia (33%) and Stuttgart Region (22%).

Corresponding to the sectoral spread, in Alsace/Franche-Comté, Stuttgart Region and West Transdanubia research activities are centred on **automotive** and **mobility**. Research in the areas of **ICT** and **energy** account for the largest portion of RTDI activities in Espace Mittelland. **Energy-related** research is also at the core in Vorarlberg jointly with **mobility**. In Slovenia research priorities are, equally, given to automotive, ICT and energy.

**Research entities comprise universities, including universities of applied sciences as well as public research entities partly or fully publicly financed and private research organisations fully privately financed.**

Collaboration between the different research entities as well as industry and academia is one of the key success factors of **Stuttgart Region**. In 2011, for example, the «Hochschul- und Wissenschasftsregion Stuttgart e.V.» (higher education and science region) has been established, connecting a high number of regional universities and research entities, to foster cooperation. Another example is the e-mobility cluster, being an umbrella institution for the Fraunhofer Society and the Stuttgart University providing a platform for joint research activities. In addition, companies and research consortia are supported in the development of innovative projects by the Fraunhofer IAO «Mobility Innovation Competence Center». Whereas the «Institute of Vehicle Concepts» works in close relation with industry in areas of alternative power trains and energy conversion, fuel and energy storage technologies, lightweight and hybrid design and construction as well as innovative technology systems. The competitiveness of the region's public research is well reflected in volume of funded projects at Stuttgart University summing up to 145 Mio Euro, of which 16 Mio Euro come from European projects, more than 50 Mio from contracted research by industry.

In line with its high proportion of private sector research, totalling 86% in **Franche-Comté**, large companies above 1'000 employees are the key actor in RTDI activities. However, unlike Stuttgart Region, universities and public research entities in **Alsace/Franche-Comté** rarely cooperate with the private business sector. Not at least for this reason a large network of public inter-

face organisations dealing with valorisation, technology transfer and public-private R&D partnerships has been established, providing various services to businesses conducting innovation projects, with a focus on SMEs. Public research entities in the two regions increasingly work in global networks, making the region less relevant. For example, «FC Lab» (fuel cell) and «FEMTO-ST» are world-class research units which gained reputation beyond regional and national borders.

Although in **Slovenia** the number of research entities is lower than in Stuttgart Region and Alsace/Franche-Comté the University of Ljubljana and the University of Maribor are to a large extent involved in mechanical and electrical engineering. Despite Slovenia's historical development, which similar to Hungary is characterised by a political and economical transformation, the R&D infrastructure appears to be remarkable. In part, traditional high levels of higher education can explain this. Moreover, the investments especially in the field of automotive and electric drive as well as in the field of renewable energy, ICT and grids, date back to the 1980ies. Finally, the automotive industry hardly conducts in-house R&D. Thus, the sector strongly relies on university R&D resources. Currently, more than 1'000 registered researchers are connected with Slovenian automotive industry.

In general, **Switzerland** features a high level of basic research, going hand in hand with a high innovation potential that is supported by the government through enhancing market oriented cooperation between industry and academia. With regard to electromobility-related research the situation is less clear and rather intransparent. As opposed to the previous regions, the infrastructures are characterised by single researchers – who among other projects – also carry out electromobility-related research and departments in applied research focusing primarily on e-mobility. In addition, many start-ups in the field cooperate with universities.

In **Vorarlberg**, less than one percent of workforces are employed in research sector. One reason for the rather weak performance is low number of research entities. Only one out of the 56 universities in Austria is located in the region. Distinct from Switzerland, at the «Vorarlberg University of Applied Sciences» and the various public and private research entities applied rather than basic research takes centre stage. Forasmuch, industry-academia cooperation plays a crucial role in the region, in particular as the industry supports academia and other research entities through joint projects and financial investments. For example, in 2012 the University of Applied Sciences received an endowed chair for energy efficiency, financed by the illwerke vkw group, covering the thematic areas of energy efficiency and electromobility.

Despite its significant increase in innovation input, **West Transdanubia** lags behind the EU average in a number of aspects and is according to the EU «Regional Innovation Scoreboard» (2014) is a moderate R&D-intensive region. Industry-academia collaborations are concentrated at the Széchenyi University in several knowledge centres. For example, the «Vehicle Industry Regional Knowledge Centre» serves the research and development demands of the industrial sector in the region, focusing on vehicle manufacturing technologies and vehicle part construction. Likewise, the «Vehicle Industry, Electronic & Logistic Cooperation Research Centre» with basic research in mobility and environment strives for collaboration with industry. However, contrary to Stuttgart Region, collaboration and networking is still in an early stage and needs to be strengthened, in particular as regards linking research demand and supply.

## 4.3 RESEARCH & DEVELOPMENT PROJECTS

Regardless of the number of research entities in all analysed regions R&D projects related to electromobility are ongoing or have recently completed. The overall impression of the R&D activities confirms, that Stuttgart Region and Alsace/Franche-Comté are very strong positioned in terms of electromobility-related projects. But also Slovenia, Vorarlberg and West Transdanubia are characterized by several interesting activities.

The strong industry-research relations in the **Stuttgart Region** are reflected in 55 R&D projects. About 40 projects were initiated under the regional «Programme for Sustainable Mobility in the Stuttgart Region», which address one of the following pillars: «leading edge cluster (basic research)», «pilot region (applied research)» and «showcase projects (demonstration)». With a total of 70 projects directly linked to ICT, transport and mobility **Alsace/Franche-Comté** even exceeds these numbers, with basic research projects being more pronounced than in Stuttgart Region. Among these projects a large number was granted by R&D related European Programmes (FP7, INTERREG etc.).

**Stuttgart Region** is characterised by a wide variety of projects with the focus on several mobility solutions including, for example, e-bikes, multifunctional smart cards, car sharing, charging points, EV fleets etc. In sum, they create an ecosystem of applied and interactive innovation for integrated sustainable mobility. The involvement of end users into the projects serves the fast adaption of (e-)mobility solutions by the public. In comparison, the regional projects in **Alsace/Franche-Comté** are oriented more strongly towards the automotive sector itself, which again follows the long tradition of the region. A large number of the projects launched since 2005 deal with urban planning, innovative car components, pilots, charging infrastructure, and smart and experimental vehicles.

Despite its well-developed research infrastructure, less specific R&D projects are found in **Slovenia**. In line with the strong horizontal orientation of the administration structures, the government supported the establishment of Automotive Cluster Slovenia (ACS) as a priority pilot project for the development of clusters and co-operations. A dialogue between the government, automotive suppliers and research institutes aimed at the development of several R&D projects. Currently, ACS intends to accelerate and intensify the area of developing more complex products such as electronic passenger department, interior, pedal box, brake system etc. In order to realise these aims, ACS applied for the tender of the Ministry of Economy and initiated the project called «Polycentric technology centres as innovative system of Slovenian automotive suppliers industry» expecting an increase in innovation activities and further improvement of products and services. The project is co-funded by the «European Regional Development Fund».

In **West Transdanubia** the «E-VAN-09» project focused on the development of a driving system for a small electric delivery vehicle, which also can be charged by its own solar panel. In the next period the vehicle will be tested and subsystems will be developed, which lead to the use of the vehicle under normal city traffic conditions.

Considering the fact that both regions have a rather weak research infrastructure, contrary to West Transdanubia, in **Vorarlberg** a relative high number of R&D projects based on applied research is conducted. A core theme of these projects is the interplay between customers and their electromobility-related needs. Forasmuch, customer-related field tests aim at understanding customers' behaviours and finding related solutions. Examples comprise the assessment of customers' daily use of EVs in Vorarlberg and the project «Energy Consumption and CO2-emissions of e-cars». The project «E-bike: Landrad» was, established to substitute daily car trips through e-bikes usage. During this project in total 500 pedelecs were delivered to regional actors such as citizens, companies and municipalities to analyse the way of usage, the distance covered and the satisfaction arising out of the usage of e-bikes. Another research priority is data analyses dealing with fast charging, driving performance, and sound measurement. The collected data confirmed that the e-cars have auxiliary advantages compared to conventional cars such as sound and energy consumption.

Different from the other regions and according to its sectorial focus, the priority of R&D projects in **Espace Mittelland** is on the development of driving systems, ICT and smart grid solution in field tests, applied research and application testing. The majority of projects are cross-sectorial and have a regional to cross-regional scope on ICT.

As is illustrated below, there appear regional similarities and differences in terms of **target groups** addressed by the various R&D projects. For example, three regions most advanced in electromobility Vorarlberg, Stuttgart Region and Alsace/Franche-Comté show relative high shares of **citizens** involved. In comparison, neither in Espace Mittelland nor in Slovenia or West Transdanubia citizens are address.

With regard to the involvement of **public authorities** the picture is similar, with Alsace/Franche-Comté, Stuttgart Region and Vorarlberg showing higher shares than Slovenia and Espace Mittelland. In West Transdanubia this target group is not addressed at all.

Vice versa in the latter three regions the shares for **research entities** is considerably extent those of the former three regions. **Business entities** are a major target group of R&D projects in all regions, whereas clusters are only addressed in Alsace/Franche-Comté and Slovenia.

Summing up, these results correspond with the findings on the different types of projects «basic research», «applied research», «field tests» and application» tests as well as the current state of electromobility in the respective region.

## R&D Projects - Target Groups addressed by the Projects (%)*

| | BUSINESS ENTITIES | RESEARCH ENTITIES | PUBLIC AUTHORITIES | CITIZENS | CLUSTER |
|---|---|---|---|---|---|
| ALSACE / FRANCHE-COMTÉ | 23% | 23% | 23% | 17% | 9% |
| ESPACE MITTELLAND | 43% | 50% | 7% | 0% | 0% |
| SLOVENIA | 25% | 35% | 10% | 0% | 30% |
| STUTTART REGION | 44% | 15% | 21% | 19% | 0% |
| VORARLBERG | 33% | 17% | 22% | 22% | 0% |
| WEST TRANSDANUBIA | 50% | 50% | 0% | 0% | 0% |

* Other target groups addressed are not listed: Alsace/Franche-Comté = 5%, Vorarlberg = 6%, Stuttgart Region = 1%

## 4.4 Assessment of RTDI Infrastructures

| | RETAIN | ENABLE |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – World-class expertise in drive systems and car manufacturing<br>– Comprehensive experience of e-mobility projects<br>– Variety of funding schemes | – Real cross-sectorial approach<br>– More market-oriented research<br>– Rationalisation of innovation players and schemes |
| ESPACE MITTELLAND | – Basic research and innovation potential<br>– Educational system<br>– KTI financing | – Cross-border activities<br>– Interdisciplinary research<br>– Venture capital |
| SLOVENIA | – High quality and cost competitive services<br>– Government support<br>– Promotion of cluster development through increased investments in support infrastructure | – Cooperation between academia, public and private research entities<br>– Transfer of good practices from other regions<br>– Initiate cluster formation in practice |
| STUTTGART REGION | – Pre-competitive cooperation<br>– Leading edge institutes such as ZSW<br>– International cooperation | – Mobility research<br>– Opening of (private) test facilities towards SMEs |
| VORARLBERG | – R&D projects in industry and energy sector<br>– Focus on applied research<br>– Well educated researchers | – R&D location in Vorarlberg<br>– Stronger focus on energy efficiency, renewable energies and e-mobility<br>– Evaluation of collected data |
| WEST TRANSDANUBIA | – Basic research<br>– Complex applied research | – RTDI in niche markets with low investition needs and high professional added value<br>– Hybridisation of different areas in the RTDI projects (e.g.telecommunication, ICT and drive systems) |

| | ELIMINATE | AVOID |
|---|---|---|
| ALSACE/ FRANCHE-COMTÉ | – Public and private researches living in two separate worlds | – Complicated bureaucratic procedures to receive funding<br>– Reduction of investment in e-mobility research |
| ESPACE MITTELLAND | – Intransparency of funding bodies<br>– Administrative obstacles | – Subsidies for e-mobility<br>– Only focussing on e-mobility, while disregarding other alternative driving systems |
| SLOVENIA | – A lot of paper work<br>– Projects too long in duration or projects which start in middle of the year | – Underrepresetation of electric cars and fuel cell cars in the market |
| STUTTGART REGION | | |
| VORARLBERG | | – Structures with top-down strategies from OEMs and industry<br>– Lobbying for existing structures in automotive sector |
| WEST TRANSDANUBIA | – Lack of infrastrcutural basis | – Further weakening of the professional training systems/basis |

Although the regions vary with respect to the quality and quantity of their research infrastructures, the assessment illustrates (see table on previous page) that **cross-sectorial** and **cross-border research** need to be further enhanced in all regions. Likewise, this applies to interdisciplinary research (e.g., engineering, economics, social sciences), which is seldom the case in the regions.

Moreover, the regions – in particular advanced regions Alsace/Franche-Comté, Stuttgart, Espace Mittelland and Vorarlberg – wish to retain their current strengths in **basic** and **applied research** involving research and business entities plus public organisations. In addition, the need for more market-related research is highlighted. In Slovenia with its less advanced electromobility-related RTDI infrastructure, in contrast, wishes to reinforce such cooperation. Being aware of the strengths of the other regions, West Transdanubia rather emphasises the development RTDI in niche markets with low investment and high professional needs, as this reflects the regions strengths in qualified human resources.

Aspects to be avoided in order to sustain or develop an efficient electromobility-related infrastructure include complicated bureaucracies to receive RTDI funding, lobbying for existing structures in automotive sector as well as a reduction of investment in mobility research. Interestingly, Espace Mittelland points out that the region should circumvent subsidies for electromobility.

To conclude, despite some regions excellent RTDI infrastructure, in isolation neither region is in the position to achieve the development of state-of-the-art, cross-sectorial RTDI that will lead to the creation of tomorrow's electric vehicles and new e-mobility concepts broadly adopted across Europe. In the sense of smart specialisation, this is only made possible through joint forces combining the various areas of excellence in the regions, also against the backdrop of the outstanding standardisation in the field.

# 5 CLUSTERS AS FACILITATORS

# 5.1 WHY RESEARCH-DRIVEN CLUSTERS?

In Europe a huge diversity of research clusters exist: they differ in terms of their stage of development, some are networks of only SMEs, some are organised around key research and development organisations, and yet others have customer or technological market needs to sustain their prosperity. In all cases, research clusters may embody the characteristics of the modern innovation process, and can be considered as reduced scale innovation systems. Their specific nature, including their spatial coverage, differs according to technology, market conditions, and other factors that influence the geographic extent and relative strength of linkages.

Next to RDCs taken into account within ELMOs (see definition on the right), broadly speaking, there exist two other types of research clusters: Firstly, cluster focusing on R&D cooperation between business and research entities and secondly, clusters encouraging cooperation among business entities.

RDCs entail a high potential to stimulate electromobility-related RTDI activities at the regional level and increase the competitiveness of regional economies: highly trained workforce and R&D are among the key conditions for innovation and economic success of a country, a region or a cluster. Bridging R&D actors, regional administrations and the business community, RDCs are viewed as a response to the growing local demand for research and development. Integrating this research-industry-government cooperation and interactions in the process of knowledge capitalisation, RDCs represent the triple helix model of innovation crucial for regional development.

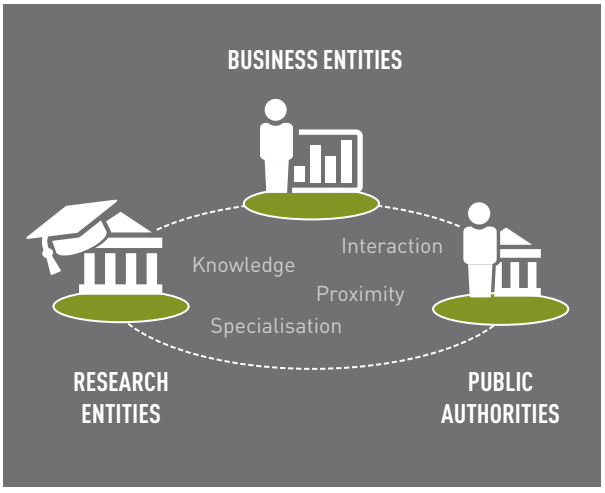
The purpose of the cluster mapping is to best identify the specific electromobility-related potential of the RDCs according to their sectorial focus sectors - Automotive, Green Energy and ICTs - and to identify synergies and complementarities bearing the potential for smart specialisation and collaboration as well as for mutual learning.

## Research-driven Clusters (RDCs)

primarily rely on R&D as source of innovativeness and competitiveness. They comprise at least three types of legal entities, namely the

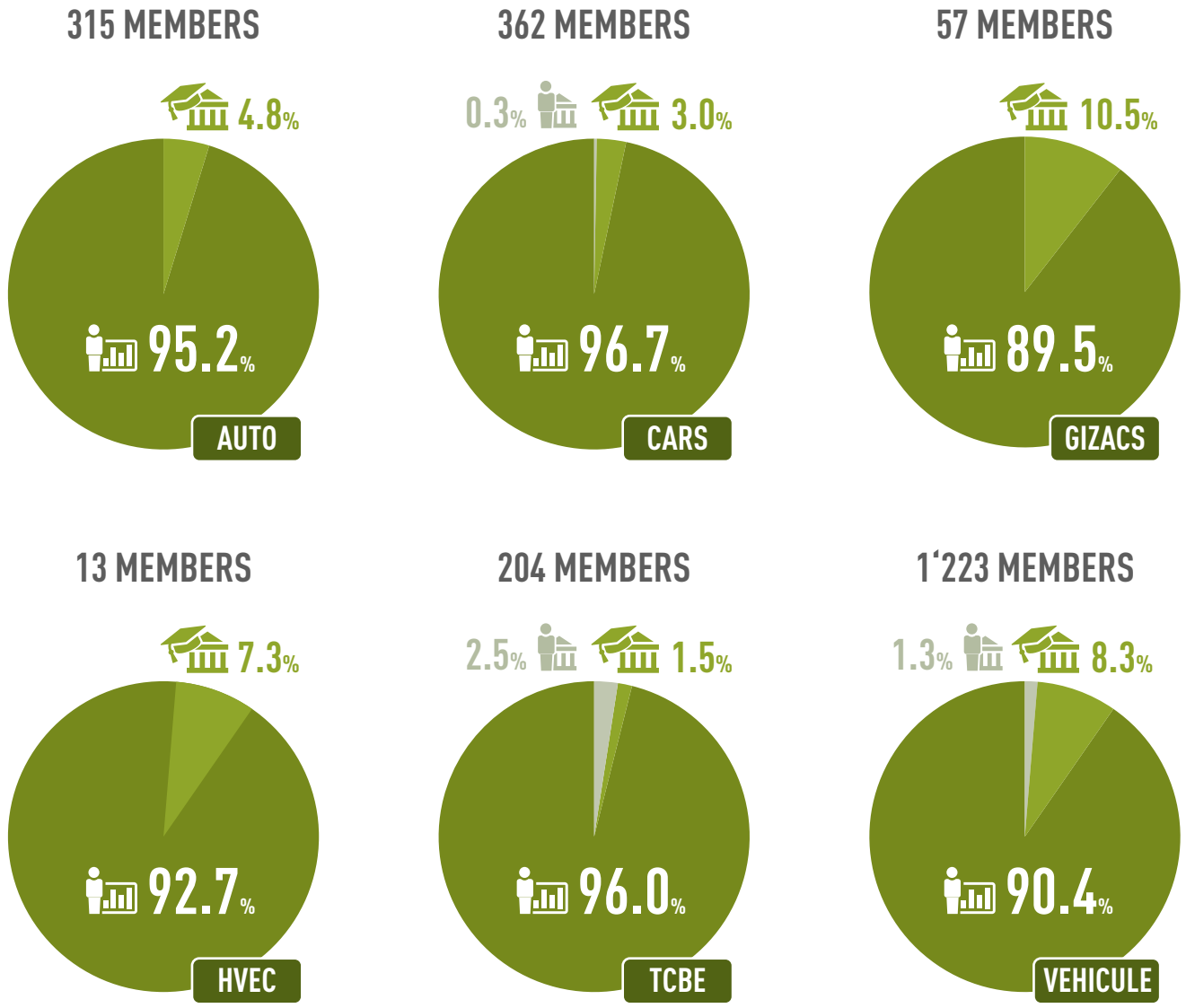
### Triple Helix associating

- → Research Entities
  (universities, research organisations and research for-profit bodies),
- → Business Entities
  (large enterprises & SMEs), and
- → Public Authorities
  (local/regional government, regional development agencies).

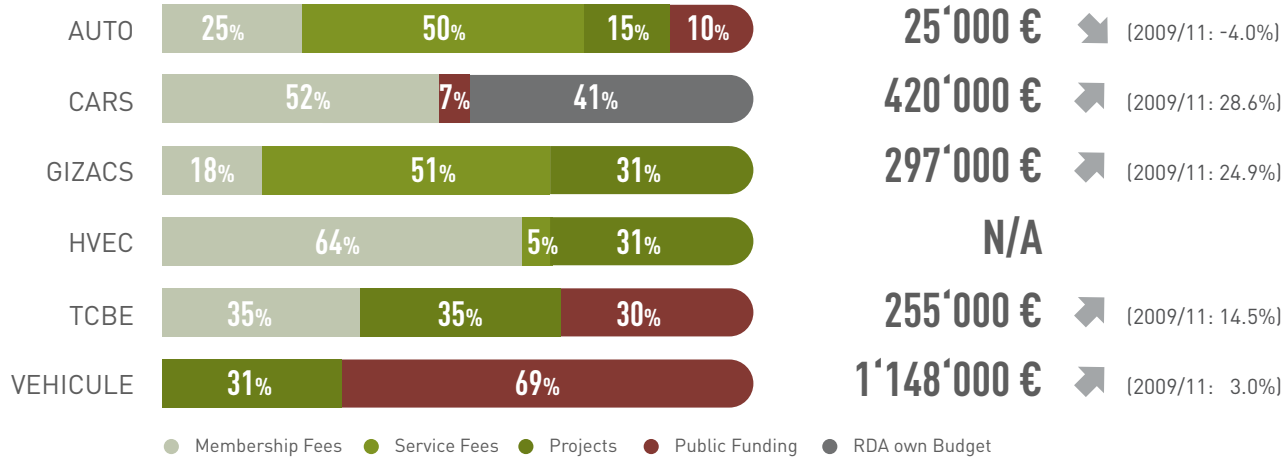


# [ SNAPSHOT ] RESEARCH-DRIVEN CLUSTERS

## Cluster Composition – Triple Helices at a Glance (2011)




## Financing Models, Total Budget and Budget Growth (2009 to 2011)



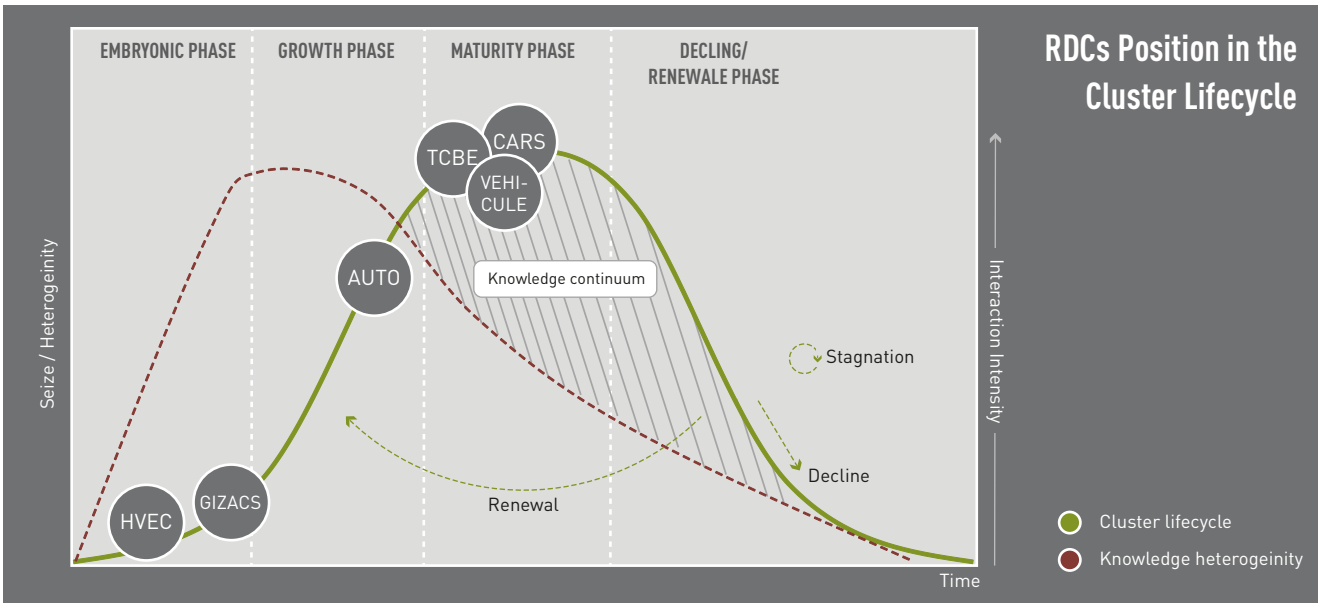
## 5.2 RDCs' FOUNDATION

With regard to their composition and development stages the participating RDCs are rather heterogeneous. While composition refers to the number of the different triple helix stakeholders involved in the cluster, the development stage relates to the RDCs position in the cluster lifecycle. Concerning the latter, four stages are distinguished:

The **embryonic phase** describes the emergence of a cluster. Key characteristics are a small number of enterprises, great heterogeneity of accessible knowledge and competencies, and a hardly existing institutional environment and loosely linked businesses. At this state the cluster is often not perceived as such. The **growth phase** is marked by the entry of additional business entities, start-ups and so on. Cluster boundaries become visible and the perception of the cluster increases. The growing number of enterprises and institutions within the cluster creates opportunities for innovation, knowledge exchange and cooperation. While firms benefit from the exploitation of synergies and network relations, heterogeneity of accessible knowledge and competencies decreases. In the **maturity phase** the RDC reaches the state of equilibrium. It neither shows high growth nor remarkable decreases in the number of business entities. To sustain cluster dynamics, connections of clustered firms to external partner are crucial. Finally, the **declining/renewal phase** is characterised by a decreasing number of enterprises. As a result of knowledge homogeneity plus highly specialised enterprises focusing on specific markets and technologies the cluster is negatively locked into its previously successful development paths, which might hinder its ability to respond to changing market conditions.

The participating clusters cover the first three stages of the cluster lifecycle. «Cluster Automotive Region Stuttgart» (CARS), tcbe.ch – ICT Cluster Bern (TCBE) and Pôle Véhicule du Futur (VEHICULE) are in a maturity phase, autocluster.ch (AUTO) is in its growth phase, whereas the «Hungarian Vehicle Engineering Cluster» (HEVEC) and the «Automotive Cluster Slovenia» (GIACS) are in an embryonic stage of development.

According to the different development stages and regional specifics the number of **cluster members** and their **composition** vary considerably. With shares ranging from 89.5% (GIZACS) up to 96.7% (CARS), business entities account for the majority of members in all clusters. Public authorities are involved in the cluster activities of the three most advanced clusters, namely CARS, TCBE and VEHICULE, which therefore, comply with the RDC definition. Accounting for shares of 10.5% and 8.3% **research entities** are most strongly represented in GIZACS and VEHICULE, followed by HVEC (7.7%). According to the high shares of entrepreneurial members, for AUTO (4.8%) and CARS (3.0%) the share



of research entities is significantly lower. With only 1.5% TCBE shows to be the cluster with the lowest share of research entities. In the following a brief overview of each cluster is given, starting with the embryonic clusters.

Established in 2001 and organised as business interest association, **GIZACS** unities of 52 industrial and services companies plus five independent R&D organisations (10.5%). Next to cluster manager, one full-time and one part-time employee are involved in the clusters management. The cluster expands every year and is financed by membership fees (31,1%), projects (17,7%) and service fees (51,2%) such as organisation of events. In 2011 the cluster's budget totalled 296'595 Euro. The clusters overall aim is to reinforce the competitiveness and create greater added value. GIZACS is the central communication point of the automotive cluster and its supporting infrastructure. It provides support for its members to integrate into the global automotive industry and to improve the range of their products and services. Therefore, it accelerates the efficiency of its members by providing adequate research and development and co-operating with expert development and scientific institutions both in Slovenia and abroad. GIZACS is founder of the national technology platform ERTRAC (European Road Transport Research Advisory Council) Slovenia, which, aims at mobilising stakeholders to develop a shared vision, and ensure timely, coordinated and efficient application of research resources to meet the continuing challenges of road transport and competitiveness. One of the future tasks is to professionalise the cluster management. Even if in the course of the last years the cluster management started several activities in the field of internationalisation and established several new cooperation, the main development task should be the improvement of the competitive ability and innovation of the economic sphere.

**HVEC** was founded in 2009 by six Hungarian engineering SMEs, all with large experience in international projects. Managed by the MAJAK Non-Profit Ltd, the cluster is mainly financed by projects (64%) and membership fees (31%), whereas service fees account for 5% of the total annual budget. A part-time cluster manager is in charge of RDCs management. The cluster aims at coordinating the activities of Hungarian engineering companies operating in the field of vehicle or vehicle part development, including passenger cars but also trucks, buses, airplanes, boats and new mobility solutions. In 2011, the cluster counted 13 members, which are assisted by the cluster management through joint marketing operations in targeted countries, know-how transfer among employees and the provision of a knowledge database for members. In addition, HVEC supports its members in areas such as complex solutions, joint R&D activities, joint innovation projects as well as support of individual innovators. Further activities comprise the support of spin-offs, collaboration with universities, research centres and innovation intermediaries.

Founded by Espace Mittelland, Greater Zurich Area and the cantons of Solothurn and Zurich, **AUTO** is the Swiss cluster for the automotive supply industry, managed by two part-time employees. Since 2007 the cluster is formally incorporated as a non-commercial association (Article 60 of the Swiss Civil Code). Of its approximately 315 members most are SMEs. Core fields of activity include facilitating national and international business-to-business, supporting innovation networks and RTD business-academia collaboration and innovation cycles. Furthermore, it aims at the improvement of the position of Swiss automotive suppliers in the international markets, the raise of awareness of the production sector as well as the facilitation of cross-organisational innovations. Since its establishment autocluster.ch has been able to increase the visibility of the Swiss automotive supply industry in the media, in research and in policy making. AUTO is financed 15% by membership fees, 50% by platform services, 25% by projects and 10% by public funding/subsidies.

In Stuttgart Region two complementary RDCs are established: CARS addressing the automotive sector as a whole and Electric Mobility Cluster South-West dealing with the e-mobility subgroup on leading edge research only. However, the comparison is confined to CARS as partner of ELMO[S]. With the **CARS** founded in 2001, the regional development agency Stuttgart (WRS) aims to link and align the automotive relevant activities of WRS more closely with each other and to expand them into new areas. Today CARS with its 326 members is struc-

tured as a multidimensional and need-driven initiative that is flexible to respond to dynamic changes of the industry and the region. Two full-time and two part-time employees conduct the cluster management. At the core of the cluster there are two renowned and successful OEMs (Daimler and Porsche), a group of very competitive suppliers, which include the world's largest automotive supplier Bosch, and a concentration of innovative research entities. SMEs account for 80% of the entrepreneurial members. The thematic areas cover different topics: regional communication, skilling, clean energies, sustainable mobility, and software services for the automotive industry. These again are in line with four strategic areas (1) E-mobility, (2) Lightweight vehicles, (3) Vehicle Efficiency and Life Cycle Optimisation and (4) ICT and Electronics. Strengthening the cooperation between companies and academia is one of the key targets of the cluster. Moreover, CARS initiated regional channels for exchange and platforms for communication (e.g. Meetingpoint Automotive, where future-oriented technological and business visions are discussed). Regarding internationalisation, the RDC cooperates with leading automotive cluster organisations across Europe under the European Automotive Strategy Network (EASN). The cluster also participates in automotive BW founded in 2010 as the state's network of cluster management organisations. Here the first Tec Net has been dedicated to «modules and systems for electric vehicles». CARS in cooperation with BW GmbH moderate and coordinate all projects of the federal e-mobility initiative in the region. Contrary to the other RDCs, CARS is financed through the WRS own budget with a share of 41%. In addition, projects contribute with a proportion of 52% and public funding with only 7%.

Founded in 1996, **TCBE** also is organised as a non-commercial association. One of the reasons for the cluster foundation was a lack of well-educated ICT workforce in the region. The majority of the members are SMEs. Only 19 of the 210 cluster members employ more than 100 people. Working with a relatively small budget and few personnel resources, much of the work is done by the cluster members on a voluntary basis, especially as regards the cluster board and the working groups. Two part-time employees are responsible for the cluster management, which has since its establishment continuously be professionalised and shifted its priorities from location promotion to benefit and support for cluster members. Networking, internationalisation and education are amongst the main pillars of the clusters activities. The cluster's financing model bases on comparable proportions of membership fees (30%), public funding (35%) and projects (35%).

Case Study

## INNOVATION CIRCLES

Electric drives for cars have real market potential. Particularly for SMEs, there is currently a niche market with promising perspectives. The innovation circles of autocluster.ch help SMEs to investigate the opportunities of electric mobility and to understand its impact on their business as suppliers to the automotive industry.

The second innovation circle on e-mobility took place in February 2014 on the premises of Brusa Elektronik AG. Brusa is a Swiss pioneer in electric mobility and particularly active in the development and manufacturing of highly efficient and compact power electronics. Its technology is found in Daimler's Smart For Two Electric Drive or the Volvo C30 Electric and in various racing and concept vehicles.

The innovation circle specifically addressed a cross-sectoral audience. The 25 participants represented automotive suppliers, companies active in ICT, electronics and telematics design and manufacturing, energy suppliers and grid operators, plus research institutes.

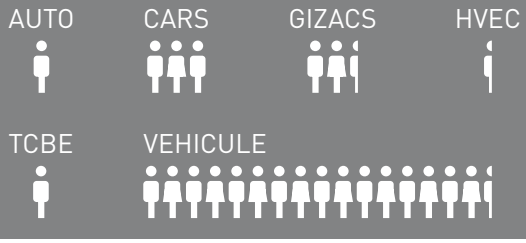
In the semi-structured method of the innovation circle the participants analysed current and future developments in e-mobility and assessed their potential for developing unique selling propositions for companies in the sectors mentioned. They highlighted key achievements of e-mobility that they feel were bound to stay, such as near zero emissions, charging at home and current electric car models, as well as technologies that will need to be phased out, e.g. incumbent battery technologies. The participant also identified promising developments such as inductive charging, techniques to increase the charge density of batteries and smart electric grids. And they highlighted problems that urgently need to be tackled in order not to hinder development and market uptake, a key issue being late or lacking standardisation.

Beyond, the second innovation circle was an opportunity for active players in the field to meet face-to-face, often for the first time, to exchange views and opinions and to explore common interests and topics for potential future collaboration.

Further information
autocluster.ch

François With

### Cluster Management – # of Employees



Cross-innovation plays an increasingly important role in the cluster activities, as does electromobility. The main added value of the cluster for the region is skills development, regional image shaping and branding.

Awarded as «competitiveness cluster» by the French government in 2005, **VEHICULE** as non-profit organisation organises the particular competencies of its geographical remit and missions around solutions for future vehicles and mobility. In 2011, the cluster united 1'123 members. VEHICULES strategy is directed towards vehicles and technologies for urban and peri-urban mobility striving for sustainable regional development. This strategy is reflected in the four development programs «Urban & peri-urban Mobility Solutions», «Intelligent Driving Systems», «Urban & peri-urban Vehicles» plus «Sustainable Technologies for Transportation». Fertilising business entities innovation activities through collaborative projects involving companies and research entities is one of the RDCs core activities. In total 119 collaborative projects were approved between 2009 and 2011. In comparison to the other cluster, VEHICULE is mainly financed by public sources (73,7%), of which the major part comes from regional government including subsidies from local authorities such as urban communities, cities etc. In addition, 3 of the 14.5 full-time equivalents are assigned employees from PSA Peugeot Citroën are fully involved in the cluster management. This is the reason why the cluster in big parts is also private sector funded.

As distinguished from the other regions, Vorarlberg has no cluster in one of electromobility constituent sectors, **VLOTTE** with it electromobility activities is an important network facilitating the development of sustainable green mobility. Although no formal cluster, VLOTTE promotes clustering activities in the region through joint projects with companies from the financial and insurance sector, research entities, garages and institutions dealing with transportation. The focus of the «cluster» has been on the one hand on the launch of e-cars to Vorarlberg's market and on the other hand of building up a charging system. A further task is worldwide monitoring of new technologies in connection with electromobility. With the execution of on-road tests new technologies are being checked for «mass suitability». Apart from the initiation of local mobility projects the company also offers comprehensive mobility consulting and promotes e-mobility through targeted public relations Europe-wide. VLOTTE is 100% publicly funded.

Case Study

## VLOTTE « ONE-STOP SHOP »

Electromobility is a complex and widely diversified topic. Charging opportunities, range anxiety, investment, operational and insurance costs and many more are just a few of many other questions potential customers raise. To enhance citizens' confidence in the new technology and therewith, accelerate the market uptake of electromobility, it is essential for these questions to be answered satisfactorily. This in turn, necessitates neutral, independent and competent consulting services.

In order to provide such services, by 2015 VLOTTE will establish a so-called «One-Stop Shop» at VWK's headquarter in Bregenz, which is assumed to be an effective instrument. Besides consulting, test-drives with electric vehicles and instruction how to handle charging infrastructures will be provided as further services. Interested parties are invited visit VLOTTE's «One-Stop Shop» to receive information on electromobility and experience electric driving.

In addition, dissemination activities and events concerning e-mobility play also an important role to accelerate the diffusion of electromobility. The One-Stop Shop on the one hand can support existing initiatives by allocating information and know-how and on the other conduct own events, which makes electromobility more visible.

### Contact

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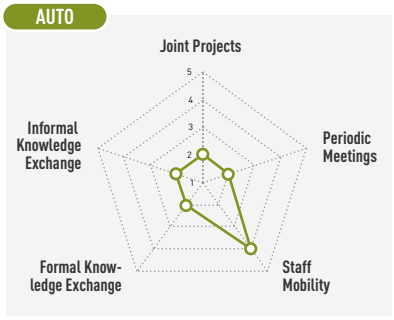
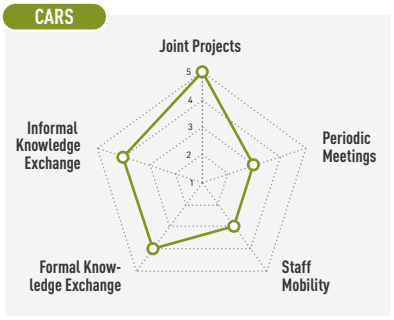
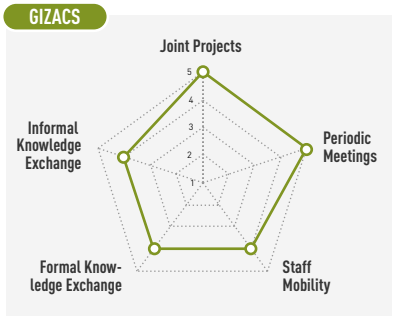
# [ SNAPSHOT ] RDCs HUMAN RESOURCES & KNOWLEDGE TRANSFER MECHANISMS

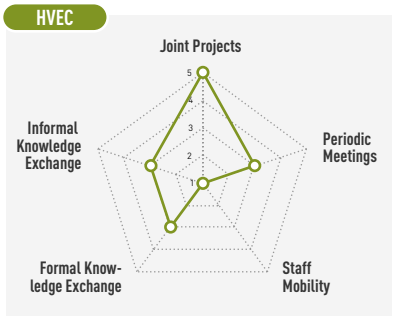
## Human Resources in the RDCs

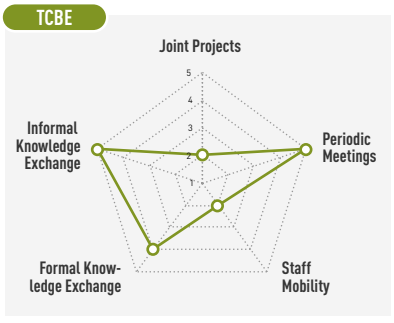

## Knowledge Transfer Mechanisms in the RDCs

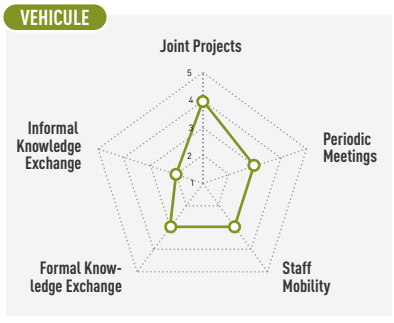


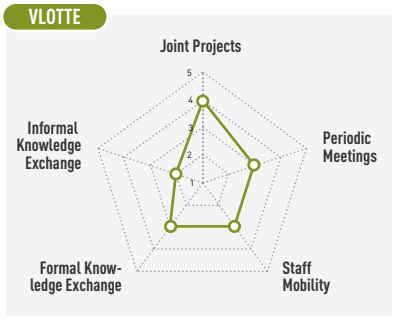




Please assess the frequency of occurence of knowledge transfer mechanisms in the cluster.

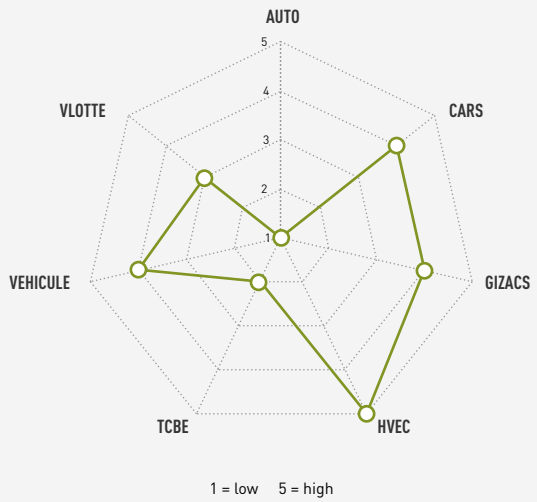
1 = not at all  5 = frequently

Cluster members' **awareness of electromobility** as future business opportunities is crucially important to promote the development of green mobility solutions for cities and regions. Comparing the clusters in terms of their members' perception of electromobility it appears that in case of CARS, CIZACS, HVEC and VEHICULE the awareness is rather high. Just the opposite applies to AUTO and TCBE, whereas VLOTTE falls between the two extremes. These results correspond with the regional **demand conditions.** While in all regions a certain demand for electromobility exists, in Stuttgart region, Slovenia and West Transdanubia demand is growing. The reasons for the increasing demand are manifold. In Slovenia, for example, a mentality towards green technology is seen as key driver. In case of Stuttgart Region and West Transdanubia pilot tests, demonstration projects, showcases activities and events plus the development of electromobility infrastructures are the main drivers. In Espace Mittelland and Voralberg the demand is in an emerging state. Despite the awareness of cluster members, this also applies to Alsace/Franché-Comte, where high purchase prices for electric vehicles and low driving ranges are viewed as major barriers for a market uptake.

With respect to the availability of **human resources** the figure on the left illustrates that in particular AUTO and VLOTTE lack sufficient levels of qualified personnel in the cluster. Even though the situation is better in the other clusters, for neither cluster it is easy to attract additional highly qualified staff to the region. Stuttgart Region and Espace Mittelland (for ICT) are to some extent able to circumvent this constraint due to their well-established electromobility-related higher education offers, which is rather poor in case of Vorarlberg, West Transdanubia and Espace Mittelland with respect to the automotive sector. Comprehensive electromobility-related training offers exist only in Stuttgart Region and Slovenia, whereas the other regions lack such offer. The mobility of researchers in the clusters – which is rather low – also shows not to be a sufficient solution to overcome the general shortage of qualified workforces.

Interactions among the cluster members – including the **exchange of knowledge** – distinguish clusters from pure agglomerations. Amongst others, mechanisms for knowledge exchange comprise informal and formal

## RDCs Members' Awareness of E-Mobility




interactions, periodic meetings, joint projects and the mobility of staff between the cluster actors. With respect to the frequencies these mechanisms occur in the RDCs the figure on the left illustrates the varying exchange patterns in the clusters. **Joint projects**, for example, a rather an exception within AUTO and TCBE, yet the opposite is the case for the other clusters. **Staff mobility**, in contrast, is the major mechanism for knowledge transfer within AUTO and HVEC, but plays only a minor role within CARS, VEHICULE, VLOTTE and TCBE, and none within HVEC. **Periodic meetings** of cluster members are of great importance within TCBE and HVEC. **Informal knowledge exchange** along cluster members' social networks is an important channel of knowledge transfer within CARS, GIZACS and TCBE. Such informal mechanisms seldom occur among the member of AUTO, VEHICULE and VLOTTE, here formal mechanisms are of higher importance. Interestingly, the patterns of the occurrence of knowledge transfer mechanisms within VEHICULE and VLOTTE are similar, notwithstanding the different sectors addressed, development stages and composition of the cluster/network.

## Assessment RDCs' Foundation

| | RETAIN | ENABLE |
|---|---|---|
| AUTO | – Community apporach<br>– Know how in production technologies<br>– Ability to cope with global sourcing requirements | – Growth of network<br>– Enhance awareness |
| CARS | – Trustworthiness in cooperation<br>– Educational and training offers<br>– Open minded exchange of ideas and knowledge | – Inward mobility of skilled personnel<br>– Cross border / international knowledge transfer |
| GIZACS | – Promotion of green mobility<br>– Expertise in human resources<br>– Private investment in research | – Focusing on existing measures<br>– Promoting linkages between business and public R&D sector and the measure |
| HVEC | – Professional knowledge base<br>– Zero emission /sustainable mobility PR | – Cooperation with start-up companies<br>– Usage of EU good practices<br>– Cross-cluster cooperation |
| TCBE | – Good informal interactions<br>– Higher education offer<br>– No prohibition influencing demand on e-mobility | – Awareness of business opportunities in the RDC<br>– Training offer of e-mobility related ICT<br>– Better demand conditions |
| VEHICULE | – Good regional educational offer<br>– Knowledge transfer mechanisms within the cluster | – Improved mobility of researchers<br>– Extend external recognition of RDC's activities<br>– More cross-sectorial education & training offers |
| VLOTTE | – Good contacts to project partners<br>– Awareness for green mobility in Vorarlberg<br>– Well-educated employees and researchers | – Involve more interested parties<br>– Solutions to improve training &higher education<br>– Incentives for e-mobility |

| | ELIMINATE | AVOID |
|---|---|---|
| AUTO | | |
| CARS | | |
| GIZACS | – Poor coordination<br>– High level of user unfriendliness | – Non educated human resources<br>– Public funding which does not bring sufficient results |
| HVEC | – Continous changing of the governmental orientation | – Conflicts between cluster members<br>– Non supporting regulations |
| TCBE | – Obstacles to joint projects<br>– Non-involvment in smart grid<br>– Non-importance of social innovation | – Coordination problems of SMEs<br>– Innovation constraint<br>– Restraints for using smart grids |
| VEHICULE | – Lack of employees' mobility | – Cutting off consumer incentives<br>– Lack of political support for e-mobility<br>– Loss of cluster members |
| VLOTTE | | |

Referring to the concept introduced in section 3.4.1, in the following the results of the assessment of RDCs foundation is summarised.

As is well reflected in the cluster's innovation circles (p. 54), a major strength of AUTO is it community-based approach that allows for an efficient **knowledge exchange** and the joint development of **future ideas**. Similar to AUTO, the open exchange of ideas and knowledge is common practice among CARS' members. Moreover, CARS stresses the wish to even more extensively manifest the already existent **trustworthiness in cooperation** among the cluster members and to actors from outside. Likewise, VLOTTE focuses the retention of good contacts to their project partners.

**Human capital** is a central topic in almost all partner regions. Foremost highly skilled workers are regarded as key driver of innovation. Forasmuch, electromobility-related higher education and training offers plus skilled workers mobility is emphasised either to be retained or enabled. TCBE focuses on delivering higher education offers, which at the same time should be developed in forms of e-mobility trainings related to the ICT topic. In line with this, CARS and VLOTTE strive to find solutions to improve training possibilities and higher education concerning electromobility. Even though CARS and VEHICULE consider the educational and training offers for companies and employees as sufficient, they envisage to expand these within the cluster as well as cross-sectorial and cross-regional to further enhance knowledge. In addition, VLOTTE endeavours to bind well-educated employees and researchers to the region to circumvent a brain drain. While VEHICULE and CARS express the need for stronger inward and outward mobility of skilled workers and researchers, HVEC wishes to avoid a decline in educational levels.

Against the backdrop of a rather low **awareness of business opportunities** resulting from electromobility (see p. 57), AUTO, TCBE and VLOTTE intend to intensify awareness raising activities. This is also a topic for VEHICULE, which aims at improving the external perception of the cluster's electromobility-related activities. By improving the awareness of the cluster, VEHICULE intends to sustain the size of the cluster and political support for e-mobility activities. The other clusters rather wish to retain the already achieved levels of awareness.

Improvement of the regional **demand conditions** is a major issue for TCBE. In the same vein, VLOTTE and VEHICULE consider electromobility-related incentives as key to stimulate the regional demand and therewith, accelerate the market uptake of electromobility solutions. In Alsace/Franché-Comte, Stuttgart Region and Slovenia regional respectively national demand is stimulated by public procurement. For Baden-Wuerttemberg, for example, the state government launched a specific programme for the procurement of electric vehicles for the state's fleet. In addition, regulations, such as car-free/car-light city centres, drive the demand for electric vehicles in Alsace/Franché-Comte.

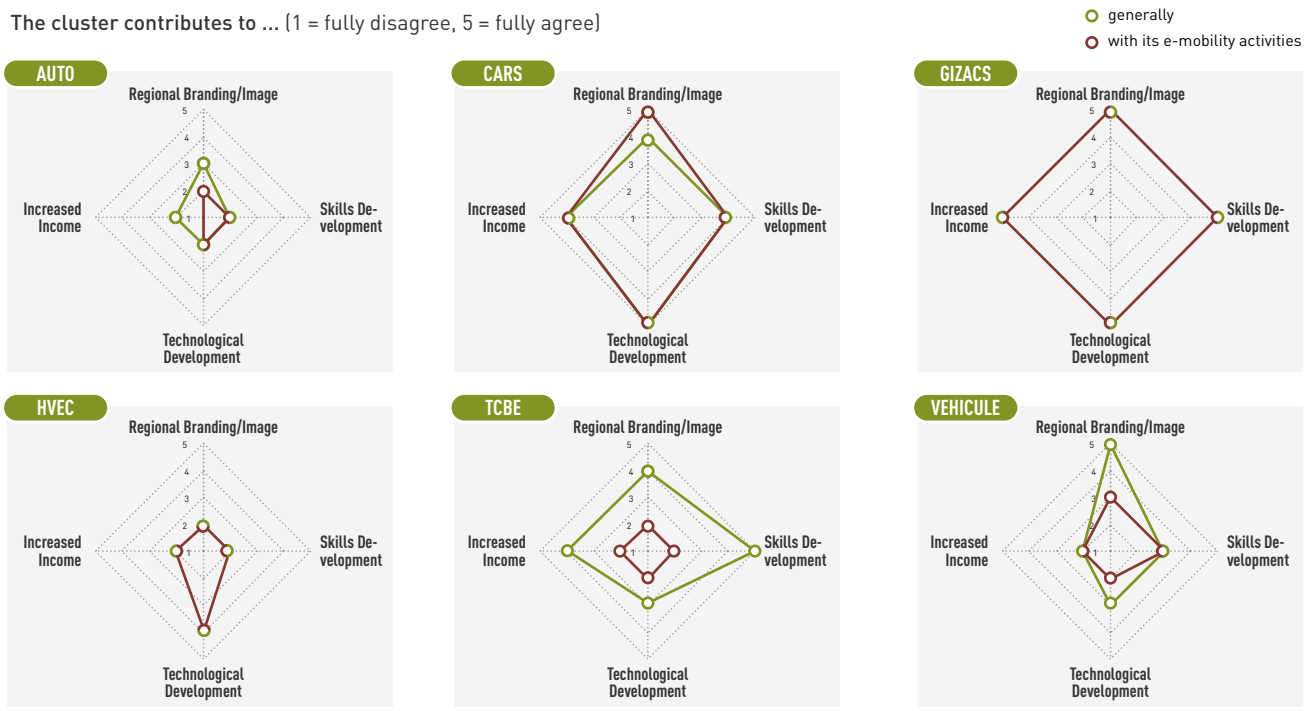
Acknowledging the importance of **cooperation** to enhance firms' innovation capacity in the field, in particular with regard to SMEs, GIZACS, TCBE and HVEC perceive conflicting interests of cluster members, a lack of coordination of SMEs and inefficient funding schemes as major obstacles/barriers for joint projects and knowledge exchange. In addition, GIZACS aims at developing stronger links between business and academia supplemented by related policy measures. Being in an early development stage HVEC additionally asks for supportive regulations. Currently, the main focus of the cluster is the fostering of cooperative activities among cluster members, and foremost with start-ups. In addition, a stronger cooperation with further clusters is required.

With respect to **cluster growth,** VLOTTE, as network, aims at involving further parties in their activities. Likewise, AUTO emphasises the necessity to increase the number of cluster members to strengthen the cluster.

# [ SNAPSHOT ] RDCs COMPETITIVENESS

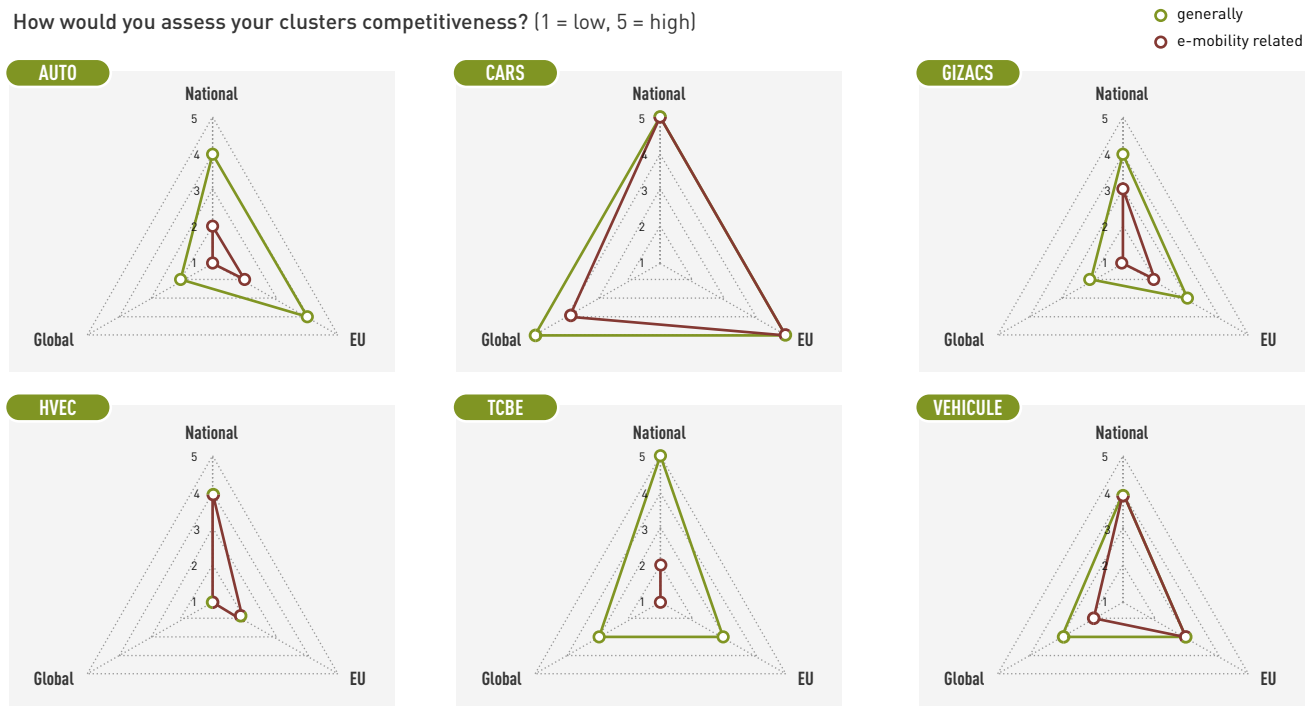
## Clusters' Contribution to Regional Development

The cluster contributes to ... (1 = fully disagree, 5 = fully agree)




## Clusters' general and electromobility-related Competitiveness

How would you assess your clusters competitiveness? (1 = low, 5 = high)

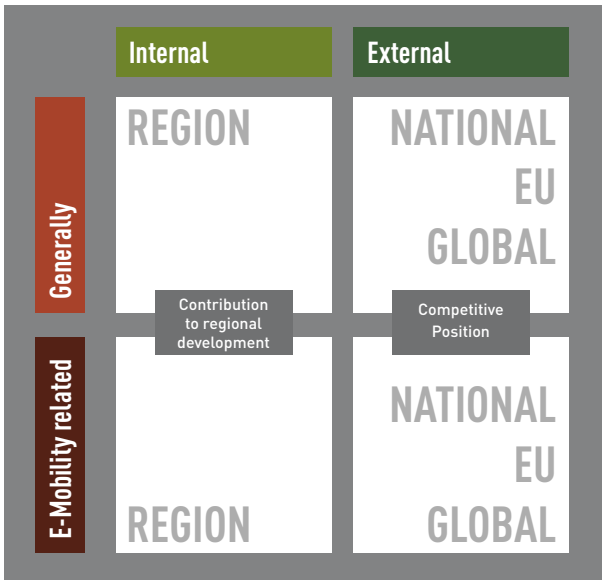


## 5.3 RDCs' COMPETITIVENESS

Clusters' competitiveness is examined from two perspectives: Firstly, from the regions internal perspective it was asked for the RDCs' contribution to regional development in terms of «regional branding/image», «skills development», «technological development» plus «increased income». Secondly, from an external perspective RDCs' competitive position at national, European and global was assessed by the cluster managers.

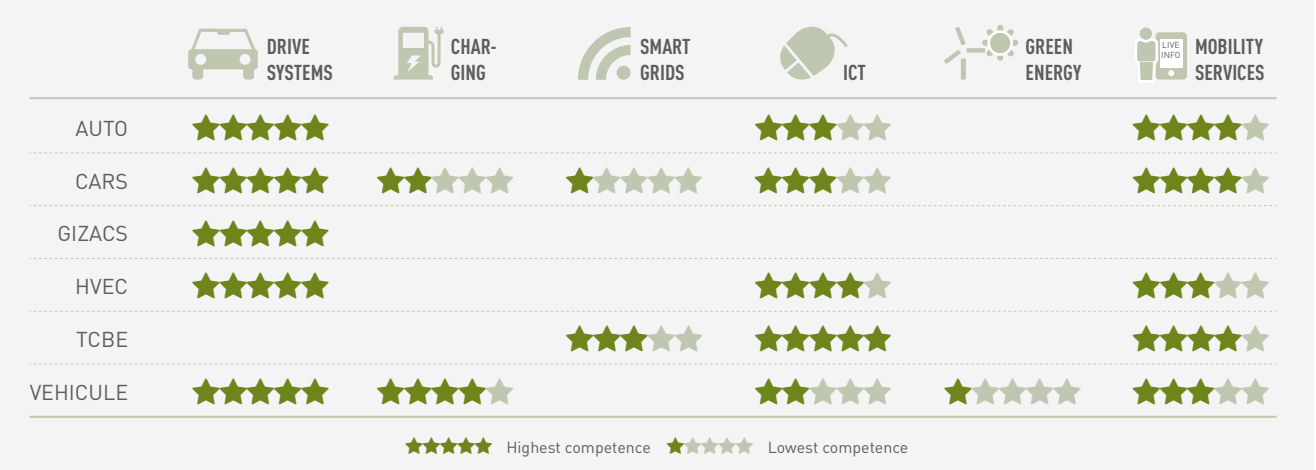
As the figure on the left illustrates, the clusters' contribution to **regional development** is rather heterogeneous. For example, AUTO's overall and electromobility-related contribution to regional development is comparatively low, whereas GIZACS's contribution is surprisingly high. CARS, as one of the leading automotive clusters in Germany and Europe, plays a significant role with respect to the region's image and technological development in Stuttgart Region. Moreover, the cluster contributes – both, in general and with its electromobility activities – to skills development and regional income. The same applies to TCBE, the difference being that only the cluster's basic activities generate the regional benefit, where skills development in ICT is most marked. Regarded as one of the major automotive clusters in France, VEHICLUE's contribution to regional development is rather low, except for regional branding. In view of its contribution to employment and increased income the cluster was affected by massive downsizing in the French automotive industry. In spring 2012 PSA Peugeot Citroën, for example, cut 8'000 jobs. Due to the sector's serve crisis employment growth is expected to be negative. Expecting a slow and gradual uptake of electromobility – at least in the next five years – this situation will not change. Being in an early development stage, HVEC's contribution to the regional development derives from technological development rather than other factors.

With respect to the RDCs' **competitive position** at national, European and global scale, results reveal identical patterns for CARS and VEHICULE. Although, VEHICULE's position is a little weaker, both RDCs have strong position in their home country. At European and global level, CARS outweighs VEHICULE. Nevertheless, it is, in particular, VEHICULE's global outreach in terms of research-related knowledge exchange and cooperation, which positively affects its competitive position. The general competitive position of AUTO and GIZACS is as well rather strong at the national level. Despite, neither of them can compete with their electromobility-related activities on European or international markets. The difference between the general and electromobility competitiveness is most pronounced in case of TCBE. The cluster performs well at national and moderate at European and global scale, but is on none of the three markets competitive as regards electromobility. In comparison, HVEC has a rather strong position in the national market, in general as well as in electromobility, whereas the opposite is true for European and global markets.




The outlined results correspond to the findings of the European Cluster Observatory where Stuttgart Region received a 3-star ranking in automotive, Franché-Comte and West Transdanubia a 2-star ranking. Moreover, the RDCs national competitiveness is reflected in their location quotients (LQ). The LQ indicates whether or not a sector has a high share of a region's employment compared to the reference area (nation, EU). A value above 1 indicates that the region is specialised in the sector. In 2011 the LQ (national) amounts to 4,9 for Franché-Comte, 3.4 for Stuttgart Region, and 3.0 for West Transdanubia. Taking EU27 as reference area, West Transdanubia ranks first (LQ = 5.9) followed by Stuttgart Region (LQ = 5.3) and Franché-Comte (LQ = 4.3).

## 5.3.1 RDCs' FIELDS OF COMPETENCE



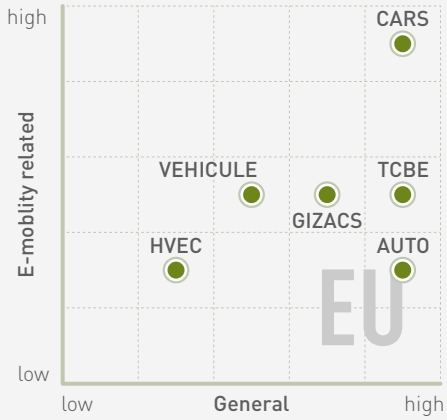

The comparison of RDCs' fields of competence reveals that all four automotive clusters have high levels of expertise in **drive systems** – albeit with varying emphases. VEHICULE's members are mainly concerned with HEV and EV components, modular systems and vehicle design (e.g. engines, air cooling systems, smart sensors). AUTO's members, in contrast, are specialised in parts and components (mechanical and electric devises), where materials, manufacturing skills and systems form major unique selling propositions. Being an engineering cluster, HVEC's core competences comprise lightweight design, simulation, CAD, prototyping and material sciences. Within GIZACS, companies excel in design, development and production of mechatronic drive systems and electric motors to improve safety, decrease energy consumption and minimise the impact on the environment for worldwide OEM customers and their suppliers. Based on heavy investments in RTDI and some public incentives CARS was able to close the earlier existing competitive gap to global competitors. Today, cluster members are fast developing. Lightweight vehicles including new materials, structural optimisation, vehicle bodies and platform solutions, production processes for new materials are related areas of competence. In addition, Bosch, ZF, GETRAG and other suppliers entered the market with electromobility products such as hybrid and electric drivetrains, power electronics, and so on.

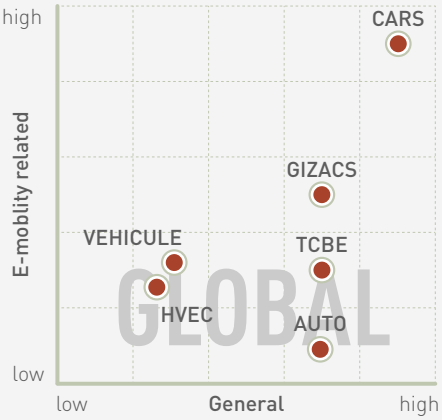
**Mobility services** build another core competence of AUTO, CARS, VEHICULE and TCBE, not at least driven by changing user behaviour and companies' diversification strategies. Today owning a car is considered less important. Over recent years the number of young car buyers is decreasing, while the number of car sharing users increased. Acknowledging this trend, Daimler as large OEM has with its car2go car-sharing service (see p. 24) taken first steps from producer to mobility provider. Fleet management and electromobility related logistics (CEP services, delivery solutions) are further fields of competence. Although less pronounced, car-sharing services, next to car park infrastructure and management, also build fields of expertise at VEHICULE. TCBE companies foremost offer smart mobility solutions.

Except for GIZACS all RDCs have a certain degree of **ICT** expertise, exemplifying the increasing integration of the electromobility constituent sectors. While ICT competencies are at the heart of TCBE covering basically all areas including embedded systems, vehicle-to-vehicle and vehicle-to-grid communication. HVEC also has a rather accentuated expertise in ICT, while these are less marked in case of the other automotive clusters. VEHICULE's expertise centres around human-machine interfaces, simulation, smart and embedded systems and smart mobile communication. As VEHICULE, CARS subcluster's (CARS-IT) competencies comprise embedded systems, autonomous driving, driver's assistance, vehicle-to-vehicle and vehicle-to-grid communication, traffic management and flow optimisation.

With regard to **charging**, VEHICULE particularly focuses on charging stations, whereas Conductix-Wampfler, SEW Eurodrive and other CARS members are mainly concerned with developing inductive charging solutions. Closely linked to this are the RDC's competencies in the field of smart grids. Yet smart grids go hand in hand with use of ICTs. That is why TCBE companies have developed high levels of expertise in this thematic field.

## 5.3.2 RDCs' PERFORMANCE IN INTERNATIONALISATION




Internationalisation is at core of cluster management activities in the majority of growing and mature RDCs across Europe. Through matchmaking at European and global scale, cluster managers are able to derive additional benefits for their members, in particular for SMEs. Likewise, export and internationalisation is one of the main areas of cooperation among clusters' members.

**CARS** can be considered as a «high performer» at European and global scale as regards internationalisation of the RDCs general and electromobility-related activities (see figure above). Many cluster members (including SMEs) operating at global scale, participation in European projects, contributions to European and international standardisation plus membership in networks such as ACEA, CLEPA and ERTRAC are major reasons for CARS excellent performance. Just the contrary applies to **HVEC** as internationalisation low performer.

For **VEHICULE, GIZACS** and **TCBE** the situation is more diversified as regards the scale and content of internationalisation. All three RDCs have moderate positions with regard to the internationalisation of their electromobility activities at European scale. Their performance concerning the clusters general activities, however, ranges from moderate (VEHICULE) to high (TCBE). Just as TCBE, **AUTO** performs well in Europe with regard to their common activities, but low concerning the electromobility-related activities.

With regard to the global level, VEHICULE and HVEC show rather low levels of performance. VEHICULE, for example, is due to Peugeot's headquarters better known for its history in vehicle production than for its efforts in electromobility-related research efforts. **AUTO's** position is weak concerning electromobility, but moderate with regard to the more traditional activities of the cluster members.

Acting as supplier of global OEMs and close cooperation with system suppliers in Japan and Korea, are reflected in the **GIZACS's** internationalisation performance. Besides, the cluster signed a memorandum of cooperation with the Association of Ukrainian Motor Vehicle Manufacturers (Ukrautoprom). The establishment of a network of suppliers plus joint projects in Serbia and with Samara Region in Russia, allow cluster members to enter Fiat and Avtoavaz global supply chains. All RDCs complement their internationalisation activities through the collaboration with other clusters across Europe and partly worldwide.

Next to internationalisation, research and development is among the core areas of cooperation in all clusters. Except for AUTO and HVEC, RDCs' members also collaborate in cluster promotion, which is usually governed by the cluster management. Related activities comprise site visits, excursions, and presentations at events, fairs and exhibitions plus participation in relevant networks. However, firms barely collaborate in skills development by means of joint training and education. This can partly be explained by the lack of and therefore the fierce competition for skilled staff. In this respect VEHICULE and GIZACS are an exception. In both clusters cooperation in training and education takes central stage. Surprisingly, standardisation as core field of cooperation is only emphasised by GIZACS. This may be attributable to the clusters composition of small firms compared to large OEMs – taking the lead in standardisation – located in Alsace/Franche-Comté and Stuttgart Region surrounded by a large number of SMEs.

## 5.3.3 Assessment RDCs' Competitiveness

| | RETAIN | ENABLE |
|---|---|---|
| AUTO | – National cluster community<br>– Network with related organisations<br>– Cooperation with regional stakeholders | – Sustainable funding<br>– Cooperative R&D projects<br>– More active members |
| CARS | – Typical ownership structure<br>– Cluster's leading role for the regional economy<br>– Steady development and adaptation of cluster's vision, strategy and tools | – Cluster's influence on national policies<br>– Involvement in international think tanks |
| GIZACS | – Network with companies and R&D institutions<br>– Cooperation with domestic & foreign stakeholders<br>– Confidence between the members and shared understanding of common operations | – Sustainable funding<br>– Government support<br>– Improving the power network by incorporating renewable energy and battery electric vehicles |
| HVEC | – Cluster's role in initiating cooperation<br>– Participation in transnational EU projects<br>– Cooperation with multinational (EU based) developing companies through common projects | – Cooperation with start-up companies<br>– Usage of EU good practices<br>– Cross-sectorial cooperation<br>– Allure home professional Hungarian work forces |
| TCBE | – Technology know how about e-mobility<br>– Enhanced sensitivity for e-mobility<br>– Relation between research and business | – Initiation of more common projects, espacially in sense of cross-innovation<br>– Initiation of open-innovation processes<br>– Pre-work for establishing a centre of competences in e-mobility |
| VEHICULE | – Cluster's global impact on local economy<br>– Cluster's positive role in advocating electromobility | – Reputation of the cluster on the European scene as a leading, competitive automotive cluster<br>– Give rise to new companies and attract new electromobility players to keep competitive advantage and market leading position locally |

| | ELIMINATE | AVOID |
|---|---|---|
| AUTO | – Insufficient resources | – Supported competition with other associations<br>– Short-term orientation |
| CARS | | – Lock-in effects of RTD and innovation |
| GIZACS | – Concerns about e-mobility | – Inaccessibility e-mobility for all population |
| HVEC | – Brain drain | – Conflicts between cluster members<br>– Frequent changes regulations |
| TCBE | – Prejudices about e-mobility | – Being a late mover |
| VEHICULE | | – Disappearance of traditional companies by lack of innovation<br>– On-going massive job shedding |

**Cooperation** along the triple helix within the cluster and across its boundaries is among the most important factors the RDCs wish to either retain or enable. AUTO, for example, wishes to retain cooperation with regional stakeholders and enable cooperative R&D projects to sustain the cluster's competitiveness, whereas CARS strives for a stronger involvement in national think tanks. Just as CARS, GIZACS and HVEC envisage to retain their cooperation with domestic and foreign stakeholders. Nevertheless, HVEC sees the necessity to develop stronger cooperation with start-ups and across sectors.

With regard to **innovation** as key driver of clusters' competitiveness, TCBE wishes to develop more common projects, particularly with regard to cross-innovation in combination with open innovation processes. Closely related to this, sustainable **funding** is a central concern of AUTO and GIZACS.

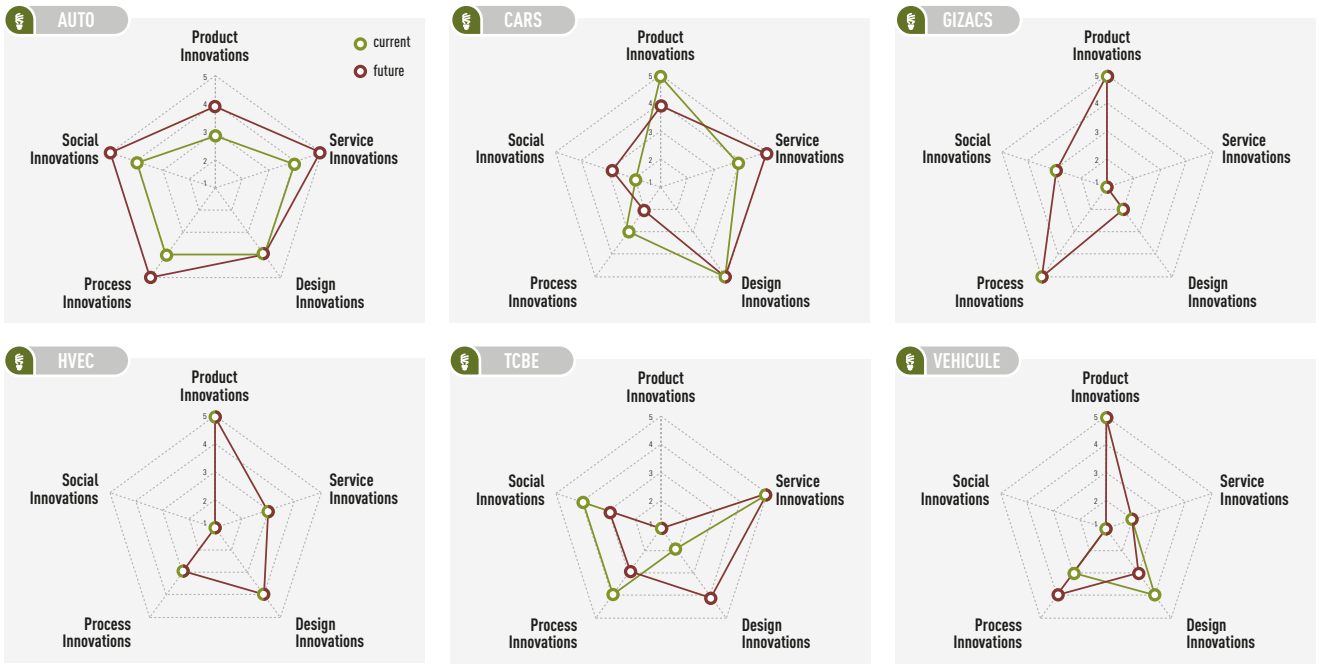
Continuously developing and adapting the cluster's **vision, strategy and instruments** to changing framework conditions is one key success factors for CARS, which is to be retained. HVEC envisages making better use of such practices across Europe, also to avoid conflicts between cluster members. A frequent review of its vision and strategy might as well be suitable for TCBE to avoid being a late mover and for AUTO to circumvent short-term orientation.

Insufficient resources, brain drain and concerns about electromobility are the main factors to be eliminated. VLOTTE's concept of a One-Stop Shop (see p. 55) could prove to be very useful as regards the latter aspect such service provides professional, objective information, raises awareness for electromobility through evens and allows potential customers to experience electric driving.

In summary, CARS competitiveness is mainly driven by innovation through cooperation including, both business-to-business and academia-industry collaboration. Forasmuch, sustaining collaboration and accepting change as opportunity for new business approaches are perceived as key success factors for the cluster's future development. TCBE's potential for future development is, foremost, seen in cross-innovation, new business models (e.g. open innovation) and digital business. Combining the RDC's future development with the market uptake of electromobility in terms of employment and turnover growth, VEHICULE needs to attract new electromobility actors and foster partnerships between strategic players to sustain its competitive advantage and leading market position in Alsace/Franche-Comté. GIZACS main task is to improve the competitive ability of its members and the innovation ecosystem including government's awareness of knowledge as core input factor for innovation and competitiveness.

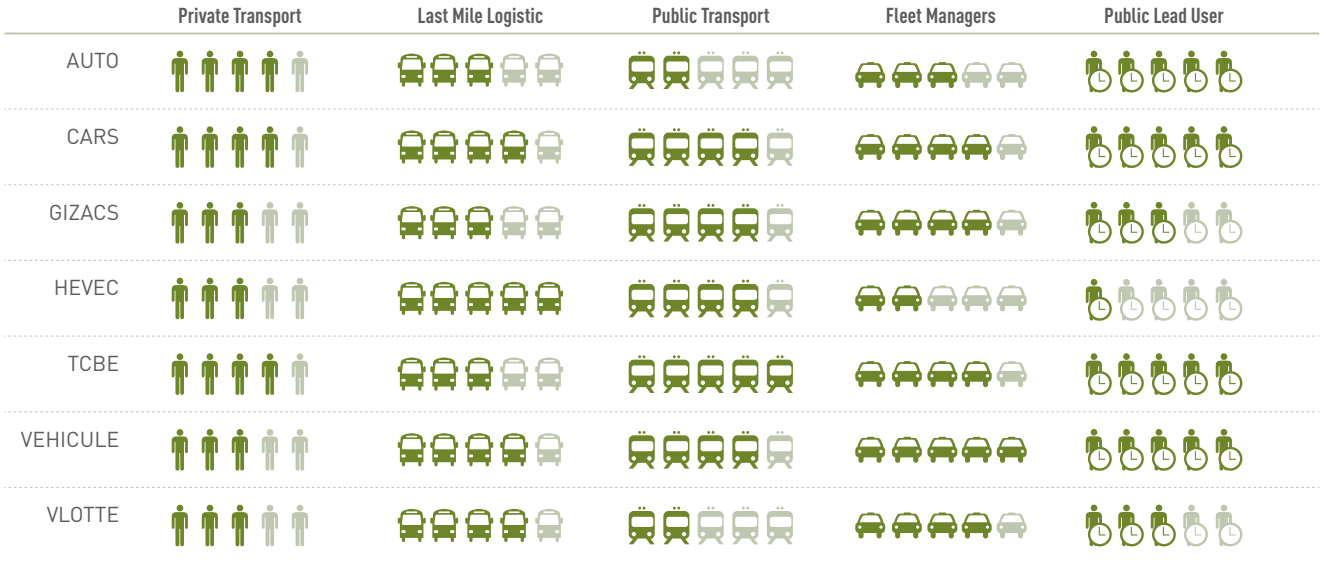
# [ SNAPSHOT ] RDCs DYNAMICS

## Importance of different Types of Innovation for E-Mobility




1 = not relevant  5 = highly relevant

## Relevance of User Groups for RDCs' Future E-Mobility related Development




5 = highly relevant  1 = not relevant

# 5.4 RDCs' DYNAMICS

## 5.4.1 Relevance of Innovation

Innovation is at the core of clusters' dynamics. In order to illustrate RDCs varying trajectories, it is distinguished between

- **Product innovations** as new or significantly improved products, including significant improvements of the technical specifications, components and materials, user friendliness or other functional characteristics;
- **Service innovations** referring to new or significantly improved service practices;
- **Design innovations** located at the intersection of technology, business and human values (e.g. usability, desirability) transcend technology and utility;
- **Process innovations** as a new or significantly improved production or delivery mode;
- **Social innovations** as novel combinations of ideas or distinct forms of collaboration that transcend established institutions and are predominately socially driven.

As can be drawn from the figure on the left, the RDCs assign varying importance to the different innovation types as regards electromobility. At current state, **product innovations** are less important for AUTO and not relevant for TCBE. In contrast CARS, GIZACS, HVEC and VEHICULE value product innovations as highly relevant as electromobility is emerging. With regard to the future development, however, a shift is anticipated: For AUTO product innovations gain in importance, whereas their relevance for CARS is expected to decrease. In view of the other clusters there will be no change in the role of product innovations.

**Service innovations**, in turn, are currently of high importance for AUTO, CARS and TCBE, while an increase is anticipated as regards RDCs' future development. This shift is in the case of CARS, for example, substantiated by initiatives such as car2go (see p. 24). Neither GIZACS nor HVEC or VEHICULE assess service innovations as relevant for the clusters current and future electromobility-related development.

**Cluster dynamics refer to the development of RDCs as well as their contribution to innovation.**

AUTO, CARS and HVEC rate **design innovations** as highly relevant in view of their current and future development. While at present of little relevance, for TCBE this type of innovation is expected gain significantly in importance in the coming years. Just the opposite applies to VEHICULE, where design innovations are projected to decline in their relevance for cluster development. In view of GIZACS this type of innovation neither matter for its current nor its future development.

On the other hand, **process innovations** are of vital importance for GIZACS' current and future development. For AUTO and VEHICULE it is on the increase, whereas its relevance is waning for CARS and TCBE.

**Social innovations** play a key role for AUTO's current and future development, while they do not matter for HVEC and VEHICULE. CARS, in contrast, assumes an increasing relevance, but TCBE a declining one as regards the RDCs future development.

For VLOTTE as a network service innovations are most important, followed by process and social innovations. Product and design innovations are of least relevance for the network's current and future development.

In summary, the four automotive clusters emphasise product innovations with respect to their current development, whereas TCBE as ICT cluster and VLOTTE focus on service innovation. However, the comparison illustrates that major shifts in the RDCs innovation activities will take place during the coming years as electromobility grows out of its infancies, established firms diversify and new actors enter the scene.

## 5.4.2 Relevance of User Groups

As depicted in the figure on the right and in the snapshot (p. 66) electrification of transport can serve different purposes and user groups, each implying specific demands and requirements. Envisaging integrated mobility solutions all user groups are deemed relevant. Comparing the relevance of the different user groups for the RDCs' future electromobility-related development reveals, however, similarities but also differences between the clusters.

**Public lead users** are assessed highly relevant by AUTO, CARS, TCBE and VEHICULE, not at least due to their signalling effect and their potential to stimulate demand. For GISZACS and VLOTTE, on the other hand, public lead users are of secondary importance, whereas HVEC values them as not relevant for the future development of the cluster's electromobility activities. In part, HVEC's assessment can be attributed to the reluctance of the public sector and the associated lack of public backing and support.

AUTO, CARS and TCBE deem **private transport** of passengers important as acceptance and usage are key drivers of an accelerated introduction of electromobility. GIZACS, HVEC, VEHICULE and VLOTTE, in contrast, ascribe passenger transport only little relevance for their future development.

In view of HVEC it rather is **last mile logistics** that is a key driver for the RDC's electromobility activities. Likewise, CARS, VEHICULE and VLOTTE see large potential in urban freight delivery, while TCBE and GIZACS assign only little relevance to this user group.

Resulting from the long history of electrification of public transport in Switzerland, TCBE values **public transport** as highly relevant for its future development. CARS, GIZACS, HVEC and VEHICULE also ascertain this user group great importance, whereas AUTO and VLOTTE do not. In case of AUTO this may be due to the status as «supplier» cluster.

For AUTO the same may apply to **fleet managers** as target group, which are valued as moderate relevant. Likewise, this target group is of little importance for HVEC's future electromobility-related development. VEHICULE, on the other hand, sees great potential in public fleets for its development, as do CARS, GIZACS and TCBE.


## 5.4.3 Entrepreneurial Climate

Clustering can be viewed an entrepreneurial process, where entrepreneurs function as change agents. They influence the conditions for other entrepreneurs to start and develop a firm by changing the demand and supply conditions in a region. Over time they develop norms and informal institutions, which in turn constitute the entrepreneurial climate in a region, which is crucially important for clusters' dynamics.

In this regard **CARS'** long-term strategy goes hand in hand with well functioning multilevel governance facilitating the cluster's rapid development. Cluster subgroups in the field of electromobility (e.g. TecNet E-Mobility for suppliers) are evolving fast. Supported by large-scale cooperation projects based on mutual trust, interactions between actors of all three electromobility-constituent sectors are dense. Taken together, these conditions form an excellent climate for start-ups and spin-offs in the field of electromobility.

**VEHICULE** also offers a good entrepreneurial climate to drive RDC's growth. Since its establishment in 2009, six new firms emerged, of which five are start-ups and one is a university spin-off. During this period the pace of business formation accelerated: four in 2011 compared to one in 2010 and one in 2009. Notwithstanding such positive development, the cluster was not able to attract external companies to the cluster.

Concerning **TCBE**, favourable conditions for start-ups are also found in Espace Mittelland in particular as regards consulting of founders. One of the major shortcomings is seen in the difficulty to acquire sufficient financial resources by means of risk financing and venture capital. Nevertheless, during the term 2009 to 2011 the cluster was able to attract 31 new entrepreneurial members. **AUTO**, in contrast, could not report any start-ups or spin-offs.

With regard to entrepreneurial activities, there has been a major shift in Slovenia between 2009 and 2012, with far more people in favour for working as an employee (+18 points, 66%), and far fewer (-19 points, 28%) favouring self-employment (European Commission, 2012). These results are in line with the EU27 average, though more marked. Forasmuch, one can assume an adverse entrepreneurial climate. Despite this constraint situation, **GZIACS** was able to attract 9 additional members to the cluster between 2009 and 2011. In addition, seven spin-offs were founded in 2011.

Just as in Slovenia, the entrepreneurial climate in West Transdanubia is compared to the other ELMO[5] regions less favourable. In response to this, **HVEC** as embryonic cluster focuses its activities on cooperation rather than on cluster growth through start-ups and spin-offs.

**Monitoring**

... is the systematic and routinely collection of information on cluster activities

**Evaluation**

... is about assessing, as systematically and objectively as possible, RDC's activities against the defined objectives

## 5.4.4 Monitoring & Evaluation

Monitoring and evaluation are important management tools to track RDCs' progress and facilitate decision-making.

Except for HVEC and TCBE, all RDCs monitor and evaluate their cluster development on a regular basis. **AUTO**, for example, conducts an annual conference with a state of the cluster address, whereas **CARS** commissions bi-annual studies on facts, figures, indicators and scenarios for future development. **GIZACS** follows a common approach including indicators such as number of cluster members, joint projects and events, sector performance, and number of established contacts with potential customers. According to the performance contract between **VEHICULE** and the French Government, the cluster is evaluated every three years based on the objectives defined. The number of cluster members indicates achievements in governance and coordination. The number of projects and innovation platforms appraised and financed by VEHICULE measure the cluster's RTDI performance. Improvements in the region's attractiveness are evaluated based on new business formations in conjunction with the cluster activities and the number of SMEs involved in joint projects. Finally, the number of companies involved in technology working groups and other collaborative actions (e.g. training courses) plus the number of appraised training offers, function as indicators for achieving the targets set regarding the development of human resources and skill management.

## 5.4.5 Assessment RDCs' Dynamics

| | RETAIN | ENABLE |
|---|---|---|
| AUTO | – Industry network<br>– Cross-organisational competences<br>– Knowledge transfer | – Access to the product development process in an early stage<br>– Operational experience<br>– Improved systems competences<br>– Taking advantages of market niches |
| CARS | – Multilevel governance (region, state, national)<br>– Community building<br>– Pre-competitive cooperation | – Support of members new to the market |
| GIZACS | – Process innovation<br>– Monitoring and evaluation measures<br>– Cluster management competencies | – Improved infrastructure<br>– Linkage between industry and electrical vehicle distributors<br>– Cheaper batteries in the world market<br>– Investments |
| HVEC | – Initiating pilots<br>– Complemental cooperation<br>– Cooperation with similar clusters abraod | – Integration of start ups in complementary RTDI areas<br>– Hybrid projects<br>– Open innovation<br>– Services innovations from idea to implementation |
| TCBE | – Dynamics in service innovation<br>– Networking capabilities<br>– Business matchmaking and partnering | – Innovations for e-mobility in public transport, mobility services and smart grids<br>– Innovation in ICT sector related to e-mobility |
| VEHICULE | – Good involvement of mobility user groups and local authorities which facilitates pilot projects<br>– Focus on design, product and process innovations | – Acceleration of business formation in the cluster<br>– Company visitis<br>– Enhanced regional attractiveness at the European level |

| | ELIMINATE | AVOID |
|---|---|---|
| AUTO | – Dependency on tier 3 suppliers | – Limiting niche strategies on long term<br>– Focus on concept cars and image-project |
| CARS | – Too many different labels | – Competing cluster services of different actors |
| GIZACS | – Monopoly of one manufacturer | – Failure to comply with global trends<br>– Risk of loss of competitive position on the market |
| HVEC | – Brain drain, i.e. loosing professional researchers and workforces<br>– Continously changing governmental/economic regulations | – Supporting only technical innovations (marketing, design innovtions are needed too)<br>– Negative rivalism between cluster members |
| TCBE | – Lack of information about start-ups and spin-offs<br>– Bounderies of service innovations in e-mobility | – Net product innovations<br>– Focusing solely on households |
| VEHICULE | – Unbalanced relationships between SMEs and large companies | – Lose the «Competitiveness Cluster» label granted by the French State |

# 6 CONCLUSIONS & FUTURE PERSPECTIVES

# 6.1 POTENTIAL FOR MUTUAL LEARNING

With the aim of integrating RDCs across Europe and including more regions into «Regions of Knowledge», ELMO$^S$ follows an integrated approach bringing together four fully fledged mature clusters with complementary fields of expertise and two clusters with less-developed research profiles. Mentoring for capacity building and mutual learning are central elements of ELMO$^S$, which are also reflected in the deduced priority themes as basis for the formulation of joint actions.

However, the comparative analysis unveiled various **challenges** regions are facing in their efforts to stimulate «Green Mobility Solutions» that drive quality of life, competitiveness and sustainable growth hindering a fast uptake of electromobility. By gathering and comparatively analysing available knowledge in the regions as well as at the level of RDCs a first step towards the achievement of a modal shift for sustainable growth has been taken.

As outlined in the previous sections, due to varying regional RTDI infrastructures as well as RTDI and cluster policies plus action plans in combination with RDCs' different degrees of maturity, the range of challenges is mixed and rather broad. Reinforced by the cross-sectorial nature of electromobility and its particular social relevance the complexity of challenges is even increasing. Taken together they affect areas such as environment, society, technology, markets, policies, education, RTDI and RDCs, while they partly overlap (see figure on the right).

Based on these findings potential fields of mutual learning and action were identified distinguishing between **«Thematic Priorities»** and **«Strategic Priorities»**. While the former concern specific topics for future electromobility, the latter are of strategic importance to facilitate electromobility in general as well as smart and sustainable regional growth. The second figure on the right illustrates the relationship between challenges and priorities.

In addition, the factors influencing the thematic and strategic priorities have been identified:

- Interdisciplinary research
- Infrastructures (e.g. charging)
- Reliable technologies
- Legal and economic framework conditions
- Cooperation and participation
- Education and training
- User acceptance
- Industry readiness

Through an iterative process of priority setting the manifold challenges were consolidated. The results clearly indicate **«future business models»** (C10) as major challenge affecting all regions, follow by **«intermodal mobility & mobility services»** (C05) and **«green energy»** (C06, see figure below). Joint actions are defined to address these challenges.

## Regions' Major Challenges

| Region | C01 | C05 | C06 | C09 | C10 | C11 | C16 | C18 | C19 | C25 | C26 | C27 | C28 | C32 | C34 | C35 | C38 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alsace/Franche-Comté | | | | ● | ● | | | | ● | | | ● | | | | | |
| Espace Mittelland | | ● | ● | ● | ● | | ● | ● | | | ● | ● | | ● | ● | | ● |
| Slovenia | ● | | ● | ● | ● | | | ● | ● | ● | | | ● | | | | ● |
| Stuttgart Region | | ● | | | ● | | | | | | | | | | | | |
| Vorarlberg | ● | ● | ● | | ● | ● | | | | | | | | | | | |
| West Transdanubia | ● | ● | ● | | ● | | | | | | | | | | | | |
| Total | 3 | 4 | 4 | 3 | 6 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 2 |

● thematic ● strategic

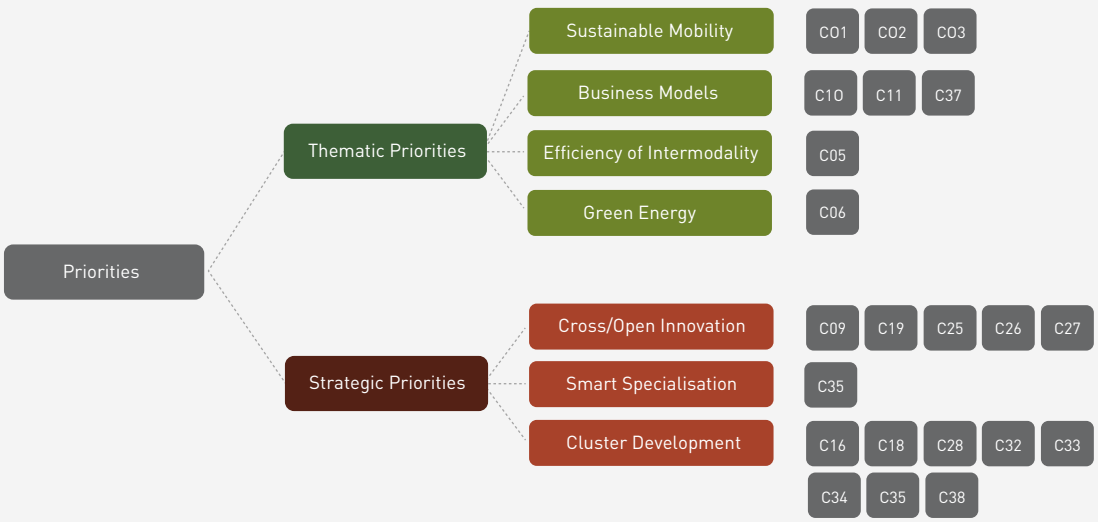
## Thematic & Strategic Challenges

| No. | Challenge | E | S | B | T | M | P | R | C | ED |
|---|---|---|---|---|---|---|---|---|---|---|
| C01 | Reduction of greenhouse gas emissions | ● | | | | | | | | |
| C02 | Reduction of noise emissions | ● | | | | | | | | |
| C03 | Improving quality of life, wellbeing and safety of citizens | ● | ● | | | | | | | |
| C05 | Intermodal mobility & mobility services | | ● | ● | | | | | | |
| C06 | Green energy | ● | | | ● | | | | | |
| C09 | Improvement of cross-sector and open innovation | | | ● | | ● | | | | |
| C10 | Future business models (transforming technology in added value) | | | ● | | ● | | | | |
| C11 | Total cost of ownership - options for users and industry) | | | | | ● | | | | |
| C16 | Improvement of cooperation of strong regions in Europe | | | | | | ● | | | |
| C18 | Improvement of academia-business collaboration | | | | | | | ● | | |
| C19 | Improvement technology transfer to SMEs | | | | | | | ● | | |
| C25 | Alignment of public and private research | | | | | | | ● | | |
| C26 | Improvement of market research | | | | | | | ● | | |
| C27 | Improvement of cross-sector collaboration | | | ● | | | | | | |
| C28 | Improvement of collaboration among and diversity of RDCs actors | | | | | | | | ● | |
| C32 | Enhance RDCs' innovation dynamics particularly in service innovation | | | | | | | | ● | |
| C33 | Facilitate RDCs' role in advocating electromobility | | | | | | | | ● | |
| C34 | Balance the relationship between large and small enterprises in the cluster | | | | | | | | ● | |
| C35 | Elaborate regions' potential for smart specialisation | | | | | | ● | | | |
| C37 | Facilitate start-up activities | | | ● | | | | | | |
| C38 | Attraction of new cluster members | | | | | | | | | ● |

E = Environment, S = Society, B = Business, T = Technology, M = Market, P = Policy, R = RTDI, C = Cluster, ED = Education

● thematic ● strategic

## Deduced Thematic & Strategic Priorities



Likewise, areas for mutual learning can be derived. CARS, for example, is well-experienced in cross-sector and open innovation, from which VEHICULE, TCBE and GIZACS can learn to address the challenge in their regions. VEHICULE, on the other hand, possess profound knowledge on intermodality (C05), which is useful for the other regions. In addition, mentoring schemes are elaborated, defining actions for capacity building, to support GIZACS and HVEC to analyse the feasibility and define their own action plans bringing forward their RDCs in terms of electromobility.

With respect to factors influencing the future development of electromobility and RDCs, **«improved user acceptance»** (C12) and **«reliable technologies & appropriate (public) charging infrastructures»** (C07) were assessed most pressing. With three namings **«improved policy awareness for electromobility»** (C13) is perceived as the most important challenge to be improved as regards legal framework conditions.

Next to synergies and complementarities, mutual learning is further enhanced by the regions' proximity. In fact, Alsace Franche-Comté, Espace Mittelland, Stuttgart Region and Vorarlberg have a strong cultural and historical coherence, both in mentality as well as e.g. in the nature of academic life, performance and citizens mobility behaviour. Likewise, this applies to the two Eastern regions Slovenia and West Transdanubia.

**8 PRIORITY THEMES**

**Theme 1**
Integrated electromobility in public transport systems

**Theme 2**
Cost-effective, consumer-oriented electromobility solutions

**Theme 3**
Green energy production and smart grids for electric vehicles

**Theme 4**
Contribution to user acceptance

**Theme 5**
Initiation of an interdisciplinary public & private research network

**Theme 6**
Development of vibrant, efficient, global-oriented RDCs

**Theme 7**
Enhancement of open innovation culture in business, research and society

**Theme 8**
Development of Smart Specialisation Strategies

For each of the eight priority themes needs and good practices have been identified, as exemplified below.

## 6.2 POTENTIAL FOR SMART SPECIALISATION

To foster a smart, sustainable and inclusive economy and to actively proceed against current challenges the European Union set up five ambitious objectives, which are the employment, education, social inclusion, climate energy and innovation. Research and innovation are identified as the key players for the increase of regional growth and employment. Innovation is the most important factor to create economic growth and new jobs in a region. In order to foster European regions the European Commission's Cohesion Policy has set the target to decrease differences between regions and to ensure growth across Europe and to overcome the current crises. For this reason a research and innovation strategy for smart specialisation (RIS3) was developed.

**Smart specialisation (S3)** is a new innovation policy promoting the efficient and effective use of public investment in research. S3 aims at increasing regional innovation by means of enabling regions to deeper focus on their strength and unique characteristics. Instead of spreading investments too thinly across single technology fields, S3 wants to build on a wide-ranging regional analysis of existent resources and technological skills. For doing so, the inclusion of regional partners is crucial. Following the idea of the triple helix, S3 strongly bases on the cooperation between business, public and research entities. Despite that, a comparison between regions in terms of their competencies is foreseen, in order to avoid duplications. S3 regarded as an innovation instrument helps regions to identify their strength and high-value added activities, in order to strength their competitiveness. The implementation of the S3 in a region requires several single milestones. Firstly, each single region needs to identify their niche areas of competitiveness. Secondly, the cooperation between innovation partnerships should be emphasized. And thirdly a multi level implementation should be assured. Thirdly, an even stronger focus is given to R&D and innovation. Fourthly, cross-sectoral connections should be aspired and a critical mass and scale of activities should be given.

However, smart specialisation is not to be interpreted as an impulse to pure specialisation that exploits the economics of localisation, but as **«specialised diversification»** that exploits the economies derived from related variety. That is, regions should pursue a diversified portfolio of related activities, to find sufficient areas of specialisation to enable competitiveness while allowing for diversification and preventing regions from being exposed to the risks of market condition changes or other unpredictable external events (COM (2010) 533 final).

### Smart Specialisation Strategies

... are multi-annual strategies defining a policy mix and budgetary framework, focusing on a limited number of globally competitive areas to stimulate smart growth, and therewith, concentrating human and financial resources in the most promising areas of comparative advantage. Similar to the cluster approach, such strategy is based on a strong partnership between regional authorities, the business community and stakeholders from research and academia.

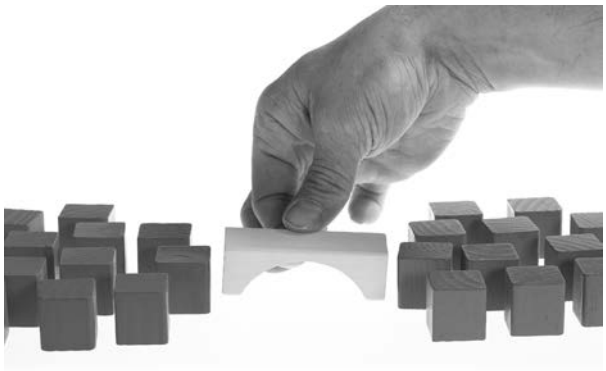
Forasmuch, S3 strategies should be well prepared including the evaluation of existent regional resources and e.g. technological skills. In addition, such strategies need to be deeply rooted in the region, and therefor, necessitate the analysis of both the current state of play and the potential for future developments. Also a plan for the integration of necessary regional partners to a S3 strategy is crucial.

Electromobility is expected to become a central topic in several regions. Hence, it is even more important for regions engaging in this field to specialise. Specialisation in the here used sense, means avoiding duplications in a specific working field in comparison to other regions. In consequence, finding a unique selling proposition can sustain the regional competitiveness.

As was outlined in the previous section, detail regional analyses were carried out in the framework of ELMO$^{S}$, including amongst others the identification of regional strengths and weaknesses. But, more important the analysis emphasises the regional potential for a possi-

ble S3 strategies. Based on these findings potential fields for smart specialisation in Alsace/Franche-Comté, Espace Mittelland, Stuttgart Region and Vorarlberg, as most advanced cluster regions have been elaborated.

## Building Bridges – Smart Specialisation in the ELMO$^S$ Regions



Traditionally **Vorarlberg** was a touristic region. In addition, textile counted as one of Vorarlberg's former key competences. Although the region has never been a typical location of the automotive sector, some important automotive suppliers allocated there. Rather, Vorarlberg is known for its competencies in renewable energy. It builds a fundamental pillar of the regional economy. In the former years, the region constantly increased its competencies, skills and knowledge in the field of green energy. Renewable energies and energy efficiency are today significant business areas in the region and can be seen as unique characteristics. Illwerke vkw, the largest electricity provider in the region, generates electricity exclusively from hydroelectric and other renewable energy sources. With the regional commitment to VLOTTE, Vorarlberg stepped into the topic of electromobility by establishing a fully fledged infrastructure for electric vehicles. This development included the provision of electric vehicles as a first step, followed by charging stations, new business and mobility models and so on. Today, Vorarlberg disposes of a well-established e-mobility infrastructure, consultancy competencies, in combination with unique selling proposition in green energy. In addition, Vorarlberg has acquired in-depth knowledge of the users. Taken together these competences and infrastructures can build a starting point for the formulation of the region's S3 strategy. As regards the involvement of regional partners, Vorarlberg lacks a critical number of research entities. The region's geographic proximity to Lake Constance and the borders of Germany and Switzerland provide favourable conditions to overcome the research gap by making use of complementary research infrastructures through cross-sectorial connections with the AUTO in Zürich and cooperation with outward research entities from Stuttgart Region. Further potential is seen in the expansion of electromobility around the Lake of Constance and therewith, increase the accessibility of electromobility in peripheral sub-regions.

**Espace Mittelland** poses long-term competencies in the field of ICT, represented by TCBE. ICT is one of the electromobility-constituent sectors and functions as architecture inside and outside electric vehicles. In parallel it opens new business opportunities with regard to different modes of communication. The meta-themes in the field of ICT in terms of electromobility arise at the intersection of automotive and energy sector and play a crucial role in a variety of areas (see section 2.2.3). On the other hand, AUTO represents strong competencies in the Swiss automotive supplier industry. Its know-how and technology are featured in almost any vehicle produced for the global market. Combining ICT and automotive competencies, the region Espace Mittelland can claim strong cross-sectoral collaboration as the unique selling point. A related S3 strategy could centre on cross-sectoral innovation in the field of «smart cars». Especially, regarding the expertise of the automotive suppliers which base on a broad spectrum of parts and components, automatic systems, steering systems and electronic, the regional ICT competencies could help to broaden the value chain by expanding the competencies and giving access to product development in early stages. This in turn, would offer new market niches. Doing so, would also help to dissolve established boundaries between regional automotive and ICT sector as well as between manufacturers and suppliers. In relation to the integration of regional partners into such long-term strategy,

similar to Vorarlberg, Espace Mittelland challenges the involvement of research entities and a strong R&D infrastructure in such a plan.

In comparison to Vorarlberg and Espace Mittelland, **Alsace/Franche-Comté** and **Stuttgart Region** are traditional automotive regions. Both regions are European hubs for the automotive industry and still home of large companies such as PSA Peugeot-Citroën, Daimler AG and Porsche AG, plus international and regional suppliers. Alsace/Franche-Comté is well experienced in design and production of vehicles with a focus on drive systems. And although, Stuttgart Regions has similar capabilities, more recently they have expanded their competence base towards the creation of an overall ecosystem of applied and interactive innovation for integrated sustainable mobility. Following the regions tradition, Alsace/Franche-Comté will focus its future activities on the development of smart cars including innovative car components. Cross-sectorial collaboration of automotive, ICT and energy sector will be utilised for the further development of charging infrastructures.

A S3 strategy in Stuttgart Region, in contrast, could include a stronger specialisation on service innovation. Already at present Stuttgart Region has implemented concepts such as e-bikes, multifunctional smart cards, car sharing, charging points and EV fleets. The expansion of such user-oriented services necessitates a stronger involvement of end users into regional projects in order to ensure a fast adaption of e-mobility solutions by the public. Involvement of strategic partners into S3 strategies, should for neither region pose a great challenge, as their electromobility-related RTDI infrastructures are well developed. Moreover, stakeholders in Stuttgart Region enjoy considerable confidence in cooperation and an open-minded exchange of knowledge and ideas. Integrating regional projects to national action plans enables Stuttgart Region to widen the scope of decision-making. Likewise, regional stakeholders' commitment to cooperation and specialisation is high in Alsace/Franche-Comté. However, due to the high centralisation of the French government, compared to Stuttgart Region Alsace/Franche-Comté is less flexible in implementing new ideas.