

West Transdanubia

« Green Mobility »
State of Play in the Region



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Abbreviations

KET	Key Enabling Technologies comprise technologies such as nanotechnologies, micro- and nanoelectronics including semiconductors, advanced materials, biotechnology and photonics.
RTDI	Research, Technological Development and Innovation
RDC	Research-driven cluster
ICT	Information- and Communication Technologies
SWOT	Strengths, Weaknesses, Opportunities and Threats
R&D	Research and Development
SME	Small and Medium-sized Enterprises

1 INTRODUCTION

The overall goal of **ELMOs – Electromobility Solutions for Cities and Regions** – is to promote more sustainable transport 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 for cross-border field tests which should lead to an improved standardisation in electromobility technology and to new insights in applied science. The project therefore, contributes to enhance the regional capacities for a fostering of the sustainable transport-related economy.

Due to daily-congested roads in and around agglomerations with highly polluting stop-and-go traffic, electromobility with zero-emissions in cities will bring large and quick gains in greenhouse gas reduction and alleviation of air and noise pollution. Moreover, innovative green vehicle concepts will lead to new and sustainable mobility forms in urban mobility.

*“**Electromobility** includes all electric vehicles as well as plug-in hybrids in urban, sub-urban and rural areas. Range extenders are excluded.”*

However, a fast uptake of electromobility depends on appropriate regional infrastructures, a shift in user patterns, and intelligent vehicle-use concepts embedded in the urban transport environment. At first step towards the achievement of a modal shift for sustainable growth is to gather and analyse available knowledge in the regions as well as at the level of research-driven clusters (RDCs) and on EU level, and to conduct SWOT analyses to serve the formulation of joint research, policy actions and business strategies.

This State of Play report seeks to provide an overview of RTDI and Cluster Policies, Action Plans, R&D Infrastructures related to electromobility and to stimulate the debate on future «Green Mobility Solutions» that drive quality of life, competitiveness and sustainable growth in West Transdanubia.

2 REGION & SECTOR

West Transdanubia is one out of six regions across Europe joining forces to drive the uptake of green mobility solutions for cities and regions. To better assess the regional state of play in electromobility, some basic information on the region and automotive sector is presented in the following sections.

2.1 West Transdanubia– The Region at a Glance

West Transdanubia is a three county (Győr-Moson-Sopron, Vas & Zala) comprising region; it has an area of 11,328 km². With its location on the west-side of Hungary as special givens:

- it is neighboured with 4 countries (Slovakia, Austria, Slovenia and Croatia) and two other regions,
- transacts 60% of Hungary's road freight transit traffic.

The population is slightly over a million. The Region has 5 county level cities (Győr, Sopron, Szombathely, Zalaegerszeg, Nagykanizsa), 22 smaller towns and further 628 smaller villages.

Strong investment activity began in the '90-es, well-capitalized foreign investors settled (AUDI, GM). The share of industrial employment in the three counties is significantly higher than the national average. From the economic sectors has the industry, mainly the processing industry the prominent role.

Roads. The one-sixth of the national road infrastructure are located here, and the road density is here the highest of the Country. However, only 6.8% is of the roads highway or primary highway. One of the most acute problems of the road transport is the absence of a north-south highway, because of the fast growing north-south transit traffic.

Railroads. Several international railway lines run across the Region, five additional domestic main line builds up the main rail network.

Shipping. The region has practically only one navigable river: the Danube, where we can found the only international port: Győr-Gönyü.

Airport. Péter (near Győr) and Sármellék (near Balaton) operates currently a public commercial airport.

Regional employment data in December 2010 (age 15-74)

Regions	Unemployment rate	Employment rate	Activity rate
Southern Great Plain	11.27 %	48.4%	54.6%
Southern Transdanubia	11.95 %	48.3%	54.9%
Northern Great Plain	15.48 %	45%	53.2%
Northern Hungary	16.37 %	43.8%	52.4%
Central Transdanubia	10.31 %	52.6%	58.7%
Central Hungary	8.02 %	51.5%	56%
Western Transdanubia	8.54 %	54.6%	59.7%
Total	11.11 %	49.4%	55.5%

Source: NFSZ (National Employment Service): <http://kisterseg.munka.hu/>

Table 2-1 West Transdanubia – Key Figures

	Hungary	West Transdanubia
Basic Information		
Territory (km ²)	93 026	11 328
Population (2011 in 1 000)	9 962	995
Population density (inhabitants per km ²)	107.1	87.8
Economy		
GDP per inhabitant (2009 in €)	9 100	8 500
Total Employment (2011 in 1 000)	3 812	412
Employment Rate (2011 in %)	62.7	65.1
Unemployment Rate (2011 in %)	10.9	7.4
Research Infrastructure		
Universities / Academia		
Research Laboratories		
Research* (2009 in % of EAP)	0.48	0.22
Total R&D Personnel (2009 in % of EAP)	0.71	0.35
Human Resources in S&T (2009 in 1 000)	1 680	143
Human Resources in S&T (2009 in % of EAP)	32.1	26.5
Intramural R&D Expenditure (2009 million €)	1 067	50
(% of GDP)	1.17	0.59
EPO Patent Applications (2009 by Priority Year)	30	6

* EAP = Economically Active Population

Source: EUROSTAT

2.2 Automotive Sector

The economic development of the West Transdanubian region is relatively high. In the last years it took the second - third rank in the list of the Hungarian regions, however from the international point of view, the GDP of the region is about only 60% of the average of the EU countries. In the sector of thermal tourism and **vehicle industry**, 50% of the national gross added value is realised in this region.

In West Transdanubia the machine industry¹ had significant importance erstwhile as well, but **nowadays the investment of companies of (road) vehicle industry** enhances it further. In the year 2010, West Transdanubia took part with 47 percent of the whole sale of domestic vehicle industry, from which 40 percent was given by enterprises with headquarters in Győr-Moson-Sopron County. At the end of the year 2010, there were 96 companies registered in West Transdanubia, which is 10 percent of the domestic number and 55 percent of them are micro enterprises² in relation to the vehicle industry.

The two automotive manufacturing investments of the region (**Audi in Győr, Opel in Szentgotthárd**) could double the domestic production capacity until the middle of the decade. Considering the suppliers, the number of new workplaces could increase by tens of thousands in the region.

The income received by car manufacturers and supplier companies is 3,500 billion forints, which amounts to over ten percent of the GDP, and they employ over sixty thousand people. This amounts to more than a quarter of Hungary's exports from the processing industry. Hungary's engine manufacturing: Audi manufactures 1.9 million, while General Motors in Szentgotthárd manufactures four hundred and fifty thousand. (Source: http://hetivalasz.hu/english_business/a-recovering-hungarian-car-industry-32637)

In the West-Transdanubian Region there are two OEMs AUDI and GM. AUDI produced last year above 1.6 Mio engines and 38.500 cars. GM produced last year 215T engines, 246T cylinder heads and 10T Allison transmissions. Both OEMs are heading next years for huge extensions of production, which means new activity fields, new jobs, extended supply chain.

The big international TIER1 suppliers playing a key role in the regional automotive sector (BOS, SMR, NemaK, VERITAS, AUTOLIV, Schäffler, LEAR, etc.).

The TIER2 suppliers are Hungarian but some foreign origin companies (RÁBA, SFS, Borsodi Műhely, Unirív, Pannon Tools). These companies invest also in R&D and extension.

Thanks to new developments in the last five years are establishing new "OEMs" on the field e Mobility: Antro Kht., Moveo Zrt., Willisits Engineering. (Source: [HITA: E-mobility Technology in Hungary](#))

The number of automotive companies by headcount-category, 2010

	0-49	50-249	250-499	500-999	≥1000	Total

¹ Based on the report of the Hungarian Central Statistical Office, West Transdanubia had almost 20 percent of the registered companies of the machine industry of the country in the year 2008, where at the same time the production of this industrial sector was the strongest among the Hungarian regions.

² The status and function of the vehicle industry in West Transdanubia. Hungarian Central Statistical Office, May 2011

West Transdanubia	65	11	5	9	4	96
- Győr-Moson-Sopron county	36	6	3	6	2	55
- Vas county	14	3	-	3	2	22
- Zala county	15	2	2	-	-	19
Hungary	728	99	32	23	12	941

Source: KSH (Hungarian Central Statistical Office): [A járműipar helyzete és szerepe a Nyugat-Dunántúlon](#)

Production, sales and productivity of automotive companies, 2010

Territory	Production	Domestic sales	Export	Total sales	Employed	Production per one employee, 1000 HUF
	million HUF					
West Transdanubia	1699822	61241	1631828	1693070	19100	88996
- Győr-Moson-Sopron county	1442352	49564	1387829	1437393	12856	112194
- Vas county	252413	11364	239302	250665	5137	49140
- Zala county	5057	314	4698	5012	1108	4565
Hungary	3616013	304063	3294979	3599041	67949	53216

Source: KSH (Hungarian Central Statistical Office): [A járműipar helyzete és szerepe a Nyugat-Dunántúlon](#)

3 POLICIES & ACTION PLANS

Many actors are usually involved in the formulation and implementation of RTDI and cluster policies, requiring efficient coordination mechanisms to be well 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, MS, regions and players grows alongside 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.

“Multilevel governance (MLG) is used to describe situations in which governance and policy-making is best understood as a process not only dominated by actors centrally located in nation states. The term indicates that policy formation and political authority is significantly influenced or transferred 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.”

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 ELMOs, 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 give an overview of electromobility-related RTDI and Cluster Policies as well as of Action Plans implemented in West Transdanubia.

3.1 RTDI Policies

Research, Technological Development and Innovation (RTDI) policies are understood as a form of public support of RTDI activities. RTDI programmes/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 which are usually 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/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 relating to electromobility and/or one of the three electromobility-constituent sectors Automotive, ICT and (Green) Energy. In the following the major policies are introduced.

In the following an overview of ongoing policy programmes/measures of regional and cross-regional relevance introduced by national, regional or local governments is provided. Measures carried out in the past are only listed, if they are of high importance for electromobility and their expiration date was no longer than 2 years ago.

3.1.1 Introduction – A First Impression

The economic development of the last 15 years was mainly based on factors such as low wages (but relatively skilled workforce), well developed infrastructure, tax allowances and incentives, and geographical location, closeness to the Austrian border and the Western markets. One could characterise it as a form of extensive development that is based on labour intensive inputs with a low technological base, although there are some foreign multinational companies with the highest technology and some very competitive Hungarian SMEs with state-of-the-art technologies and products (ROP 2007). Nevertheless, there is a need to transform this extensive development process into an intensive one which is based on knowledge, innovation, and R&D activities.

The most important problems are follows:

- A low level of R&D spending
- A low level of cooperation between the business sphere and the academic sphere;
- A lack of academic and university research institutions (no traditional university);
- Highly centralised systems, no regional autonomy in innovation or R&D policy.

To cope with these problems, West Transdanubia has elaborated its own Regional Innovation Strategy (RIS) in 2001 (one among the first in Hungary) so as to accord to the regional development programme (RIS 2001). The mission of the RIS is the development of West Transdanubia's innovation system. The main objectives here are:

- Creating the missing institutions in the regional innovation systems, reaffirming the existing institutions and organising them into a suitable network;
- Improving the innovation performance of enterprises with the help of specialised programmes and adequate application systems;
- Providing prominent support for those knowledge-based activities which produce high value.

Altogether, the RIS had eleven measures, and these were grouped into four priorities. However, all the regional actors knew that due to the highly centralised innovation and R&D policy system of Hungary, the region would not have the financial resources for its implementation. Any new initiative or project complying with RIS priorities in West Transdanubia had to be connected to the national policy schemes and programmes to receive financial support. The technology and knowledge-based development programme thus began. The first steps of this new development were the establishment of the regional cluster initiatives in five sectors and of some regional innovation centres in the most advanced industrialised centres such as Győr, Sopron, Szombathely, or Zalaegerszeg (Dörny / Grosz 2005).

3.1.2 Detailed Measures

In the following we give an overview of key aspects of the implemented RTDI policy measures.

New Széchenyi Plan		
Duration	Budget (€)	Scope
2011 to 2013		3 – national
Key Policy Actors		
Several		
Sectors addressed		
<input checked="" type="checkbox"/> Transport <input checked="" type="checkbox"/> ICT <input checked="" type="checkbox"/> Energy <input type="checkbox"/> KET <input type="checkbox"/> Electromobility <input type="checkbox"/> Other		
Key Target Groups		
<input checked="" type="checkbox"/> SME <input checked="" type="checkbox"/> Large Enterprises <input checked="" type="checkbox"/> Research Entities <input checked="" type="checkbox"/> Cluster <input type="checkbox"/> Region <input type="checkbox"/> Other		
Rational		
Common economy development programme to Hungary with 7 key areas. Three sub-programmes should be relevant.		
1. Healing in Hungary – Health industry		
2. Renewal of Hungary – Green economy development		
3. Home project– Housing		
4. Enterprise promotion – Development of the business environment		
5. Science – Innovation – Growth		
6. Employment		
7. Transport – Transit economy		
Main Outcomes		
Green economy: reach or overcome the 20-20-20 targets. Including alternative road transport modes (alternative fuel production, infrastructure development and production of alternative driven vehicles) but until now no e-mobility applications. Planned: demonstration project "creating hydrogen producing and distributing infrastructure"; "creating e-mobility financial structure and pilot project to spread e-mobility" and "building biogas cleaning and fueling equipments at the biogas plants".		
Transport: ICT should support the synchronisation and cost effectiveness of the public transport modes.		
Science and Innovation: different developments such as securing the sustainable social and economical development		

of the country. One of the main priorities: transport, logistic, vehicular industry.

From 2011/III. period to 2012/II. period 35 309 new jobs created in the Hungarian economy. In this same period 1 245 kilometer road were build.

Source: <http://ujszechenyiterv.gov.hu/eredmenyek-statisztikak>

Policy Impact

No exact numbers named concerning e-mobility.

3.2 Cluster Policies

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, policy instruments and measures.

Cluster Policies can broadly be defined as specific governmental efforts aimed to support clusters. These efforts can be categorised in facilitating policies, traditional framework policies and development policies. **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.

3.2.1 Introduction – A First Impression

The established cluster initiatives aim to promote the clusterisation processes in an individual branch by stimulating cooperation among enterprises and between business and nonprofit organisations (higher education, research, special services, infrastructures), by providing cluster specific services, and by accelerating the flow and spread of information.

Cluster organisations in the region are important tools for creating and forming the missing elements of regional innovation systems and for improving the relationships among the different elements of the whole system. Cluster management, members, and related professional bodies, institutions, and associations possess the specific information required for the development of the given sector or cluster.

They can identify the most important development directions and mobilise relevant enterprises, as well as formulate and articulate inputs for policy decision makers and development players. Cluster organisations contribute to the improvement of the innovation environment of the region by supporting cooperative activity and the spread of best practice among cluster members (Grosz 2006).

From 2000 to 2005, five cluster initiatives were established in the region, but two of them were not really successful. Experience and sector analysis led to further clusters being founded at the end of 2005. In 2006, as we mentioned before, the so-called Pannon Clusters decided to found an association, a network for the coordination of

their work and activities and to intensify investment in West Transdanubia by supporting the cooperation of the 23 industrial parks in the region (Pannon Business Network 2006).

Inside the New Széchenyi Plan, a new application will (originally was planned in March 2012) come out this Year called "Development of Enterprenual cooperations and Clusters". Shall come out in all 7 Regions with different budgets. A kind of "development policy" which shall help the further development of the accredited clusters.

Until now were 25 Billion HUF (80Mio EUR) given to several accredited clusters. The new (2012) application is in strong delay.

The 2007-2013 EU budgetary period made a long-term consistent cluster policy possible: Hungarian Pole Program for cluster development and for the improvement of the business environment with a total budget of EUR 1.5 billion.

The total number of cluster members: 728, of which 554 SMEs. The total revenue of cluster member companies was (2009): EUR 10.7 billion (11.5% of GDP) and the number of employees of cluster members: 83,378 (2.2% of total No. of employees in Hungary).

3.2.2 Programmes in Detail

In the following we give an overview of key aspects of the implemented cluster policy programmes.

New Széchenyi Plan / Development of Enterprenual cooperations and Clusters

Duration	Budget (€)	Scope
2012 to 2013		3 – national

Key Policy Actors

NFÜ (National Development Agency)

Key Implementing Actors

MAG Zrt. (Hungarian Economy-development Center)

Sources of Funding

National Ministries
 Regional Government
 Structural Funds
 Region
 Enterprises
 Other

Sectors addressed

Transport
 ICT
 Energy
 KET
 Electromobility
 Other

Key Target Groups

Business Entities
 Research Entities
 Public Authorities
 Citizens
 Other

Rationale







Inside the New Széchenyi Plan, a new application will (originally was planned in March 2012) come out called "Development of Enterprenual cooperations and Clusters". Shall come out in all 7 Regions with different budgets. A kind of "development policy".

Main Outcomes

Possible outcomes: better cooperation between and new common projects by the cluster members.

2007-2013 EU budgetary period made a long-term consistent cluster policy possible

- Hungarian Pole Program for cluster development and for the improvement of the business environment
- In total approx. a budget of EUR 1.5 billion
- Total number of cluster members: 728, of which 554 SMEs
- Total revenue of cluster member companies ('09): EUR 10.7 billion (11.5% of GDP)
- Total number of employees of cluster members: 83,378 (2.2% of total No. of employees in Hungary)

Accredited clusters		
	Industry	Number
	Healthcare	8
	ICT	6
	Environmental industry	6
	Packaging	2
	Construction / Energy	1
	Food industry	1
	Investment promotion	1
	Total	25

Sources: <http://www.wire2011.eu/upload/presentations/38/08062011%20-%20WIRE2011%20-%20Csaba%20Novak%20-%20Debrecen.pdf>

http://magzrt.hu/nyomtatvanyok/Klaszteriroda/Klaszterek_elemzese_2012.pdf

<http://akson.sgh.waw.pl/aci/20100528/doc/pres/Bendo.pdf?PHPSESSID=d3095cb7596eb6fe002f3b75432d8652>

Policy Impact

Better cooperation between and new common projects by the cluster members.

3.3 Electromobility-related Action Plans

“**Electrification** of mobility means embedding electric vehicles in a wider intermodal green transport system taking into account new usage patterns such as car sharing, leasing or transport on demand models, public means of transport as well as intelligent last mile freight.”

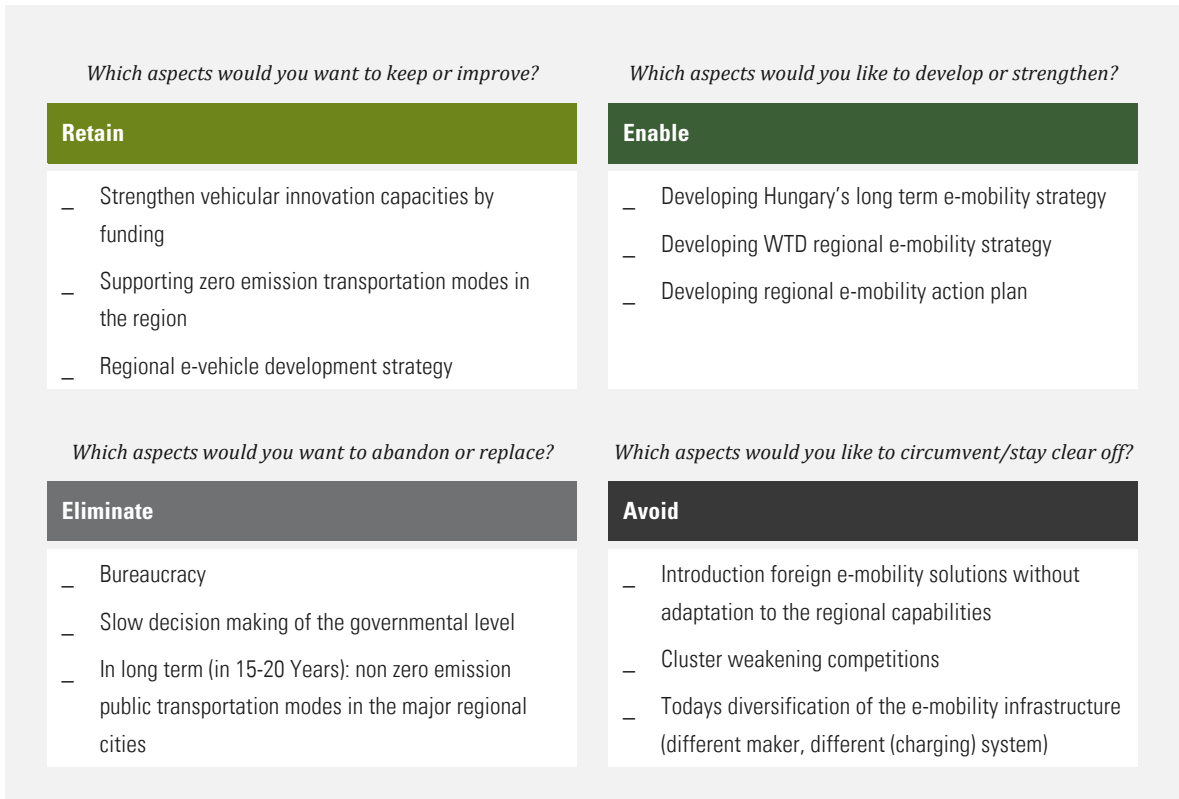
In general, regional/national **Electromobility Action Plans** comprise a vision and strategy for electrification of mobility or in a wider sense sustainable green mobility, define thematic priorities, objectives, actions and measures while outlining the potential of electric/future mobility, challenges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

By mapping regional/national electromobility-related Action Plans, ELMOs strives 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.

So far, no electromobility-related Action Plans have been developed.

3.4 The Interplay of RTDI, Cluster Policies and Action Plans – A Summary

Figure 3-1 Assessment of RTDI, Cluster Policies and Action Plans



It will be an important step forward, when Hungary / WTD Region will have its e-mobility policy, strategy and action plan. Without these documents will be more “trial and error” in this field than necessary, because of the lack of the governmental support.

3.5 Preliminary Appreciation

Region has apparently only one policy in place, the “New Széchenyi Plan”. The cluster policy appears to be a (planned) instrument within that plan. This should be mentioned either under policy impact for the RTDI policy or in an explanatory statement.

4 ELECTROMOBILITY-RELATED RTDI INFRASTRUCTURES

“Research infrastructures refer to facilities, resources and related services that are used by the scientific community to conduct research in their respective field. This definition covers research entities, investors and financial instruments as well as R&D projects carried out by multiple stakeholder.”

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 that aim to bring their innovations to market and to drive enterprises competitiveness and regions' welfare. Against this background, mapping the electromobility-related RTDI supply 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.

4.1 Basic Information

In spite of a dynamic growth in West Transdanubia in the last ten years, the region is among the last regions in Hungary in the number of research units, researchers and research subjects, as well as R+D indicators.

Based on the survey “Innovation Union Scoreboard³”, ordered by ProInno Europe in the year 2010, Hungary is relatively strong in the area of production activities, as well as market and firm-innovation activities, however in the areas of open innovation, excellence researches, company co-operations and intellectual potential Hungary is relatively weak. There is strong increase in the field of introduction of community trade marks and new products, but the venture capital investments are declining.

³ The survey was made by the Maastricht Economic and social Research and training centre on Innovation and Technology

The capacity of research and development shows significant regional heterogeneity is mainly concentrated in Győr-Moson-Sopron County, primarily joining the two university centres (Sopron and Győr). As for the numbers, **more than half of the research sites** (229 in 2009)⁴ **belong to higher education institutions**, from which three-quarters is concentrated in Győr-Moson-Sopron County. The number of effective research-development staff in 2009 (3101 people)⁵ is only 5.9% of the overall national level. The region is also undeveloped in the aspect of expenditure of R+D, West Transdanubia has only 4.75% of the national average and it is one of the last of the Hungarian regions.

Until 2005 the region did not have any research institutions, which could really serve the needs of key sectors of the business. **Two knowledge centres and two synergistic research centres** were established in the above mentioned concentration-sites, which were able to react to the industrial needs, integrate the active firms of the area and call their R+D demands (Csizmadia/Grosz, 2006). These centres establish co-operations in the field of motor-vehicle production, electronics, wood industry and renewable energy sources.

There are **two university centres** in West Transdanubia (Széchenyi István University in Győr, West Transdanubian University in Sopron) with university education and further **education places in seven settlements** (*Győr, Mosonmagyaróvár, Sopron, Szombathely, Zalaegerszeg, Nagykanizsa, Keszthely*).

The industrial parks provide competitive concentrated investment environment to the enterprises, which are after the incubation process, strengthened and outgrew their sites. In the region some 30 industrial parks operate, at least one in each micro-region. As for the year of establishment, ownerships, number of settled enterprises and employees, there is a very heterogenic picture. Mainly the basic services for settled enterprises are available: offices for rental, warehouse for rental, conference room, common internet and phone subscription, organization of business meetings, financial consultancy.

In the significant centres of the region the **innovation centres and incubator houses** provide help to starting and operating micro- and small-enterprises with up-to-date company infrastructure at favourable prices (office, workshop, auditorium, meeting room, broadband internet connection, structured communication network) and basic business consultancy (financial, taxation, accounting services, legal consultancy services, marketing). After **Győr, Sopron and Szombathely**, in the last few years in **Zalaegerszeg, Nagykanizsa and Mosonmagyaróvár** innovation centres and incubator houses were constructed.

In the region the INNONET Centre of Innovation and Technology in Győr is a good example to realize an innovation centre, which was built up among the first in Hungary. The centre with more than ten years' operation and fully used capacity in the Autumn of 2011 functionally extended and developed as an **Automotive Industry Technology Competence Centre**. Among the first in the country, to undertake special roles, cluster initiatives were established in the area with independent management organizations which are trying to foster the **clustering processes** of the emphasised industrial sectors of the region. Recently more than 20 initiatives were started, some of them have already 7-8 years' operation, but there are some, which have just been established. The most important sectors are: machine industry, other processing

⁴ Source: TEIR

⁵ Source: TEIR

industries, informatics, renewable energy, services related to tourism. (Source: West Transdanubian Regional Development Agency Non-profit Ltd.)

As the result of innovative developments, in the past years considerable fascinating innovation has been realized in West Transdanubia in the field of **electric mobility**. It is necessary to mention the hybrid small car, named Solo and the folding electric powered motor-scooter (Moveo) developed by **Antro-group**. A team of developing engineers in Győr (**Meshining Engineering Ltd.**) participated in the realization of the first Hungarian fuel cell vehicle (HY-GO), as well as in the mechanical design of the electric powered small car, named Micron, which participated in the Geneva Motor Show, and both of them are prospective developments. Last but not least the **Willisits Engineering Office**, a family enterprise, has to be mentioned, which has twenty years' experience and production capacity for small series in the field of electric vehicle powering, as well as the scientific research and infrastructural background, which is provided by the **Széchenyi István University**. The results of the developments is planned to be presented in the European scene, through the **Széchenyi Race – Competition of Alternative Driven Vehicles**.

The main research directions of the Széchenyi István University have been organized around the "green car", and the middle range plans contain joining the e-mobility network of the Central-European area. One of the research groups working at the university is the **Vehicle Industry Regional Knowledge Centre**, which already serves six years of the research and development demands of the industrial sector in the region. The centre established a world class level capacity with 8 full time employed researchers, the professors and PhD students of the University, as well as with up-to-date research equipment.⁶ The research centre deals especially with research of the vehicle manufacturing technologies and vehicle part constructions. The two vehicle industry knowledge centres of the country (the other one is operating in the Budapest University of Technology and Economics) represent a kind of organizing power of the education of the vehicle industrial engineering. The two centres are complementing and supporting each other, they established and published their journal the Future Vehicle, which reaches every industrial enterprise, and provides professional forum to introduce the innovative results of the sector.

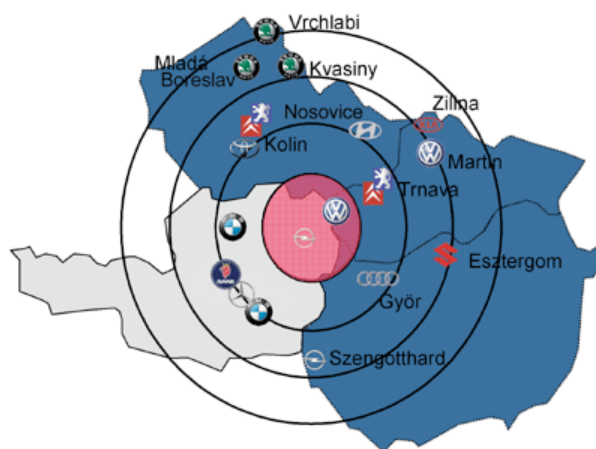
The other research centre of the Széchenyi István University, which has close connections with the business sector, the **Vehicle Industry, Electronic and Logistic Cooperation Research Centre**, started its operation in 2004. In the beginning the main research directions were the technologies of vehicle industry, electronic regulations and test-processes, process modelling and computer simulation, regional and international economy, as well as the development of infrastructure. At the end of November 2010, 28 partners joined from the business sector. Under the title: Mobility and environment: vehicle industry, energetic and environmental researches in the Central- and West Transdanubian regions, the above mentioned research centre has been realizing a unique scientific cooperation between 2010-2012 with the Pannon University seated in Veszprém. The main direction of the project of the basic research include: vehicle industry material and production technology, engine technology, vehicle electro-techniques, modern fuels and power materials. To synchronize the intellectual potential of the two universities and the common use of the researcher equipment they are trying to increase the efficiency of the work.

⁶ Regional Innovation Annual 2009-2010 page 58., Pannon Novum Regional Innovation Agency 2009.

In the next years and decades the Széchenyi István University is going to become a significant scientific partner by settling down and regional integration of the new production capacity of **Audi** in Győr, supporting the establishment of suppliers' network, and the fulfilment of needs of highly qualified workforce, which demand comes from the above facts. The base of the future plans are the fact, that 60% of the about 12 000 students attend engineering faculties, and about half of them belong somehow to the vehicle industry, therefore probably 3000-4000 people are going to work in the vehicle industry.⁷

A good example for the cooperation of the university and the multinational company is the **Audi Hungaria Department of Internal-Combustion Engines**, established in 2007, which was extended with a new laboratory building in 2011, creating the infrastructural conditions of the competitive practice oriented education.

1 million cars and 3 million vehicle engines are produced within 300 km circle of the City of Győr.



Source: www.accentrope.com

The following pictures give some overview without the needs of completeness, about the up-to-now results of research and development activities in the region.

E-VAN-09

Development of the driving system of an electric driven small delivery vehicle (Ford Transit with original diesel engine and electric motor), which can be charged also by its own solar panels.

Targets:

- development of a renewable energy driven traffic system target elements: electricity driven power system allowed for the road traffic vehicles, electricity driven delivery vehicle and solar charger system unit
- functional examination of the developed system and analysis of the technical-social aspects of the usage.

The project is closed. The vehicle is ready, and tested by TÜV. The planned equipment were developed. In the following period will start the test of the vehicle and the developed subsystems under normal city traffic conditions.

⁷ Szilasi, Péter Tamás (2011), Startegic director of Széchenyi István University

The developed and optimized subsystems can be useful to other vehicle (drive system) developer and also the experiences, which will be collected during the traffic tests.

Achieved results (assumed also):

Developed new product: 4

Developed prototypes: 4

New Patents: 2

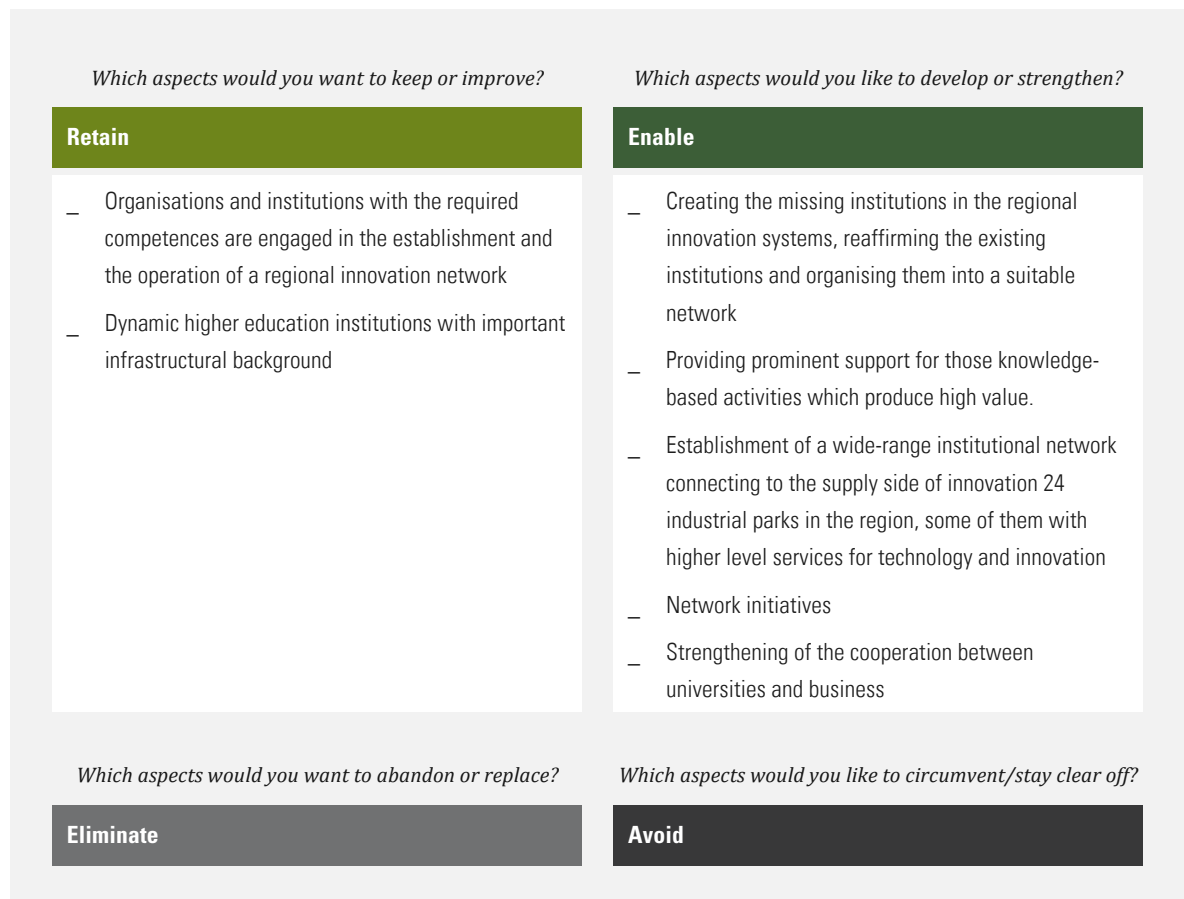
Newly started projects based on this project: 1

Utilization of the project results by SMEs: 2

4.2 Research Entities

In general and, in particular in the case of RDCs, research entities are of high importance for innovation at entrepreneurial and regional level. These comprise «Universities» including Universities of Applied Sciences, «Public Research Entities» partly or fully publicly financed and «Private Research Entities» fully privately financed. While all three types of 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.

Figure 4-1 Electromobility-related Research Entities – Assessment of Structure, Intersections & Interplay



- _ Fragmented higher educational system with several participants, no campus university
- _ Highly centralised system, weak regional institutions without financial independence
- _ Weak higher educational and R+D institutional background

- _ Parallel and overlapping activities and tasks in the different supporting organisations in the region
- _ The draining effect of the neighbouring big metropolitan centres

4.3 Financial Actors & Instruments

The allocation of financial resources to RTDI can play an important 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 of the electromobility-constituent sectors Automotive, ICT, (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.

Please describe in detail the current state of play concerning financial actors and instruments, sectorial focus, volume (total budget of instruments), investment size, and beneficiaries. Please indicate the general conditions, funding processes, target exit time, interest rates, expected ROI, operational/strategic management involvement of financiers, collaterals (e.g. tangible, intangible assets). Please also outline good practices and gaps as regards RTDI investors and instruments.

In the region there are no regional Financial Actors, only those investors are available, who work in whole Hungary. None of them is specialized to e-mobility, but they are ready to invest (it depends on the project). Pannon Novum is in partnership with OTP PortfoLion, which invest innovative technologies typically. (e.g. Leonar3do)
Naturally any of the companies have the possibility to ask bank loan or guarantee. It mainly depends on their creditability, but to be honest since the depression it is not easy to get a bank loan for an SME.

Table 4-1 Financial Instruments available in the Region

Financial Instrument	Short Description	Availability			
		R	CR	N	EU
Seed Funds	Seed capital is the initial capital used to start a business. Seed capital usually comes from the founder's personal assets or investments by friends and family, but can also come from outside angel investors. Since the venture is usually in the conceptual stage, seed capital is used to sponsor research and development and cover basic expenses until the product or services can begin generating revenue.			x	
Business Angle Funds	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 debt or equity. They are thought of as bridges between loans from family and venture capital.			x	
Crowd Funding	Crowd funding refer to the funding of a company by selling small amounts of equity to many investors and therewith describes an collective effort of pooling financial resources; it addresses the equity gap between loans from family/friends and informal investors.				
Bank Loans	A debt-financing obligation issued by a bank or similar financial institution to a company or individual.			x	
Mezzanine Capital	A hybrid of debt and equity financing that is typically used to finance the expansion of existing companies. Mezzanine financing is basically debt capital that 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 full. It is generally subordinated to debt provided by senior lenders such as banks and venture capital companies.				
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.			x	
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.			x	

The JEREMIE Funds are ready to invest into projects with acceptable business plan, good returns and good strategies, mainly over 50-100 MHUF. The companies look for first always to Hungarian or EU funding with higher intensity and prefinancing.

Figure 4-2 Assessment of RTDI Financial Actors & Instruments

<i>Which aspects would you want to keep or improve?</i>	<i>Which aspects would you like to develop or strengthen?</i>
Retain	Enable
<ul style="list-style-type: none"> – Regional Business Angel Club – Governmental support by high intensity (>75%) funds 	<ul style="list-style-type: none"> – Visibility of Business Angels – Supporting cooperation between financial actors
<i>Which aspects would you want to abandon or replace?</i>	<i>Which aspects would you like to circumvent/stay clear off?</i>
Eliminate	Avoid
<ul style="list-style-type: none"> – Differentiated fundings in the different regions of Hungary (most supported are the eastern, less the western and central regions) – Difficulties on SME side to get bank loans for RTDI aims 	<ul style="list-style-type: none"> – Bridging institutions do not consider the demand for services – Problems in financing innovation activities of SME sector

In Hungary the most preferred financing method is the Hungarian and EU funds with high intensity. It should be strengthened in the future in case of realistic projects with lucrative outlook.

4.4 Electromobility-related R&D Projects

“**Basic research** (aka fundamental or pure) research is driven by a scientist's curiosity or interest in a scientific question. The main motivation is to expand man's knowledge, not to create or invent something. Unlike basic research, **applied research** aims to address and answer the practical problems that exist in the modern world, rather than to just acquire knowledge for knowledge's sake. Importantly, applied research is, like basic research, based on previous theory.”

Table 4-2 Number of Projects by Type of Projects by Thematic Focus

	DS	CH	SG	ICT	GE	MS	O
Basic Research							
Applied Research	x	x		x			

DS = Drive Systems CH = Charging SG = Smart Grids ICT = ICT MS = Mobility Services O = Other

Figure 4-3 Assessment of electromobility-related R&D Projects

Which aspects would you want to keep or improve?	Which aspects would you like to develop or strengthen?
<p>Retain</p> <ul style="list-style-type: none"> – Start more e-mobility projects – Special funds for e-mobility projects – Big MNEs (Audi, GM) should build up development centres in our regions 	<p>Enable</p> <ul style="list-style-type: none"> – Research on battery technology – Research on effective drive systems – Research on new multifunctional chassis for personal transportation – Producing vehicle prototypes – Develop some “crazy ideas” which have more PR than business value (vehicles for niche markets or very extreme design)

<i>Which aspects would you want to abandon or replace?</i>	<i>Which aspects would you like to circumvent/stay clear off?</i>
Eliminate <ul style="list-style-type: none"> Parallel developments without cooperation 	Avoid <ul style="list-style-type: none"> Developments without business or PR value RTDI projects "for the drawer"

4.5 Summary – RTDI Infrastructures

Our region is a start-up region concerning e-mobility. Without e-mobility policy, action plan and RTDI policy. We would like to close up the region to the technology developer/applier regions.

First we need a plan how to do that, second we need a group (research entities, universities, SME-s and may be automotive multinational companies) who can work together on realization.

We could provide to other regions special knowledge on drive systems, chassis design and recyclable materials. Most of the SMEs in the cluster are ready and open for further cooperation.

Figure 4-4 West-Transdanubia – Assessment of the regional electromobility-related RTDI Infrastructure

<i>Which aspects would you want to keep or improve?</i>	<i>Which aspects would you like to develop or strengthen?</i>
Retain <ul style="list-style-type: none"> Basic research Complex applied research 	Enable <ul style="list-style-type: none"> RTDI in niche markets with low investment needs and high professional added value Hybridization of different areas in the RTDI projects (like telecommunication, IT and drive systems)
<i>Which aspects would you want to abandon or replace?</i>	<i>Which aspects would you like to circumvent/stay clear off?</i>
Eliminate <ul style="list-style-type: none"> Lack of infrastructural basis 	Avoid <ul style="list-style-type: none"> Further weakening of the professional training systems / basis

5 RDCs – AN ECONOMIC PERSPECTIVE

“Research-driven Cluster (RDC) can be defined as clusters that rely predominately on R&D as source of innovativeness and competitiveness. Like technology and innovation clusters they associate enterprises, universities, research organisations, public authorities, and other stakeholders. However, they but differ from those by the fact that they have a stronger science/research base, and by their ability to generate a greater frequency of innovative enterprises able to commercialise and exploit research. They play a vital role in strengthening the research and innovation potential of European regions and are seen as enabler for smart and sustainable growth.”

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. At the same time, RDCs represents a response to the growing local demand for R&D organisations to contribute more directly with the business and the public administration sectors, by contributing to the creation of public-private partnerships at local level and by creating a bridge among R&D actors, regional administrations and the business community.

Electromobility is no discrete sector, but constituted of the three sectors Automotive, Energy and ICT, represented by the participating RDCs within the ELMOs project.

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

5.1 Basic Information

E-mobility Cluster fostering the sustainable road traffic

The key element of numerous European success-stories, the openness, continuous flexibility and renewability of the enterprises, as well as cooperation willingness, worthy connections, fast availability to information and knowledge, continuous education level of the managers and employees, trend- and market-analysis, appropriate external and internal communication, marketing and so on. To fit all of these success-factors is supported by the cluster, or business network, where the earlier individually acting firms get together to reach common goals.

The previous chapters introduced several prototype-developments from small companies of West Transdanubia, which are just before entering the market. The big automotive production companies of our region are in the process of extending their capacities these days as well, and they are looking for local suppliers and adequately educated and trained workforce. Our region has the “knowledge factory” university, adequate connection between university and big companies of vehicle industry exists, however the availability of knowledge as well as external research and development infrastructure and services is not sufficient for micro- and small enterprises.

At the beginning of year 2009 the Hungarian Vehicle Development Cluster (MaJÁK) was established, of which operation supports the creating of automotive industry services related to the sustainable regional traffic.

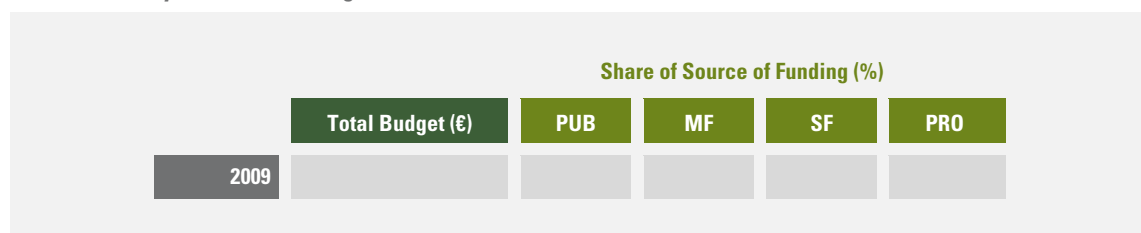
By strengthening the organization and developing the services of MaJÁK, the domestic vehicle development firms could get support in the following areas:

- Availability of relevant information, knowledge-level and worthy connections.
- Services for discounted prices (e.g.: marketing, market research, trend-watch, tender consultation, project management)
- Shortening of product development cycle – e.g.: selection of appropriate partner, strengthening consumer relations
- Opportunity to join bigger (international) projects, more orders from the customers.
- Infrastructural network, as well as design and manufacturing of electric powered vehicles based on common patent.
- With cooperation of developers and manufacturers of individual electric equipment, a new product, a product-family, a wider product supply can be launched in the market.

Based on international good examples and trends, the following technological innovation has to be focused on within the cluster to establish environmentally friendly traffic:

1. Raw materials
2. Battery technology
3. Control, driving technology
4. Motor-car-, bodyworks
5. Communication equipment

Table 5-1 RDCs Finance by Source of Funding





PUB = Public Funding MS = Membership Fees SF = Service Fees PRO = Projects

5.2 Foundation

In our region the professional knowledge of the HR is good, which is the basis of any RD Clusters. The RDCs should concentrate in the near future on such cooperations where unusually different economy areas work together and give solutions for complex problems. This we mean is the Hybridization way can open new research areas which are unique in the EU. With such solutions we can be innovative and be a step ahead even before the multinational companies. We think the new RD cluster foundations should go this way. It means also to integrate Start-ups into the clusters (possibly without membership fees) and let them cooperate with existing members.

It is also necessary for RDCs, that the economical regulations of the government should be more predictable and less changing (and challenging) as in the last years.

Figure 5-1 Assessment of RDCs Foundation

<p><i>Which aspects would you want to keep or improve?</i></p> <p>Retain</p> <ul style="list-style-type: none"> – Good professional knowledge base – Zero emission / sustainable mobility PR 	<p><i>Which aspects would you like to develop or strengthen?</i></p> <p>Enable</p> <ul style="list-style-type: none"> – Cooperation with Start-up companies – The usage of other EU best practices – Hybrid cooperation between the members of different RD clusters
<p><i>Which aspects would you want to abandon or replace?</i></p> <p>Eliminate</p> <ul style="list-style-type: none"> – The continuous changing of the governmental economic background 	<p><i>Which aspects would you like to circumvent/stay clear off?</i></p> <p>Avoid</p> <ul style="list-style-type: none"> – Conflicts between Cluster members – Non supporting regulations

5.3 Competitiveness

Figure 5-2 Assessment of RDCs Competitiveness

<i>Which aspects would you want to keep or improve?</i>	<i>Which aspects would you like to develop or strengthen?</i>
Retain	Enable
<ul style="list-style-type: none"> – Clusters positive role in the cooperation – Participation in transnational EU projects (FP7, Horizon 2020) – Cooperation with multinational (EU based) developing companies through common developments 	<ul style="list-style-type: none"> – Integration of start-up companies – Realization of lucrative project ideas – Starting even more hibryd projects – Allure home the professional hungarian work force (who is working abroad)
<i>Which aspects would you want to abandon or replace?</i>	<i>Which aspects would you like to circumvent/stay clear off?</i>
Eliminate	Avoid
<ul style="list-style-type: none"> – Brain drain 	<ul style="list-style-type: none"> – Conflicts between members – Frequent changes in the governmental / economical regulations

5.4 Cluster Dynamics

Please provide a qualitative summary best describing your cluster's dynamics (max. 5 lines)

The (MAJÁK) HVE Cluster is a developing cluster with innovative partners who developing their own products/services and also able to cooperate for bigger "out of the box" projects (like prototype development). The cluster has not several hundred members and will not be so big with lot of "sleeping" members. Instead of the size they concentrate on cooperation and will integrate members with this philosophy. Is also foreseen that they integrate promising start-ups and use open and also cross innovation (hybridization) techniques. They cooperate with the local university if necessary.

Figure 5-3 Assessment of RDCs Dynamics

<p><i>Which aspects would you want to keep or improve?</i></p>	<p><i>Which aspects would you like to develop or strengthen?</i></p>
<p>Retain</p> <ul style="list-style-type: none"> _ Initiate pilots _ Complemental cooperation _ Cooperation with similar clusters abroad 	<p>Enable</p> <ul style="list-style-type: none"> _ Integration of Start ups with comlemental RTDI areas _ Hybrid projects _ Usage of open innovation _ Complex services (from idea to the realization) instead of product development / production for order
<p><i>Which aspects would you want to abandon or replace?</i></p>	<p><i>Which aspects would you like to circumvent/stay clear off?</i></p>
<p>Eliminate</p> <ul style="list-style-type: none"> _ Loosing the professional researchers and work force _ The continous changing of the governmental / economical regulations 	<p>Avoid</p> <ul style="list-style-type: none"> _ Support only technical innovations (we need marketing, design too) _ Negative rivalism between members

6 ENTREPRENEURIAL BASE

Please describe in detail the entrepreneurial base in your cluster.

In addition, please provide a qualified summary: What is typical for your region?

- Reference to E-Mobility
- Position in the E-Mobility Value Creation System
- Position in the Value Chain (supplier, OEM, sales)

Remarks:

Please assess the current situation in your region relative to the overall goal of ELMOs to promote more sustainable transport through the development of electromobility solutions for cities and regions

Figure 6-1 Assessment of Entrepreneurial Base

<i>Which aspects would you want to keep or improve?</i>	<i>Which aspects would you like to develop or strengthen?</i>
Retain	Enable
<ul style="list-style-type: none"> <input type="checkbox"/> Complex services beside the simpler developments and productions <input type="checkbox"/> Cooperation for complex solutions <input type="checkbox"/> Improve the international cooperations 	<ul style="list-style-type: none"> <input type="checkbox"/> Open / cross innovation <input type="checkbox"/> Start-up integration <input type="checkbox"/> Develop e-mobility competences
<i>Which aspects would you want to abandon or replace?</i>	<i>Which aspects would you like to circumvent/stay clear off?</i>
Eliminate	Avoid
<ul style="list-style-type: none"> <input type="checkbox"/> Brain drain <input type="checkbox"/> Unpredictable, changing economical background 	<ul style="list-style-type: none"> <input type="checkbox"/> Bad financial / funding background

Appendices

A1 List of Electromobility-related Research Entities

Name of Organisation	Type of Organisation*						Number of Researchers	Sector**			
	SF	UAS	PUB	PRIV	CRC	TTC		A	I	E	M
Antro Alternative Resource and Vehicle Development and Manufacturing Non-profit Ltd.				x			5	x			x
ArraboCAD Ltd.				x			5	x			x
MESHINING Engineering Ltd				x			4	x			x
Széchenyi István University, Faculty of Engineering Sciences, Department of Transport	x						6	x			x
ECOTRAF Ltd.				x			4	x			x
Willisits Engineering Ltd.				x			6	x	x		x
Intermotor Ltd.				x			3	x			x
Széchenyi István University, Faculty of Engineering Sciences, Department of Automotive and Railway Engineering	x						8	x	x		x

(*) U = University UAS = University of Applied Sciences PUB = Public Research Entity PRIV = Private Research Entity CRC = Collaborative Research Centre TTC = Technology Transfer Centre

(**) A = Automotive I = ICT E = Energy M = Mobility

A2 List of Financial Actors & Instruments

Name of Organisation	Type of Instrument*										Scope			Sector**					
	BL	AF	CF	G	MC	MF	RC	SF	VC	O	R	CR	N	A	I	E	M	N	
None																			

(*) SF = Seed Fund AF = Business Angel Fund CF = Crowd Funding BL = Bank Loan VC = Venture Capital G = Guarantee

(**) A = Automotive I = ICT E = Energy M = Mobility

A3 Electromobility-related Projects

Name of Project	Duration		Budget			Type of Instrument*				Involved Actors**						Thematic Focus***						
	Start	End	Total (€)	Pub (%)	Priv (%)	BR	AR	FT	AT	B	R	P	C	CL	O	DS	CH	SG	ICT	GE	MS	O
E-VAN-09	03/2010	04/2012	410.170	30,0	70,0		x			x	x						x					

(*) BR = Basic Research AR = Applied Research FT = Field Tests AT = Application Testing

(**) B = Business Entities R = Research Entities P = Public Authorities C = Citizens CL = Cluster O = Other

(***) DS = Drive Systems CH = Charging SG = Smart Grids ICT = Information- & Communication Technologies GE = Green Energy MS = Mobility Services O = Other

A4 List of Enterprises

Company	Reference to Electromobility						
	DS	CH	SG	ICT	GE	MS	O
AMB Components Hungary Bt.							x
ANTRO Nonprofit Kft.	x	x			x	x	
ArraboCAD Kft.							x
DSM Engineering Plastics							x
Dension Audio Systems Kft.				x			
ENTAL Kft.				x			
Intermotor Kft.	x	x		x			
MESHINING Engineering Kft.							x
Mondexdesign							x
RaabCAD Kft.				x			
SIMGRID Kft.							x
Varinex Zrt.							x
Willisits Mérnökiroda Kft.	x	x					
E.ON Electricity Supply Company		x	x		x		

(*) DS = Drive Systems CH = Charging SG = Smart Grids ICT = Information- & Communication Technologies GE = Green Energy MS = Mobility Services O = Other