Prospects for E-Mobility up to 2015
in the Alliance Region Südkärnten - Karawanken

A concept for a sustainable regional development related on individual mobility

A Master Thesis submitted for the degree of
"Master of Science"

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Völkermarkt, October 2009

Affidavit

I, **Peter Egbert Plaimer**, hereby declare

1. that I am the sole author of the present Master Thesis “Prospects for Solar E-Mobility up to 2015 in the Alliance Region Südkärnten – Karawanken, 97 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master Thesis as an examination paper in any form in Austria or abroad.

Völkermarkt, …… ……..

Date Signature

Abstract

Three years ago, seven municipalities of the district of Völkermarkt joined the “Alliance in the Alps”, which is an association of local authorities and regions from seven Alpine States. The idea and goal behind this networking platform is to develop their alpine living environment in a sustainable way according to the Alpine Convention. Corresponding to the Alpine Convention two projects dealing with electric mobility have already been realized.

The present thesis reviews regional measures to initiate a process of e-mobility-change in general. The district of Völkermarkt belongs to the economically weak regions in Austria and the regional public transport should be adopted for present and future needs. A questionnaire related to e-mobility was used to analyse the position of regional opinion leaders . The result was a relevant background to develop an e-mobility concept with the focus on relevant infrastructure, multimodal mobility, strategy, public awareness and information. It was assumed that the additional energy demand should be produced by PV exclusively. A cost calculation (private and public investments together) including each measurement was made under the precondition of two scenarios (moderate and minimal) as well as the CO_2 reduction of both possibilities until 2015.

A rough overview on electric vehicles (e-cars, e-scooter and e-bicycles) and their market situation is given. Finally national and international projects concerning e-mobility have been presented because of possible transferabilities, synergies and learning effects.

Summary

The Alliance Region “Südkärnten – Karawanken” has already realized two punctual projects concerning e-mobility. The projects are aimed at increasing public awareness and additional tourism attractiveness (e-bicycle offer), also in the meaning of the Alpine Convention (e.g. CO_2 reduction). Nevertheless, to initiate a sustainable regional mobility-development a concept is still missing.
However, first very positive experiences of driving an e-car (Citroen Saxo) for two years and the activities of “lebensland Kärnten” (the province Carinthia promotes the establishment of e-mobility infrastructure) are the motivation of the master thesis at hand. Electric vehicles can achieve relvant environmental advantages in particular in combination with electricity from renewable sources.

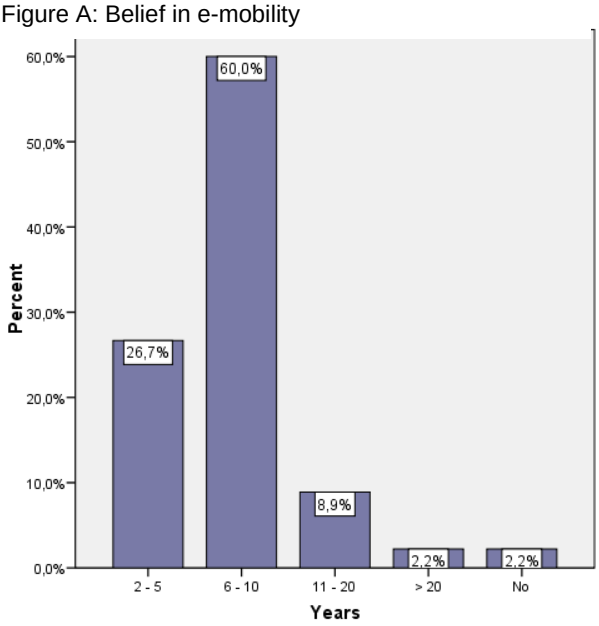
The object of this work is to define a regional e-mobility concept. In order to demonstrate the options for a mobility-change and its positive effect on the climate in general, it is necessary to implement relevant infrastructure related to regional preconditions (description of the district of Völkermarkt and traffic analysis), to increase the public awareness as well as the research on the e-vehicle market. Amongst other factors an enforced change of individual mobility behaviour needs the support of opinion leaders and examples of success. For the appreciation of regional “key players” concerning e-mobility a questionnaire was sent out, to be able to evaluate the chance of realisation as well as the acceptance and belief in new mobility technologies. Relevant data from the district of Völkermarkt and for the traffic analysis had to be derived from existing statistical data and a study called “GREMA” dealing with the actual traffic situation in Völkermarkt. For the estimation of how the e-vehicle market will develop and the analysis of national and international programs on e-mobility was generally done by internet research and a visit to the 79th international motor show in Geneva from 5th-15th March 2009. The e-mobility-concept itself was defined on the basis of personal e-mobility experience as well as statistical data. Therefore two scenarios (moderate and minimal) were defined so that a conclusion about costs and the effect on CO_2 reduction could be done. The results of the questionnaire, data concerning public transport and e-vehicle data were taken into account.

The major results of the analysis are:

1. The scattered inhabited places in the district of Völkermarkt and the resulting long distances to places of work, schools and facilities for daily use are significant. These facts increase the difficulty of establishing an efficient (public) transport system.

2. However, about 60% of the inhabitants are living nearer than 2.5 km from the next centre. For these short distances an (e-) bicycle can be considered as an alternative to motorised transport, as there is no great difference in the amount of time taken to reach the destination.
3. Additional needs of infrastructure are basically necessary in the fields of e-power stations, pv-plants and construction of cycle tracks.
4. In the area of e-vehicles the market is developing dynamically. The new products which also bring technical innovations are being offered constantly. Especially the market for e-cycles and e-motorbikes is already prepared by the introduction of a new battery technology (above all lithium ions or lithium polymer batteries are clearly improved) and by the increasing acceptance of e-mobilty in general. Nevertheless the e-car offer still does not exist but in the next few years a big change concerning the e-mobility will arise.
5. The cost calculation shows that under moderate circumstances (scenario A) a regional investment (private and public expenditures together) of about 87 million Euro until 2015 will be necessary; approximately 2200 e-cars will be on the road, the additional electricity demand should be covered by pv-plants (4900 kW_{peak}). The costs of scenario B (minimal version) will amount to about 16 million Euro.
6. The effect on CO_2 reduction until 2015 could be calculated with 3500 tons in scenario A compared to 690 tons in scenario B.
7. About 86 % of all respondents are convinced that e-mobilty will play a relevant role in the individual motorized transport within the next 10 years (see figure A).

Figure A: Belief in e-mobility



The most important conclusion of this work is that considering the e-car market the realisation of an offensive e-mobility strategy is quite high because of a significant positive confirmation by the respondents. The measures of the e-mobility concept define a basis for further activities towards an e-mobiltiy model-region. According to the regional strategy additional projects concerning infrastructure (e-power stations, pv-plants, acquisition of e-vehicles) as well as the increase of public awareness should be realised step by step (moderate scenario).

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1. Motivation

1.1 General motivation

The transport sector contributes with 26% to the greenhousegas emissions in Austria. Since 1990 the issues have risen in the traffic about 83%[1]. Beside the removal of the public transport, which can counteract against this development, the forced application of alternative transport technologies (CO_2 neutral mobility concepts) are of big importance. Besides, electric vehicles are valid as a sustainable future technology with the biggest potential.

Electric vehicles can achieve determining environmental advantages in particular in combination with power production from renewable sources.

Less energy is required by the clearly higher efficiency of electric motors than for combustion engines. In addition electric motors can reclaim energy from the brake process, the running operating expenses are very low, the motor causes no air pollutants and a substantially lower noise, and these vehicles are also predestined for the application in the city[2].

Indeed on the one hand electric vehicles are not really available till now (market failure), and on the other hand the technology is still not accepted by the public. However, if one thinks that about 97% of all journeys lie less than 100 kilometres and the average road length for Austrian commuters lie within about 15 km, many capabilities to run electric vehicles are obvious[3].

1.2 Local motivation

On 1st of January 2007 eight municipalities of the political district of Völkermarkt became a membership of the association “Alliance of the Alps”. Based on the Alpine Convention it is the main target of the region, to develop and to realise sustainable regional development concepts.

Out of this new partnership the first project which could be financed by national and international recourses concerned the acquisition of an electric car, an 2,6 kWp PV-plant and the installation of two public and clearly visible e-power-stations in the district capital Völkemarkt. The basic idea was to sensitize the pubic awareness in the efficient and sustainable use of energy related to individual mobility.

[1] Höfler 2007
[2] Engel 2007
[3] Berger et al. 2008

Picture 1: Citroen Saxo electric

Picture 2: 2,6 kWp PV-plant Völkermarkt

Based on personal experience of almost 2 years of driving an electric car it is a fact, that almost 80 % of all private an business trips could be managed by an electric car, when the acceptance of using also public transportation is given (multimodal mobility). That means individual electric mobility forces the use of public transport as well.

In several discussions and presentations it was obvious that the public awareness and knowledge on this topic is in general very low. On the one hand the limited range of e-cars and the charging time are the main reasons of low acceptance (of course beside the missing market, no infrastructure and the high acquisition costs). On the other hand it is important to explain seriously that the need of additional energy must be covered by renewable sources and that this aim is easy to achieve (ecological footstep).

How ever, the time is ripe to increase the public awareness via politics and (local) opinion leaders to think about new and sustainable mobility opinions and to force any research and development department of car industries[4].

Of course the ecological background is the biggest motivation to work on this topic not least because of the chance to realize a concept in the field of regional development and to gain additional subsidies from the European Commission (e.g. out of the LEADER-program).

Picture 3: E-power station Völkermarkt
(pictures 1-3: Plaimer)

[4] Mühlbacher 2006

2. Objectives

The conceptual considerations concerning solar mobility[5] promotion within the Alliance Region Südkärnten / Karawanken by means of an integral approach should help to highlight possibilities how solar mobility could be developed and realised within the framework of a sustainable mobility management. The mentioned ideas should be part of a regional development (mobility) concept, which must be adopted in the year 2010.
Because of the close spatial complication to bordering municipalities more or less the whole district of Völkermarkt is taken into account.
The work is not exhaustive and could not be a complete regional study of mobility. The focus is concentrated on individual traffic - aspects of commercial transport are excluded.

The basic idea is to increase the efficiency and the sutainability in the field of traffic supported by public transport and by the use of e-vehicles (not only cars). As a basic requirement the demand of additional electricity must be covered by regional and renewable energy resources. Considering that principle the concept should give helpful links in the field of regional development activities and to reduce negative environmental impact on the one hand and to sensibilise locals by showing, discussing and supporting different e-mobility solutions on the other hand.
The thesis should be seen as a basic principle of solar mobility within several regional strategies to become self-sufficient in the question of energy. It would be a great success, if aspects of this work would be discussed in several municipal conciles or initiate a change of traffic policy on a regional level.

In particular following goals are considered:

- support of non-motorised traffic (pedestrian, cyclists)
- support of individual e-mobitiy (motorised)
- to increase public awareness at ecological level and technical understanding
- renewable energy production
- advancement in the field of public transport
- better combination of individual and public transport (multimodale mobility)
- development of a tourism package (slogan, strategy)
- to influence (political) decision making processes
- concept of traffic information centres (mobility centre)

[5] Solar Mobility is an aspect respectively a contribution of a master plan of sustainable mobility, where mainly the individual transport should be focused on e-vehicles.

3. Methodological approach

3.1 Preconditions

The master thesis is based on the experience of about 11 years of Regional Management (RM) in the reseach area (destrict of Völkermarkt). Resoponsible for the sustainable growth of the rural area, RM is a communicaton and network platform, where projects and strategies have been developed since 1998. All municipalities of the district, the Chamber of Commerce, the Chamber of Labour, the Chamber of Agriculture and the Tourism Associaton are members of the RM. In the actual strategy concept of the region[6] the topics of renewable energies, the efficient use of energy as well as questions concerning traffic development are fields of activities with high priorities. Several projects, co-financed mainly by the EU (LEADER, INTERREG), have already been realised.

3.2 Analysis, questionnaire, scenarios

The description of the research area, the documentation of the regional traffic situation and the analysis of existing data (literature, professional journals, internet research) was the first part of this study. Relevant sources of information, like Statistics Austria, Government of Carinthia / Department 20 - Spatial planning were taken into account, to define a general basic of discussion.
A similar approach was chosen for the descripton of the e-vehicle-market. Professional journals and the internet search were the relevant sources of information. Discussions with experts (Eurosolar Kärnten, Autohaus Nusser) and the participation at the e-mobility-hearing organized by the Federal Ministry of Transport, Innovation and Technology last autumn were additional information sources. Interviews (by phone or personally) with representatives from the car industry were tried to be held several times, but in all cases, no further information was given to already existing homepages.

The creation of a questionnaire, by the name “E-mobility – a chance of sustainable regional development?” was done next. It contained 13 questions:

1. Do you basically belief in a future of e-mobility? If so, in which time frame?
2. Are regional basic approaches meaningful to increase the public awareness with its associated investments (e-service stations, photo-voltaic stations, e-vehicles, etc.) now?

[6] Seidenberger, C. et.al. 2007

3. Independent of the e-mobility development – what could be done to reduce the regional individual traffic in an effective way - immediately, middle- and long-term or not realizable?
4. By reducing the running costs (fuel, insurance, taxes) would you accept an environmental issue in higher prices for a new e-car?
5. Are you expecting to buy a new car?
6. Which aspects would be important if you will buy a new car?
7. In which fields of operation are electric vehicles immediately applicable (range about 150 km)?
8. Actually, every second-car could be replaced with e-cars, although the range is just 100 km. Do you agree?
9. E-mobility: Who is in which dimension able to work on the public awareness?
10. Which activities should be initiated now to sensibilize the population?
11. Do you think, that the legislation should expand the support of renewable energy resources and the idea of electric mobility (top-down- approach, national strategy)?
12. Can you see any approaches to reduce our dependency on fossil energy sources beside e-mobility?
13. Your scope / field of activity?

Asking 60 regional opinion leaders (qualitative selection) representing several sectors (politics, administration, tourism, economy), it was necessary to get an idea of the common understanding. The selection of the respondents was also influenced by their innovative, financial or policy power, which could be relevant for a sustainable regional development process.
The analysis of 45 respondents analyses were conducted with SPSS 15.0®.

The results of the questioning were used to define two different scenarios (1) moderate and (2) minimal so that a concept of a regional e-mobility plan within a period of five years was describable.

The assumptions of the moderate scenario are:

- an agreement on a regional e-mobility strategy
- environmental awareness of the opinion leaders
- straight oriented co-operation at regional level
- willingness of e-mobility related investments
- national subsidies available
- governmental support by the province of Carinthia

The assumptions of the minimal scenario are:

- regional goals defined (present strategies)
- no support from national (governmental) institutions
- individual initatives will be realized
- the level of co-operation is rather low
- the activities are concentrated at private level and
- no additional money is available (no national support program)

Based on these scenarios and considering statistical data, a cost calculation for the power generation (by PV), for infrastructure (e-power stations, investments for new bicycle routes etc.) and new e-vehicles was done. The same approach was used for the calculation of CO_2 savings.

Information about national and international acitvities dealing with e-mobility were gained by literature and internet search.

4. Research area

4.1 Geographical description

The Alliance Region is part of the district of Völkermarkt and is situated in the Eastern part of the basin of Klagenfurt, in the North it extends to the mountain chain Saualpe and in the South to the Karawanken mountains which are also the border to Slovenia.

The district consists of 13 municipalities and is traversed by the river Drau in West-East direction. The district of Völkermarkt covers a cadastral surface of 909 km² – which is 9,5 % of the surface of Carinthia. More than a third of the cadastral surface (321 km² – 35,4 %) is classified as permanant settlement area (appropriate for agriculture, settlements and traffic).

Picture 4: District of Völkermarkt
(Source: BEV, Land Kärnten)

The landscape of the lower part of the area is characterised by extended agricultural surfaces (Jauntal), by the Drau River and by several lakes offering summer tourism facilities, the most important of them is the lake Klopeiner See.

4.2 Settlement Pattern

The district of Völkermarkt has 43056 inhabitants (2008) and 16.280 households (2001). The biggest municipality is Völkermarkt himself with 11397 inhabitants. The population of the

other twelve municipalities of the district lies between 5998 (Eberndorf) and 843 (Diex) inhabitants.

Each municipality of the district of Völkermarkt consists of several villages resp. towns. According to the census data of 2001, there are four municipalities where parts of the population live within compact towns / villages of more than 1.000 inhabitants:

- Völkermarkt 4.859
- Eberndorf (Kühnsdorf 1.604, Eberndorf 1.076) 2.680
- Bleiburg 1.339
- Eisenkappel-Vellach (Bad Eisenkappel) 1.066

When considering the population living within compact settlements of more than 500 inhabitants, the villages of Tainach (municipality Völkermarkt), Gösselsdorf, Mittlern (municipality of Eberndorf), Griffen (municipality Griffen) and Wasserhofen (municipality St. Kanzian am Klopeiner See) are added to the above ones.

31% of the population of the district of Völkermarkt live in compact settlements of more than 500 inhabitants, more than two thirds of the district population live in smaller or sprawled settlements.

The settlement development is often characterised by sprawl, especially in the basins of the Jaunfeld. In the area of the lake Klopeinersee a widely extended settlement band has emerged.

Table 1: Settlement pattern in the district of Völkermarkt
Source: www.statistik.at, adapted

	Area [km²] (2005)	Population (2008)	Households (2001)	Pop>500 [1)]	Pop>1000 [2)]	LSCR [3)]
Völkermarkt district	**907**	**43056**	**16280**	**13384**	**9944**	**31**
Bleiburg	**70**	**3923**	**1475**	**1339**	**1339**	**34**
Diex	55	843	284	0	0	0
Eberndorf	**68**	**5998**	**2341**	**3961**	**2680**	**66**
Eisenkappel-Vellach	**199**	**2489**	**1113**	**1066**	**1066**	**43**
Feistritz ob Bleiburg	**54**	**2118**	**732**	**0**	**0**	**0**
Gallizien	**47**	**1758**	**685**	**0**	**0**	**0**
Globasnitz	**38**	**1658**	**577**	**0**	**0**	**0**
Griffen	75	3657	1291	899	0	25
Neuhaus	36	1159	396	0	0	0
Ruden	42	1555	564	0	0	0
St. Kanzian a.K.	41	4401	1686	660	0	15
Sittersdorf	**45**	**2100**	**799**	**0**	**0**	**0**
Völkermarkt	**137**	**11397**	**4337**	**5459**	**4859**	**48**

1) Resident Population living in compact settlements larger 500 inhabitants
2) Resident Population living in compact settlements larger 1.000 inhabitants
3) Local Settlement Concentration Ratio
fat highlighted: municipalities of the Alliance Region

4.3 Role of the Major Settlements

The municipality of Völkermarkt is the district capital and fulfils central functions for the whole district. Beside the public administration there are several medical, social and educational institutions. Völkermarkt city is not accessible by train; public transport relations to the other settlements of the district are assured by bus services. Less than half of the 11.397 inhabitants of the municipality of Völkermarkt live in the township of the same name, the others in small villages in the surrounding.

The municipalities of Bleiburg (located in the South-East of the region) and Eberndorf (rather centrally located in the Jauntal south of Völkermarkt) serve as secondary centres for the regional population[7].

4.4 Demographic Development

In 2008 43.056 inhabitants lived in the district of Völkermarkt – 7,7 % of the population of Carinthia. The population development since 1981 is almost stagnating, with a slight increase until 1991 and a decrease in the last years. Compared to Carinthia the population development is more negative, but it is slightly more positive than in the NUTS3 region Unterkärnten: The yearly rate (1991 – 2008) is 0,14 for Carinthia, -0,10 for Unterkärnten and -0,05 for the district of Völkermarkt. For a long time the out-migration was compensated by a birth surplus, but this effect is decreasing now because of the ageing population and declining fertility rates. The long-time population forecast of the Austrian Spatial Planning Conference predicts an ongoing population loss for the district.

Within the region there are considerable differences: The most dynamic municipality is St. Kanzian am Klopeinersee, a centrally located summer tourism area, followed by Globasnitz and Feistritz ob Bleiburg, both located in the southeast of the district at the limit of the Jauntal basin and the Karawanken mountains. Population losses caused by a strong out-migration are registrated for the municipalities of Eisenkappel-Vellach, Diex and Neuhaus, all in a rather peripheral and mountainous situation: Eisenkappel in the South of the region, Diex in the North, and Neuhaus in the East.

The general phenomenon of an ageing population can also be observed in the district of Völkermarkt, but the share of children and young people (younger than 15) is still notably higher than in the Carinthian average – due to a higher number of children per family. The share of the older population (older than 65) is slightly higher than the Carinthian average. Especially the municipalities with a population decline are also those with a high share of older people. For the future an ongoing shift towards the older population can be expected.

[7] Veratschnig, 2009

Table 2: Demographic development in the district of Völkermarkt
Source: www.statistik.at, adapted

	Population 2008	Population 1991	Population 65 years and older	Population < 15 years	Yearly population dev. rate	Old-age dependency ratio	Young-age dependency ratio
district of Völkermarkt	**43.056**	**43.441**	**7896**	**6597**	**-0,05**	**28**	**23**
Bleiburg	**3.923**	**4.121**	**742**	**563**	**-0,29**	**28**	**22**
Diex	843	943	199	124	-0,66	38	24
Eberndorf	**5.998**	**5.922**	**1025**	**914**	**0,08**	**25**	**23**
Eisenkappel-Vellach	**2.489**	**3.038**	**618**	**318**	**-1,17**	**40**	**20**
Feistritz ob Bleiburg	**2.118**	**2.009**	**337**	**357**	**0,31**	**24**	**25**
Gallizien	**1.758**	**1.745**	**341**	**249**	**0,04**	**29**	**21**
Globasnitz	**1.658**	**1.593**	**280**	**271**	**0,24**	**25**	**24**
Griffen	3.657	3.707	631	604	-0,08	26	25
Neuhaus	1.159	1.285	260	168	-0,61	36	23
Ruden	1.555	1.677	276	245	-0,44	27	24
St. Kanzian a.K.	4.401	4.103	792	707	0,41	27	24
Sittersdorf	**2.100**	**2.217**	**405**	**276**	**-0,32**	**29**	**19**
Völkermarkt	**11.397**	**11.081**	**1990**	**1801**	**0,17**	**26**	**24**

fat highlighted: municipalities of the Alliance region

4.5 Socio-Economic and Commuting Situation

4.5.1 Economic structure

The district of Völkermarkt belongs to the economically weak regions in Austria. The per-capita GDP attains 62% of the Austrian average.

The agricultural sector is still an important factor of the regional economy (7,8 %), especially in the municipalities in the northern and southern periphery of the region.

The goods-producing sector is dominating within the region, especially engineering, wood processing and building trade. The small enterprises are predominant – there is only one enterprise employing more than 1.000 persons all over the region. The industrial centres are Völkermarkt and Feistritz ob Bleiburg – these municipalities hold 34 % and 23 % of the industrial work places in the district.

The service sector comprises public administration, tourism and trade. More than half of the work places in the service sector are located in the city of Völkermarkt. The tourism businesses are concentrated in the area of lakes (the most important is Klopeiner See), especially in the municipality St. Kanzian am Klopeinersee. The pronounced predominance of the summer season is accompanied by structural problems of tourism – the number of tourism businesses has been declining for the last years.

The unemployment rate in the Völkermarkt district of 8,6 % (2005) is slightly higher than the Carinthian average of 8,2 %.

The development of enterprises between the censuses of 1991 and 2001 was less dynamic than in the NUTS3 region Unterkärnten (which also contains the districts St. Veit an der Glan and Wolfsberg) and remained also below the Carinthian average. There are considerable

differences within the region: The strongest decline was observed in tourism-dominated places (St. Kanzian, Gallizien), while several other municipalities were developing well (see table 3).

4.5.2 Commuting to and from work

In the district of Völkermarkt out-migration has a higher importance than in other regions of Carinthia or in the Austrian average. More than half of the out-commuters of the district leave the municipality for work but stay within the district.

The municipalities of Völkermarkt and Feistritz ob Bleiburg are economic centres with a considerable in-migration, but Feistritz is the only municipality of the district with a positive commuter-balance. For the commuter data on municipality level see table 3.

4.5.3 Development of Tourism

The district of Völkermarkt accounts for 9 % of the overnight stays in Carinthia. The tourism centre of the region is situated around the lakes in the South of the city of Völkermarkt especially the Klopeinersee. The municipality St. Kanzian am Klopeinersee counts the highest number of overnight stays of all Carinthia. The tourism in the region is strongly concentrated on the summer season. For the data on annual overnight stays see table 5.

Table 3: Economic structure and commuter situation in the district of Völkermarkt
Source: www.statistik.at, adapted

	Enterprises [1] (2001)	Enterprises [1] (1991)	In-Commuters [2] (2001)	Out-Commuters [3] (2001)	Tourism: overnight stays (2008)	Maximum population ratio	Yearly development rate of enterprises
district of Völkermarkt	1959	1724	7133	11766	1048385	96	1,28
Bleiburg	**186**	**164**	**731**	**936**	**7560**	**95**	**1,26**
Diex	28	22	29	227	17624	82	2,41
Eberndorf	**271**	**213**	**947**	**1790**	**66440**	**89**	**2,41**
Eisenkappel-Vellach	**102**	**95**	**212**	**591**	**90903**	**95**	**0,71**
Feistritz ob Bleiburg	**61**	**45**	**1164**	**605**	**21779**	**129**	**3,04**
Gallizien	**47**	**50**	**104**	**646**	**3707**	**70**	**-0,62**
Globasnitz	**40**	**26**	**47**	**576**	**960**	**68**	**4,31**
Griffen	118	99	526	983	1849	88	1,76
Neuhaus	28	21	33	398	0	69	2,88
Ruden	53	40	120	545	1740	73	2,81
St. Kanzian a.K.	413	427	507	1252	780173	132	-0,33
Sittersdorf	**60**	**57**	**212**	**709**	**12841**	**78**	**0,51**
Völkermarkt	**552**	**465**	**2501**	**2508**	**42809**	**101**	**1,72**

1) Number of enterprises (without agricultural enterprises)
2) Commuters coming to work from another municipality
3) Commuters leaving for work to another municipality
fat highlighted: municipalities of the Alliance Region

4.6 Alliance Region Südkärnten - Karawanken

4.6.1 General description

The network of municipalities "Alliance in the Alps" is an association of local authorities and regions from seven Alpine states and was founded in 1997. Its members, together with their citizens, strive to develop their alpine living environment in a sustainable way. “Exchange - Address – Implement” is the main idea behind the Alliance’s activities. The basic and guiding principle for sustainable development is the Alpine Convention. Its implementation is to come to life wherever individuals are able to shape their future, i.e. in the community. And to ensure that the wheel does not have to be re-invented each time, the network of communities offers an exchange of experience and information beyond the boundaries of language and culture.

Over 250 communities throughout the Alps from France to Slovenia joined the "Alliance in the Alps" local authority network to implement the goals of the Alpine Convention for sustainable development in the Alps together.

Within the district of Völkermarkt 7 municipalities

Völkermarkt, Eberndorf, Sittersdorf,
Bad Eisenkappel, Gallizien, Globasnitz,
Feistritz ob Bleiburg and Bleiburg (new)

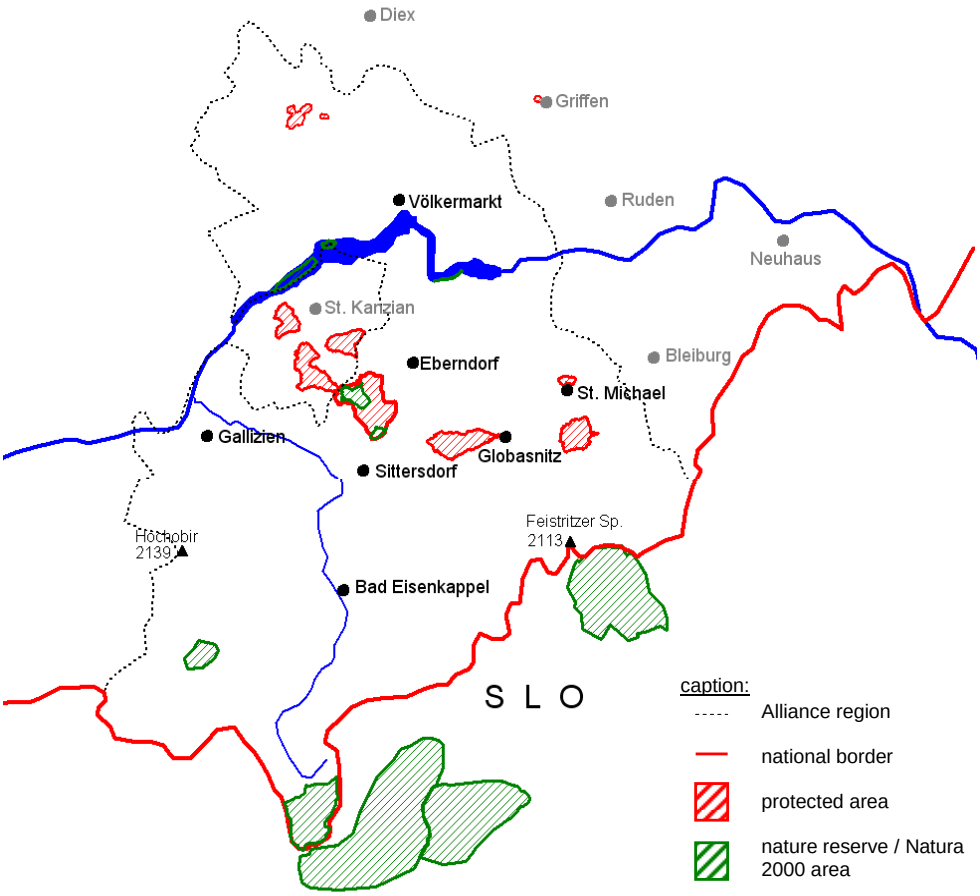
with 27.518 inhabitants are members of the Alliance Region.

Picture 5: Mayors of the Alliance Region

The broad range of small and medium sized protected areas is significant of the region.

Table 4: Protected areas within the Region of Südkärnten

Name of the protected area	hectare
Vellacher Kotschna	586,0
Sablatnig Moor	95,8
Völkermarkter Stausee	84,0
Ratschitschacher Moor	23,4
Flachwasserbiotop Neudenstein	18,5
Kalk-Tuffquellen Stausee	3,7
Trögener Klamm	147,9
Gösselsdorfer See Süd	24,7
Gösselsdorfer See	514,8
Hemmaberg	289,0
Pirkdorfer See	195,0
Lamprechtskogel/Trixner Schlösser	89,9
Katharinakogel	28,9
total	**2101,6**



Picture 6: Location of protected areas
Layout: Hartmann 2005

4.6.2 Development Strategy of the Alliance Region

Establishment of an international pilot's region to the conversion of the Alpine Convention!

Central topics of interest (extract):

– Preservation and protection of the regional and ecological landscape
– Establishment as a tourist region
– Forcing and use of renewable energy
– Protection, preservation and advancement of sensitive areas
– New memberships, area expansion
– Regional protective area management
– Sustainable traffic development (GREMA[8], 3rd developing axis in Slovenia, border crossings, public transport, gentle (e-) mobility, high-capacity road etc.)
– Development of tourism infrastructure in the harmony with the nature
– Appreciation of cultural strength fields (e.g., Hemma mountain, Katharinakogel, …)
– Incrase of regional forest products / additional income
– Increase of regional identity
– Use of international co-operation potentials, international exchange of views
– Intermunicipal co-operation

[8] Traffic masterplan of the cross border regions Lavanttal and South Carinthia on Austrian side respectively Koroska and Savinjska on Slovenian side (see GREMA, 2006)

5. Regional traffic analysis

5.1 Terminating and originating traffic

In the following short analysis the most important data of the domestic passenger traffic in this region will be presented and also the commuter traffic to the provincial capital, Klagenfurt. This refers to a rough analysis of the available data from existing references (e.g. GREMA study, local development concepts, and also see chapter 4). The freight and economic (goods traffic) traffic is not included.

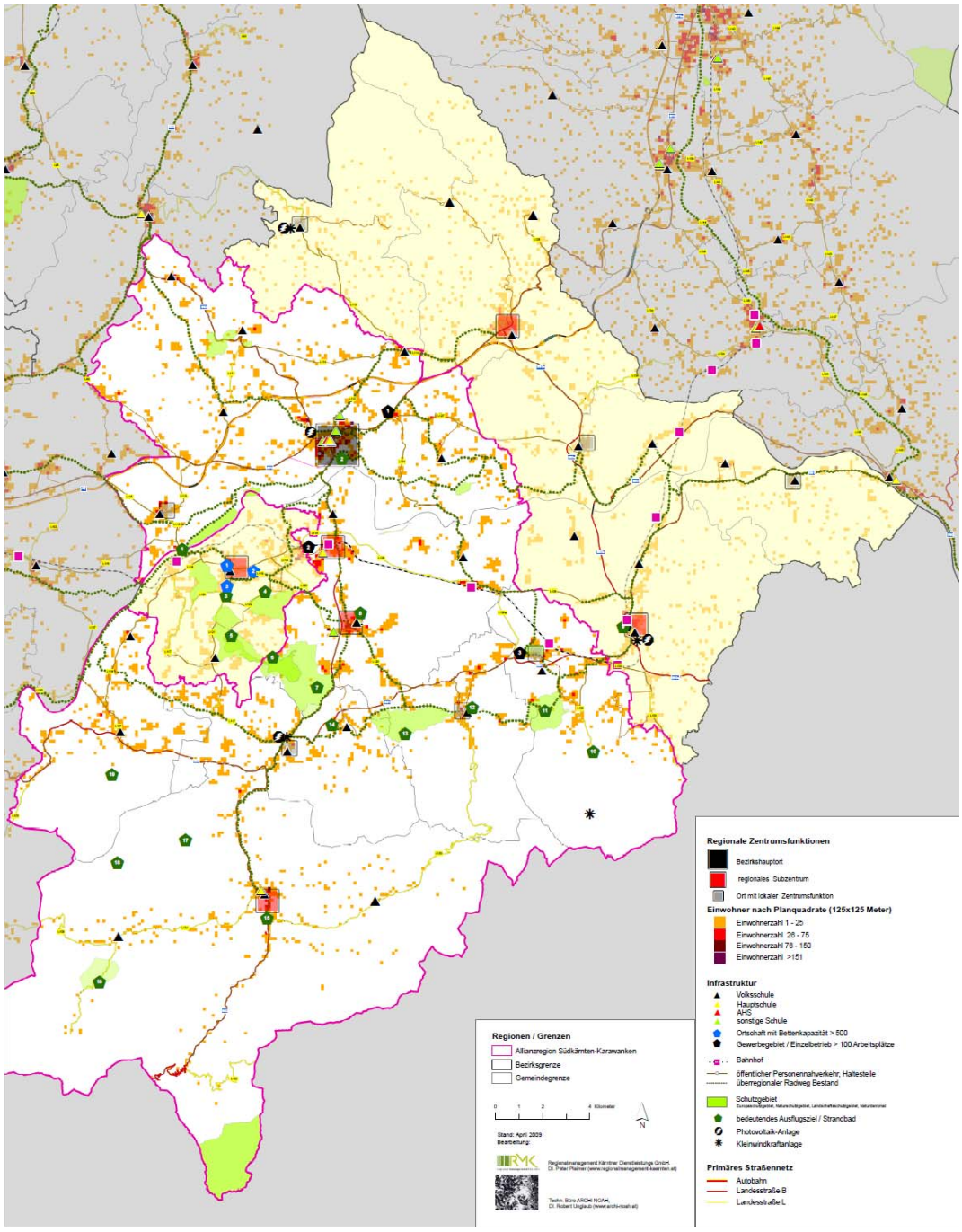
The most important destinations of an average household, which determine a large part of individual traffic frequency, are:

- commuting to place of work
- travelling to school / university / kindergarten
- shopping and other errands (post, bank, local authorities etc)
- social visits (to relatives, friends)
- recreation / relaxation / tourism
    - sport centres
    - clubs (cultural events including church)
    - pubs and restaurants
    - day trips / weekend trips and short holidays

The local structure (in particular the closeness and division of the various rooms and facilities) is a deciding factor in the decision of the individual to satisfy his needs of mobility. The longer the journey between the single centres the greater the volume of traffic. Today's way of life means that the distances to cover in scattered country places are further than those in urban areas thus increasing the daily traffic and distances travelled. This has an effect on the choice of transport. While over 50% of the population in cities can walk to their destination, usually, in rural districts, less than 10% are able to do so. Naturally the portion of motorised individual traffic is reversed, the rural districts use more private transport as they have less public transport while city people with excellent public transport but have problems with parking or traffic jams in the city centre (the need of individual mobility in rural areas is fundamental higher because of less developed public transportation and enough parking areas).

5.2 Daily mobility

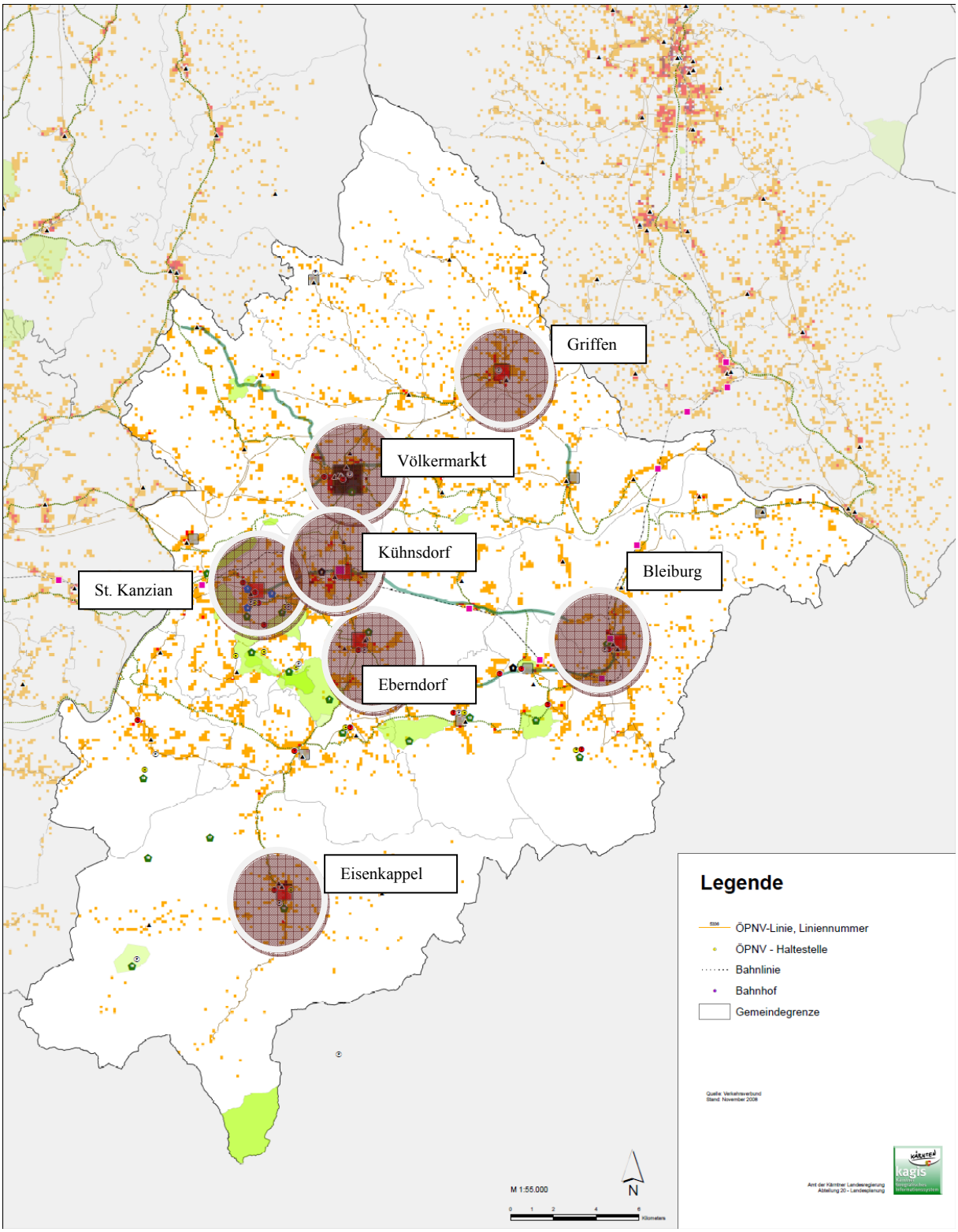
In picture 7 the most important destinations (regional (sub-) centres, schools, touristic destinations, business parks) within the region are shown. The map illustrates the scattered inhabited places in rural areas and the resulting long distances to places of work, schools and facilities for daily use. These facts increase the difficulty of establishing an efficient traffic system.



Picture 7: Regional centres and destinations
Source: Plaimer / Unglaub 2009

The basic requirements to establish an attractive public transport system in rural areas are more difficult than in urban areas as the villages are so scattered. Many destinations, in particular housing estates with more than 250 inhabitants, are beyond the available public transport facilities. At the same time it is evident that the public transport system is a basic part of the mobility and makes destinations accessible. The quality of service, (offered destinations, times and frequency etc.) have not been taken into consideration. The situation in the community of Eisenkappl is particularly difficult. The thinly populated side valleys such as Leppen or Remschenig are not even connected to the public transport system and so they cannot be reached by bus (see picture 7 in the south).

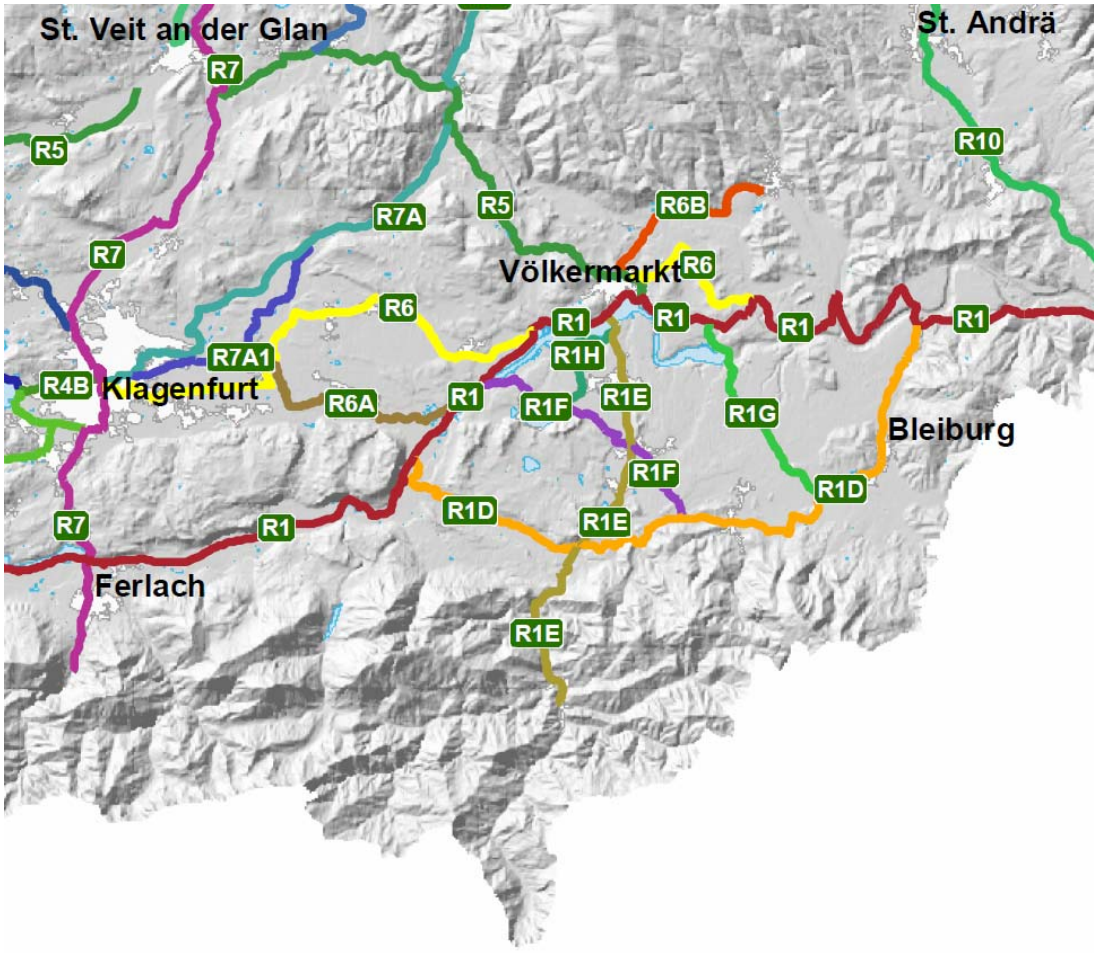
But on nearer examination it can be observed that a greater number of the sub-urban villages are within 2.5 km of the small towns of Griffen, Eisenkappl, Eberndorf, Kühnsdorf, St. Kanzian, Bleiburg and the main centre of the region, Völkermarkt (see picture 8).
As a rough estimation approximately 60% of the inhabitants are nearer than 2.5 km from the next centre which has at least 2 supermarkets, a bank, a school, post office and restaurant or pub etc. (basic infrastructure of daily needs). For these short distances a bicycle can be considered as an alternative to motorised transport (cars, mopeds and motor bikes) as there is no great difference in the amount of time taken to reach the destination. In urban areas a bicycle can be quicker than a car for distances of up to 5 km. In rural areas this time advantage is not usually evident due to higher speeds being possible and parking places are nearer to the place of work and home. Also it must be taken into consideration that the mountainous regions make cycling difficult for many people. On the other hand this restriction does not apply to electric bicycles which, due to battery technology progress, now present a realistic alternative at a reasonable price. In chapter 6 a rough overview on electric bicycles is documented.



Picture 8: Catchment area of 2.5 km
Source: Plaimer / Unglaub 2009

In picture 9 the available cycle track network of the region is shown. During recent years an improvement in offers for tourists in particular bicycle infrastructure (e.g. Drau cycle track) has been achieved. A few pedestrian footpaths and cycle tracks have been built during the reconstruction of the roads in some municipalities (e.g. St Kanzian, Wildenstein in Gallizien). But in general the need for an improvement for cycle traffic in the region is evident. Both tourists and local people often find the conditions insufficient for their daily needs.

Basically riding an (e)-bike should be possible everywhere for anyone, tourist or local, to be able to reach a supermarket, a bank, a restaurant or make an excursion in a comfortable and safe way.



Picture 9: Cycle path network in the district of Völkermarkt
Source: BEV, Land Kärnten, Abt. 7 - Kagis

R1	Drauradweg
R1D	Jauntalradweg
R1E	Seebergradweg
R1F	Klopeinerseeweg
R1G	Edlingerweg
R1H	Wasserhofnerweg
R5	Glan-Gurkweg
R6	Völkermarkterweg
R6B	Haimburgerweg

The cycle track network should be designed using the following criteria:

- continuous (no interruptions) of the cycle tracks
- direct routes (no roundabout ways)
- attractiveness
- traffic safety
- comfort - *from: comparison of cycle tracks in the Netherlands and Germany Comparison study Delft—Darmstadt* http://www1.tu-darmstadt.de/verkehr/vv/stud/kfv/v2009.htm

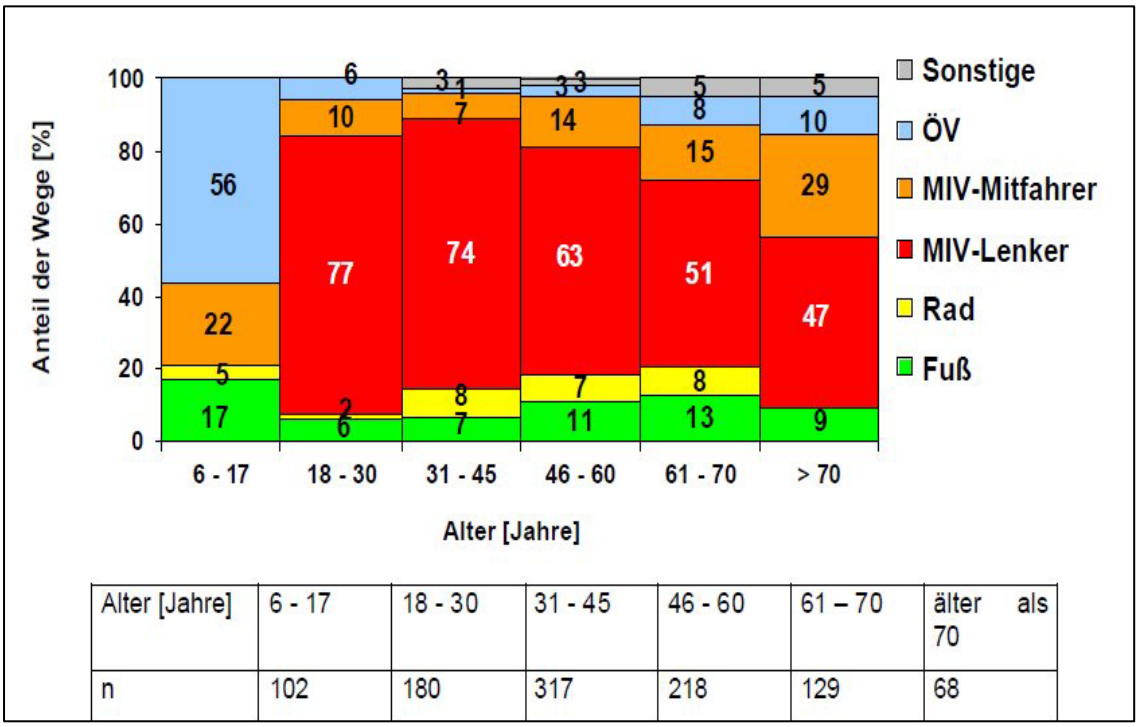
In the Alliance Region there are only a few cycle tracks which fulfil these criteria. Particularly there are no continuous connections off the main cycle tracks and several of those leading up to the main ways. At present there are cycle lanes marked on the main roads within the towns but out of the built up areas there are no such safety lanes. Cyclists must share the main roads with motor traffic and as the speeds are much higher on the open road there is a higher risk level. An efficient and user-friendly cycle track network brings the cyclist, if possible, to his destination in a direct line without detour. The most direct and shortest route is usually to use the main road.

Picture 10*:* Cycle track ends abruptly in St. Michael
Source: Unglaub

But these are not designed to be used by cycles as they have no marked cycle lanes or separate cycle tracks. From experience, detours are not usually accepted in the mobility of daily life, and are pointless, so at least the most important main roads between towns should be provided with the necessary cycle tracks.

Picture 11: Branded cycle path within centres are adequate (St. Kanzian)
Source: Unglaub

Table 5: Modal split in rural areas – example of the region Klaus / Windischgarsten
Source: Meschik, M. 2005: Wie mobil ist die Region?



Alter [Jahre]	6 - 17	18 - 30	31 - 45	46 - 60	61 – 70	älter als 70
n	102	180	317	218	129	68

Today the bicycle plays a very small role in daily mobility with <10% of all ways while the car dominates, apart from school traffic, with > 80% usage (see table 5).

The car is by far the most important form of transport in commuting (>90%). The main destination of approximately 50% of the commuters is Klagenfurt. Although the travelling times of the local train from, for example, Kühnsdorf to the main station in Klagenfurt is shorter than the time taken by car the train is seldom used by commuters. There are many reasons for this and an important one is certainly that the door to door mobility by car is more comfortable and has more advantages than the train as the bus connections from the station to the place of work are poor. The time factor is usually a big argument for the use of the car. Apart from this the train frequency is relatively small and there are no regular times which would be a big factor, as it is in other regions, for commuters to change over to public transport. As a result of car-centred mobility see picture 12 – a waste of space!

Picture 12: Eberndorf: Unnecessarily large parking areas on a few busy days in the year
Source: Unglaub

5.3 Free time, relaxation and tourism mobility

When the overnight statistics in the alliance municipalities (approx. 245.000 per year from Statistic Austria 2007) are considered, the region doesn't belong to the main tourism areas. These figures are not strictly correct as the neighbouring municipality of St. Kanzian with approx 760,000 overnight visitors is one of the most intensely visited tourist areas in Carinthia. The holidaymakers, who live in the St. Kanzian municipality, visit the surrounding countryside and in particular the district of the Alliance Region where they make day trips to the many natural sights and other tourist attractions.

In picture 7 the most important tourist attractions and the main tourist centres are shown with the density of available accommodation.
The tourist municipality of St. Kanzian is to be seen clearly. Many day trip destinations cannot be reached using public transport. Although these centres actually do have bus services, their use to popular tourist attractions can be very difficult. The infrequency or long journey, due to having to change buses, makes the journey longer than necessary as the destination is not close enough to where the bus actually stops. For example the 18 km journey from St. Kanzian to Wildenstein Waterfall near Gallizien takes up to 3 hours by bus as one has to change buses twice (by bus it is a trip of approximately 46 km).
As the holidaymaker wants to be as mobile as possible during his holidays, in order to be able to visit the sights within and beyond the region, 95% of the visitors travel to their holiday destination by car[9].
In the main season there are up to 10,000 tourists within the region, including St. Kanzian, in addition to the local population. There is a noticeably higher traffic density of private cars every year, particularly in the months of July and August.

[9] Source: ÖEK St. Kanzian 1995

6. Overview on electric vehicles

6.1 Capabilities

In the following it should be examined which electric vehicles are suitable for which purposes or user's groups in principle. Moreover, a short overview is given which products on the market are available.

Basically 4 vehicle categories are relevant for the private individual mobility:

- E-bicycle
- E-motorbike (E-Scooter)
- Electric car
- E-motorcycle

The motorcycle should not be discussed closer, because motorcycle driving is only for a small target group as well as serves predominantly just leisure pleasure and it doesn't play a relevant role in mobility concepts.

In table 6 the potential application possibilities as well as specific advantages and disadvantages of the single vehicle categories are compared with the help of some important criteria with each other. To the better descriptiveness a conventional car with a contentional combustion engine is also included.

Table 6: Comparison of different vehicle categories
Source: Plaimer / Unglaub 2009

Speed	Range	Capacity of transport	Comfort	Environment	health	costs		
						buying	running	
- -	0	- -	-	+ +	+ +	+ +	+ +	E-bike (Pedelec)
-	0	-	0	+	0	+	+	E-Scooter
+ +	0	+ +	+ +	+	0	- -	-	e-car
+ +	+ +	+ +	+ +	- -	0	0	- -	conv. car

Of course strong differences arise concerning the comfort and the transport capacity between the two-wheel vehicles and the car. A car provides a better weather shield and can advance up to 5 people and luggage. All year round e-bicycles and scooter cannot be used especially in the Alpine space. Therefore they can substitute for other traffic bearers at times. On the other side the cost of e-bicycle amounts to only approx. 5% of an e-car and it has a positive health effect on the user (above all pedelec bicycles!).

All three vehicle categories can be assigned a specific range of action[10] within the use could be defined comfortably (see table 7).

Table 7: E-vehicles and their specific range of action

up to 5 km	e-bicycle (Pedelec)
up to 15 km	e-Scooter
up to 70 km	e-car

Besides, the limiting factors are the speed to be achieved, the physical strain (with the e-bicycle) and the battery-conditioned range[11].

About 50% of the everyday ways are shorter than 5 km but handeled by car. Therefore a large part of local traffic could be managed by the use of e-bicycles as well.
Whether it concerns smaller purchases or everyday tasks like the visit of bank, post, meeting with friends or relatives, these could also be done by the e-bicycle or the e-Scooter and don't require, apart from the wintertime, the use of a conventional car.
It is to be pointed out that a modern and sustainable mobility concept has to consider the intermodality, the combination of different transport systems (e.g. e-bicycle: the range of action increases with the use of the next railway station).
It becomes clear, how important it is to develop a regional traffic concept comprehensively. The better the traffic chains of different carriers are tuned on each other (e.g. timetable, park&ride, entrainment of bicycles in public transportation), even lighter is the abdication of a conventional car.
Out of the specific qualities of utilisation and the ranges of action the respective potential user's groups can be defined.

E-bicycle:
Basically the e-bicycle is suitable for all users who are not fragile and can be also driven in mountain areas without special strain. The bicycle becomes attractive also for non-sporty people and many everyday ways could be covered instead of by car.
By the use of e-bicycles a similarly high value of acceptance could be reached like in the classical bicycle nations. In Holland the bicycle has at least one portion of 27% in modal split (in Austria approx. 7%)[12].

[10] Range of action calls the distance between start and aim; including the way back the distance amounts the doubled of the range of action
[11] The limited technical range is orientated on the still available products on the market (state of the technology).
[12] Schneider 2008

E-Scooter:

Traditionally these vehicles are attractive for youngsters between 15 – 18 years, because these opportunities offer the first possibility to be mobile independently. Hence, e-Scooter are primarily an alternative to the conventional motorbikes. Restrictions in the range (between 50 – 110 km) play no role for the everyday traffic. For many trips with only one person the efficiency would be much higher related to costs and energy (compared with a normal car).

E-car:

Basically an e-car can substitute any trips within a range of action of about 50 km (corresponds to a range of approx. 100 km). Because the acquisition of an e-car is still connected with very high costs and the range of action is limited for most people the purchase is not realistic.

Nevertheless, this argument applies only to families which have only one car at their disposal. But many families, particular in rural regions, own two cars or even more. As a second car the disadvantage of the low range is not relevant. Therefore e-cars are also attractive according to the state of technology already available on the market. That means no changes of individual mobility behavoir would be necessary. First long-term experiences in the private field have shown, that approx. up to 70% of the annual driving-kilometres could be driven electric. Of course this depends very strongly on the individual "mobility profile".

6.2 E-vehicle market

In the area of e-vehicles the market develops dynamically. The new products which also bring technical innovations are offered constantly. Especially the market for e-cycles and e-motorbikes is already prepared by the introduction of a new battery technology (above all lithium ions or lithium polymer batteries are clearly improved) and by the increasing acceptance of e-mobilty in general.

Nevertheless the e-car offer does still not exist but in the next few years a big change concerning the e-mobility will arise[13]. On the one hand nearly each car-company is working on e-concepts on the other hand a broad offer on e-cycles and several e-motorbikes still exist.

6.2.1 E-cycles

Basically it must be distinguished between e-bicycles with pedelec mode (pedal electric cycle) and the e-bike. Pedelec means, that the driver while kicking the pedal gets an

[13] Ajanovic 2008

additional electric support. This type is already common on the European market because it is comparable to a normal cycle by law.
The pedelec bicycles can be still divided into two categories:

- with muscular strength steered (muscular strength booster) and
- with pedal movement.

With muscular strength steered pedelecs the electric engine supports proportionally to the muscular power input and pedal kicking goes easier. This control provides for higher range.
With the e-bike an electric engine support is also without kicking possible (hand throttle), but it is juridically no bicycle but a motor vehicle. Hence, it needs an insurance sign and can only be driven with a driving licence up to 15, or at the age of 16 years also without driving licence.
The engine support of pedelec bicycles goes up to 20 km/h, e-bikes up to 25 km/h and more.

In view of the objectives to support the solar-electric mobility the advantage is to be given to the pedelec variation clearly, because also children can use it, higher range is achieved and the “must” also to use own muscular strength. Beside the health aspect the idea of cycling is not lost.

High-class products of pedelec bicycles cost at the moment at least €1,700. Important manufacturers are (see also tables 8 and 9):

- Flyer (Switzerland)
- Gazelle (Holland)
- Kalkhoff (Germany)
- Kettler (Germany)
- Raleigh (Großbritanien)
- Rixe (Germany)

Almost all bicycles are equipped with the pedelec system of Panasonic, at the moment with best price-performance relation.

6.2.1.1 Solar Mobility Carinthia

For about 6 months an EU-project called “Solar Mobility Carinthia” is runnig until end of 2010. In co-operation with 10 municipalities the project is financed out of the LEADER-program and shows a Carinthia-wide pilot's initiative which is aimed above all at a pedagogic aspect in the area of an enviromentally friendly mobility. This local co-operation has over the borders of the federal province Carinthia a model effect (a concentrated educational and sensitisation

measure) and underlines the role of the municipalities as "a Key player" in the matter of climate protection. With the budget of € 570.000,- following activities must be realized:

- Prelude info event (future of the mobility)
- Establishment of solar filling stations
- Establishment of PV plants in each municipality
- At five locations small windpower plants should also be tested – additional source of gaining sustainable e-power for the increasing e-mobility).
- Acquisition of electric vehicles (e-bicycle, e-Scooter, e-cars)
- Workshops for local, regional or operational mobility concepts (feasibility attempts)
- Interlinking with governmental initiatives and strategies; public relations;
- Public lectures and information events to the use of renewable energy resources and to the energy efficiency at municipalities level;

The general aim ot the project the sensitisation of the public and to initiate a long-term realisation process concerning local and regional mobility concepts and the reduction of CO_2 emisssions.

For the acquisition of e-bicycles advertising linked to a running EU-project was just carried out by the office of Regional Management Carinthia. The following tables give a rough overview about the products offered currently, their technical equipment, qualities and prices (excluding and including recuperation)[14].

[14] Plaimer 2009

Table 8: List of e-bicycles without recuperation
Source: Plaimer 2009

Provider	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Type	Zouma Sport+	Edition Pro	T4	Easy Glider	Flying Cranes combi (*mit Handgas! Zulassung?*)	T-Serie Sondermodell	Pedelec FE02	UM 44	Kalkhoff-Agattu Pedelec C 8-G Nexus
Producer	Diamant	Teamsix-myBike E4	Flyer	Gazelle	Kranich-Trading AG	Flyer	Feldmeier	Urban Mover	Derby Cycle Werke
Prices	2.124 Euro (ab 10 Stück)	1.290 Euro	1.651,70 Euro	1.674 Euro	1681,15 Euro	1.614,15 Euro	1.890 Euro	1.188 Euro	1.614,15 Euro
Drive system	Elektromotor in der Hinterradnarbe – BionX Antrieb	bürstenloser Nabenmotor 250 W	Bürstenloser Tretlagermotor	Panasonic	250 Watt bürstenloser Synchron Drehstrom Nabenmotor in der	PANASONIC,	PANASONIC, Trittkraftgesteuerte Motorunterstützung; 3 Modi	Automatisches UM Steuermodul als Antriebsunterstützung	Panasonic (Pedelec Antrieb) 250W
Control and gear	shimano deore 24 Gang Schaltung mit Rapid Fire Schalthebel	7 Gang Shimano	8 Gang Shimano Kettenschaltung	Shimano Nexus 8 Gangschaltung	8 Gang nabenschaltung Shiamo Nexus	Nexus 8 Gang Nabenschaltung	Shimano Nexus mit Pedelec Tretunterstützung	PCM Motorsteuerung (=VPAC) 7 Gang	8GNabenschaltung Shimano Nexus mit Freilauf 8 Gang
Li-Ionen Akku	ja	nein – lithium Eisen-Phosphat	ja	ja	nein	ja		ja	ja
Weihgt	25,1 kg	26kg	23-25kg	27,2 kg	24,5kg	23,5kg	20,8kg	21,5 kg	24 kg
Scaled price	ja	ja	nein – nur 40 und 10	ja	ja	ja	ja	ja	ja
Range	75 km	60 km		60 km	50 km		60 km	80 km	80 km
guarantee	gratis erst-service				2Jahre, inkl. Batterie und Ladegerät	2 Jahre Rahmen 2 Jahre Komponenten 2 Jahre Akku	1 Jahr Akku 3 Jahre gesamte Fahrrad	10 Jahre Rahmen 5 Jahre Motor 2 Jahre Batterie	3 Jahre
					2 jahre Batterie und Ladegerät	Pletscher Gepäckträger Gelsattel Schnellverschluss Sattelstütze	Alu-Gepäckträger, Ergo-Griffe, Kunststoffblech		gefederte Sattelstütze, Nabendynamo

Table 9: List of e-bicycles with recuperation
Source: Plaimer 2009

Provider	A	B	C	D	E	F
Type	Achat+	KTM	i-Step touring	i-Step city	Flying-Cranes	KTM
Producer	Diamant	Energo Fun	MATRA	MATRA	Kranich-Trading AG	Ego Fun
Prices	1.680 Euro (ab 10 Stück)	1.690 Euro (ab 10 Stück)	2.016,9 Euro (ab 10 Stück)	1.631,8 Euro (ab 10 stück)	1.655,12 Euro	1.499,25 Euro
Drive system	Elektromotor in der Hinterradnarbe; BionX Antrieb	Bürstenloser Gleichstrom-Hinterradnabenmotor ohne Getriebe	Bürstenloser Hinterradnabenmotor Matra Sports by BionX	Bürstenloser Hinterradnabenmotor Matra Sports by BionX	Getriebe-und geräuschloser 250 Watt Motor direkt i.d. Hinterachse; Synchron Drehstrom Motor, 24V Generator, alle Sensoren und Steuerung/Regelung im Motorgehäuse	Bürstenloser Gleichstrom-Hinterradnabenmotor ohne Getriebe
Control and gear	Ride+ 3Gang Nabenschaltung mit Drehschaltgriff	Shimano Deore 24 Gang	Shimano Deore 27 Gänge	Shimano Deore 9 Gänge	Shimano 7Gang Kenttenschaltung,	Tretlagerantrieb, Vorderrad Nabenmotor (Amparo FR)
Li-Ionen Akku	ja	nein			ja	Nein
Weihgt	23,8 kg	23 kg	26 kg	25 kg	25,9kg	23,5 kg
Scaled price	ja	ja	nein	nein	ja	ja
Range	60km		70 km	70 km	57,8km	50 km
guarantee	gratis erst-service		2 Jahre Fahrrad und Akku	2 Jahre Fahrrad und Ladegerät	2 jahre Batterie und Ladegerät	Erstes Service vor Ort kostenlos 5 Jahre Rahmengarantie 2 Jahre Garantie auf Komponenten 1 Jahr Garantie auf Akku

6.2.2 E-Scooter

In the following an e-scooter is comparable to a conventional motorbike (up to 45 km/h)
On the market a huge number of models are already available, which strongly differ concerning engine power, range, climbing performance in the mountain and equipment.
In the rural area of mountainous areas the range should not amount to less than 50 km and the climbing performance should not be less than 15%.
Therefore a huge number of weakly motorised e-scooter must be eliminated because they are rather conceived for the urban neighbourhood. Another differentiation sign concerns the used accumulator technology. This also has determining influence on the prices. While stronger motorised products with lead (predominantly lead-gel) or silicon batteries cost between € 1,800 and € 2,600, e-scooters with the most modern lithium ion batteries cost about € 3.000 - € 4.000. Only few manufacturers offer this technology up to now (e.g. IO-Scooter, E Max and Innoscooter). Beside the promised life time (according to manufacturer's data more than 1,000 loading cycles) and the missing memory effect, the lower weight plays a substantially role of quality. Therefore a range of more than 100 km could be achieved with these batteries.

Some important models are (technically mature, strong engines and with a range of at least 50 km):

- e-max 90S
- E-Racer Sprint
- Gecco
- Innoscooter
- IO Forenz

6.2.3 E-Car-Market

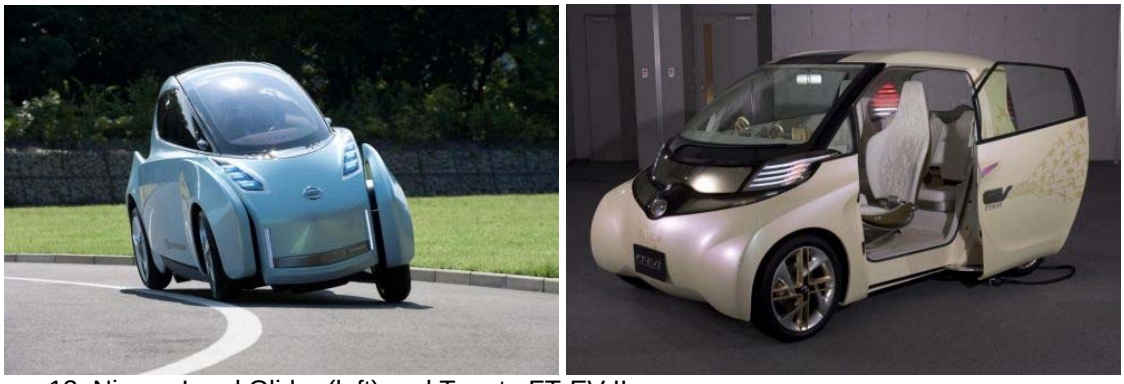
Following list should give an overview of different types and concepts which are already available or foreseen in the closer future. How ever, all car companies are working on models and strategies based on e-mobility[15].

[15] A hearing on “E-vehicles – solar mobility” was organised on 21. November 2008 by the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The original equipment manufacturer (OEMs) presented their strategies for developing e-vehicles. A download of the hearing is available at the homepage of the Environment Agency Austria:
http://www.umweltbundesamt.at/umweltschutz/verkehr/verkehrsveranstaltg/hearing_elektrofahrzeuge

Table 10: List of e-cars
Source: Internet search, October 2009

Car company	Type	Range (km)	Akku	Top speed (km/h) / hp	Charging time (h)	Costs (€)	already available
Th!nk	Th!nk City	140 – 200	Zebra / Li-Ion	135 / 46	8	> 25.000	2009
Tesla	Roadster	400	Li-Ion	210 / 250	3,5	99.000	2008
Nice Cars	Mega City	95	Li-Ionen	65 / 20	5-8	13.000	2008 (London)
Mes-Dea SA	Panda Electrica	120	Zebra	110 / 41	8	27.000	2008 only I/CH
Smith Electric V.	Ampere	160	Blei-Phosphat	112 / 68	8		2008
Aptera	Aptera Typ-1e	190	Li-Ionen	137 / 24	6	17.300	2009 USA
CityEL	FactFour	90	Lead, Ni-Cad; Li-Ionen	65 / 5	8	8.499 without Akkus	2005
Kewet	Buddy	150	Lead / Li-Ion	90 / 18	8	14.500	2009
Venturi	Venturi Fetish	250	Li-Ion	170 / 245	3	297.000 (!)	2008
							available 2010 - 2012
Mitsubishi	i MiEV	160	Li-Ion	130 / 63	7 / 25 min speed load	26.000	2010
Mindset	Mindset	200	Li-Ion	140 / 95			
Reva	NXR	160	Li-Ion / Lead	106 /	8 / 15 min speed load	> 20.000	2010
Nissan	Leaf						2012
Renault	Twziy Z.E.	100		75 / 20	6-8		2012
Renault	Kangoo Z.E.	160		130 /95			2011
Renault	Zoe Z.E.	160		140 / 73	6-8 /0,5 h speed load		2012
Renault	Fluence Z.E.	160		- / 95			2011
Peugeot	Ion	130			6		2010
Smart	e-Smart	135	Zebra / Li-Ion	120 / 41	8	_	2011
Opel	Ampera (Hyprid)	60		- / 150	3	> 40.000	2011
Hyundai	i10-E			130 / 67	5		2010
Alreda (F)	200 MC2			- / 20			2010
Tata	Indica Vista EV	160		128 / 75			
Subaru	R1e	200	Mangan Li-Ionen	100 / 82	8 (80% in 15 min)	11.200	2012
HSR Hochschule	E'mo	100	Li-Ionen	80 /	6h (100%) 1h (50%)		
Fisker	Karma Hybrid	80 el.	Li-Ion	150 / -	8	51.300	2010
Fiat	Phylla	220		145 /	3-4		
Chevrolet	Volt Hybrid	60	Li-Ionen	160 / 75 el.	6	Ca. 30.000	2010
BMW	Mini E	250		156 / 204			
Daimler	E-Smart	200	Zebra / Li-Ion	129 / 68	8	-	2010
							concepts
Peugeot	BB1	120		- / 20			
Loremo	Loremo EV	150	Li-Ion	170 / 54	-	>30.000	2012 ?
Audi	e-Tron	230		200 / 300			
VW	Up! Elektro	130		- / 54-82			2013
BMW	Vision			- / 356			

Trabant		160		- / 64	2013
Nissan	Land Glider		Li-Ion		
Toyota	FT-EV II	90		100 / -	
Mercedes	E-Cell (Hybrid)				
Magna	Mila EV		Li-Ion		
Citroen	Revolte (Hybrid)				
Protoscar	Lampo	200		200 / 268	
Honda	?				>2015
					used cars
Citroen	AX / Saxo				
Daimler	Smart				
VW	Golf CitySTROMer				
Renault	Kangoo				



Picture 13: Nissan Land Glider (left) and Toyota FT-EV II presented at Tokio Motor Show 2009

The most interesting concepts and strategies are presented by Renault with four Z.E. (zero emission) models. The background is the Renault-Nissan Alliance in close co-operation with the company Better Place. Three recharging methods are already fixed[16]:

- Standard charging with standard domestic socket 220V – 10 or 16A; charging time 6 – 8 hours
- Fast charging: high power socket (400V – 36A); charging time: 20 – 30 minutes to recharge a 20kWh battery (infrastructure is in the process of development)
- Quickdrop charging by battery exchange; charging time 3 minutes

[16] www.renault-ze.com 25.8.2009

7. Regional e-mobility concept

7.1 Aim

In the following chapter the first steps of soft mobility development with particular regard to solar electric vehicles and the most important fields of action for the promotion and realization within the Alliance Region will be demonstrated and commented upon. Besides an integrated estimate will be pursued:

- Particular value will be placed on the overlapping aspect of various forms of traffic. The combination of individual electric mobility with public transport will especially be taken into consideration.
- possible synergy should be used to provide for various traffic needs (e.g. tourism / free time and every day traffic)

The concept is meant as the basis for a systematic development of the solar mobility in the AllianceRegion within the traffic assessment for soft mobility in the next few years.

The basic idea is the improvement of the efficiency and effectiveness of the traffic through the promotion of public transport and electrically powered vehicles, as for the supply of the necessary electricity through renewable energy from the region as an impulse for the development of the region and the reduction of traffic pollution.

In detail the following aims lay the foundations of this concept:

- promotion of the non-motorised traffic (pedestrians, cyclists including E-bicycles)
- promotion of the individual motorised solar electric traffic
- generation of the necessary electricity for the electric vehicles through renewable energy from the region
- improvement of the offer of public transport network
- improvement of the connection of the public transport with the single traffic (combined traffic)
- development of a tourist segment "alternative mobility at your holiday destination"
- arranging a central traffic information and authoritative office (mobility centre)

The consequences regarding energy management will not be discussed (further reading see amongst others a study of PrincewaterhouseCoopers[17]).

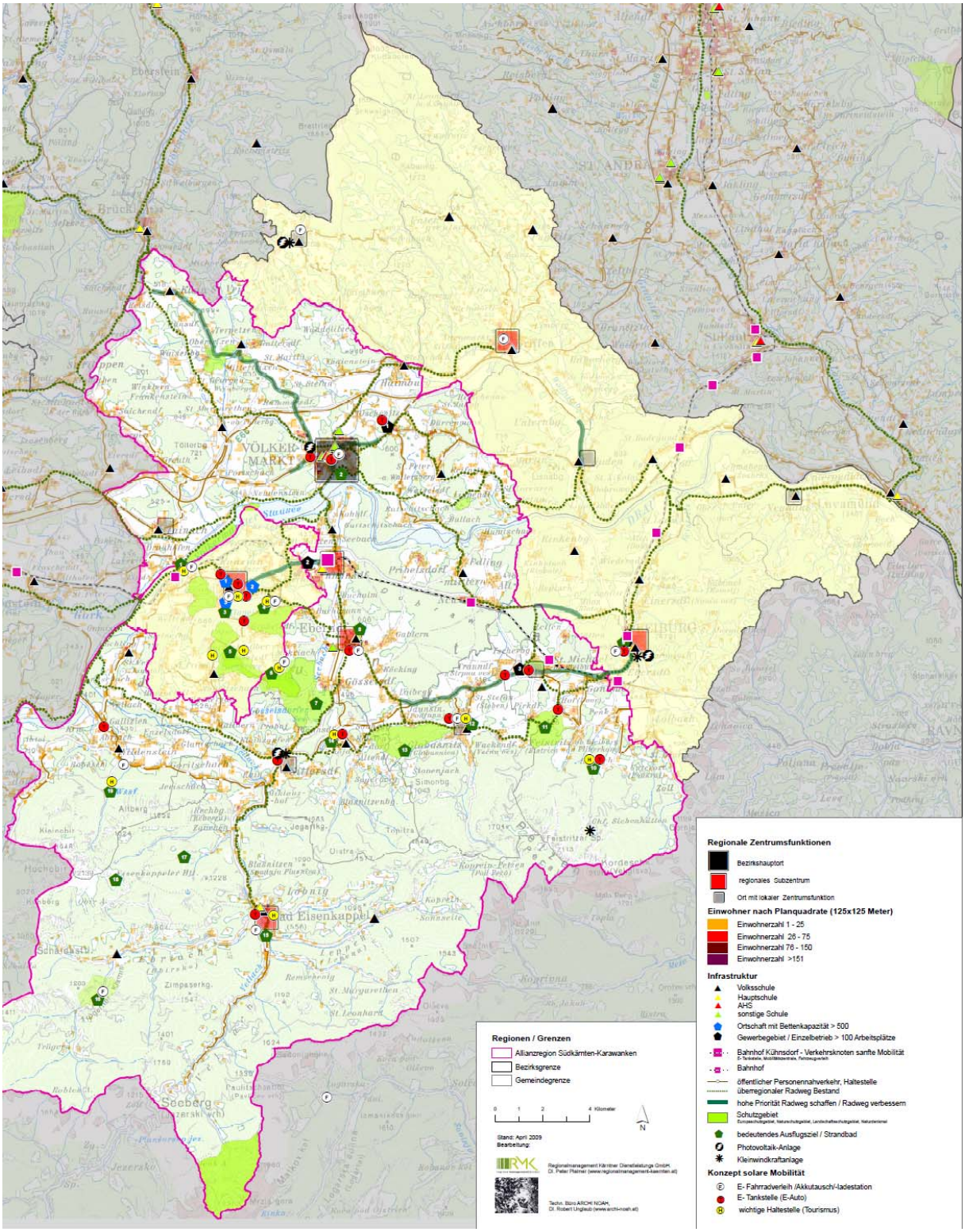
7.2 Strategies and fields of activity

The step by step realization of the target of soft mobility needs a concerted action. In the following the most important strategies and actions of activity will be commented upon.

[17] Haider, B. & Smole, E. 2009

7.2.1 The setting up and improvement of the infrastructure

The promotion of e-vehicles and the invigoration of public transport and its connection to individual traffic and the forcing of the use of e-bicycles require adjustments and investment in the traffic infrastructure. In picture 14 the essential components of an improved traffic infrastructure are shown.



Picture 14: E-mobility concept on infrastructure
Source: Plaimer / Unglaub 2009

The improvement of the traffic infrastructure includes:

- a sufficient network of loading stations for E-mobile or accumulator loading or exchange stations for e-bicycles
- the completion and improved quality of the cycle track network and
- the improvement of the available public transport with connections to individual traffic

Subsequently the most important components for the improvement of the infrastructure in these spheres

- **e-cycle mobility**
- **extension and improvement of the cycle tracks**
- **e-power stations**
- **public transport**
- **generating the necessary extra electricity through renewable energy**

will be introduced briefly.

7.2.1.1 E-bicycle mobility

An extremly environmental friendly and healthy (here the pedelec type is the most important) and uncomplicated form of individual mobility for daily short distances (up to 5 km) is the e-bicycle which can also be used by tourists achieving a higher experience level and longer trips. The advantage of electric vehicles over bikes without a motor is that less sporting people can use these vehicles in mountainous regions, as a hilly stretch needs no more effort than an even stretch.

Sufficient electro-service stations are necessary for the tourist utilization of the e-bike for longer trips. The advantage of an exchange accumulator station is that the “charging” is completed in a few seconds. Basically at present, the exchange stations can only be carried out by tourist rent-a-bike firms as here it is possible to have one particular type and make of bike and battery in use, making service stations possible with only one make of battery being needed. In Switzerland these exchange service stations have been successful in a project with e-bikes from the firm “Flyer”. For example, the bicycles can be rented out at railway stations. A map gives information about recommended tours and accumulator exchange stations which are mainly to be found at restaurants.

In 2008 the project “E-Na-tour” was realized in the Alliance Region of southern Carinthia-Karawanken. In co-operation with 3 “Alliance Municipalities” the first steps were taken for locals as well as tourists to be able to explore the natural and cultural jewels by e-bicycles instead of by car. In the centre point were the protected areas of the region or the border

areas with Slovenia. Their tourist potential in the segment of experience in the nature should be nurtured in a circumspect and considerate way. The beauties of nature should be discovered and experienced in a peaceful manner. Within these projects suitable tours and the concept of the operation of the exchange stations were worked out[18]. At the moment there are 3 bike rental stations which also offer the possibility of charging an e-bicycle battery. In addition in the neighbouring countryside of Logarska Dolina in Slovenia it is possible to re-generate the batteries for e-bicycles during a visit to this park area for the return trip to Bad Eisenkappl in the Alliance Region. The first experiences with this project have been very successful. In particular the great media interest and positive public reaction demonstrates the large potential of this alternative tourism mobility.

A marked improvement for tourists and a positive environmental effect (due to the reduction of car traffic) can only be attained when the whole region is sufficiently supplied with e-bicycle needs.

To establish an e-cycle region it is necessary to

- **expand the network of renting stations**
  important positions are the main tourist areas (e.g. around Klopeiner See) and the contact points with the local railway station (in particular Kühnsdorf station)

- **to raise the number of e-bikes available for rental step by step**
  in the first phase there should be at least 50 e-bikes available in the region (at the moment there are only 10)

- **build up a network of battery exchange stations**
  this network should cover a field of 10x10 km and preferably run by hotels or inns as here there is a good synergy with tourist services such as food and accommodation and acceptable opening times

- **make the offer "E-bikes in the region" common** and to assist the user, supply suitable information material (maps, lists of rental and exchange stations etc.)

In picture 13 the shown charge or exchange stations take into consideration on one hand

- the organized stations within the project E-Na-Tour (renewable wind- and pv-power plants are obvious) and on the other hand
- further the additional stations which are chosen so that trouble-free tours with e-bikes in the outer areas of the region are guaranteed

All institutions which are open all day and possibly at the weekend as well come into question as a charging and exchange service station. Preferably inns and roadhouses are wished as they can also be used by the cyclists as a stop-over. Depending on the traffic connection it is also an advantage when it is possible to rent a bike at these stations. The picture 13 only shows where it would be recommended to have a charging / exchange

[18] Plaimer & Unglaub 2008

station apart from the already available stations in Gallizien (Gasthaus Zenkl) and Globasnitz (Hemmamuseum) as in Bad Eisenkappl (local tourist office). The details are to be settled by the realization of the project.

The following criteria would determine the location

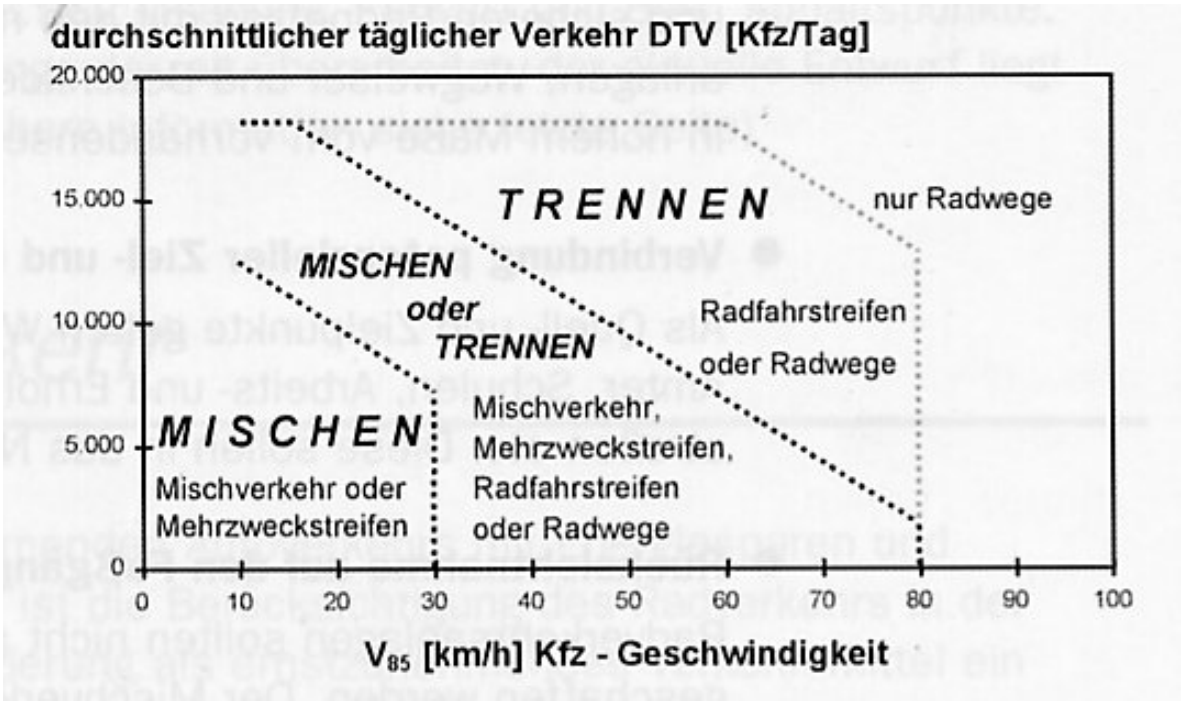
- the best distribution in the region (range of the e-bikes)
- if necessary near local railway stations
- suitable starting points for tours or on a tour of interest for tourists

7.2.1.2 Extension and improvement of the cycle tracks network

In picture 14 the most important additional cycle track connections along the main roads are also shown (green highlighted). These should be extended as a priority. Besides these big extension plans, the realization of a cycle-friendly region requires many individual measures such as, for example, the raising of the security in urban areas, at crossings and making sure of an uninterrupted cycle track.

In many cases a separate cycle track is unnecessary. Depending on the amount of traffic and speed of the cars a bike can be a part of mixed traffic or with a lane at the edge of the road, at very little extra cost.

Figure 1: Mixture and/or splitting of different traffic lines
Source: Land Oberösterreich 2001



A further important measure for improving the basic requirements for the (e-) bicycle traffic is the systematic and standardized signs on the cycle tracks. Even the picture 15 stimulates for smiling, the sign-posting is not established for additional uses.

Picture 15: Multiple use of cycle signs
Source: Plaimer

To realize the improvement of the bicycle infrastructure a concerted action and a concept in detail is necessary, which must be worked out before the carrying out of single measures.

7.2.1.3 E-power stations network

E-mobil, regardless as to their being an e-bike, e-scooter or e-car need an uncomplicated, if possible within easy reach, access to electricity where the vehicle is parked for a longer period of time so that the batteries can be charged. The charging stations have at least one or also more electric sockets (230 V) which can be used to charge the vehicle for free.

In Carinthia there are two initiatives at the moment which build up an electric charging service station:

- **"lebensland Kärnten"**: The target of the project „lebensland Carinthia" is to establish relevant infrastructure for the upcoming electric mobility[19].
  The following five points are understood by infrastructure:
  - Compact grid of e-power stations
  - Photovoltaik as power source to create a well-balanced energy balance
  - Supports for electric vehicles to make the acquisition more attractive
  - Service to meet the new needs of the owners of electric vehicles
  - Information

  There are two versions of the eZapfsäule - "light" and "intelligent":
  The "light" - variation offers a child protection, but without the possibility for authentication and payment. This version is e.g. for enterprises which want to deliver a special service to their employees (no charge).

[19] Ball, 2009

In the "intelligent" - eZapfsäule there are 4 outlets, a screen and a reading module RFID (for future payment purposes) are installed and they are suitable for the public or private use.

Picture 16: e-power station in Klagenfurt
Source: “lebensland Kärnten”, 2009 (14. Oct. 2009)

- Carinthian Chamber of Commerce[20]

  An additional design of e-power stations is created by the Carinthian Chamber of Commerce. For the present the power station, which is located in front of the WK headquarter in Klagenfurt, can be used for free. The e-mobility topic is strongly supported by the Chamber, because of regional economic advantages.

Picture 17: Design of the WK e-power station
Source: WKK, 2009

[20] http://sonnenplattform.wuapaa.com (11.10.2009)

A good policy would be to offer a three phase current connection at each charging station in addition to the 230 V sockets as in the next few years it can be expected that modern e-cars will need this connection, or that the option of faster charging will become more important. Far-reaching more intelligent solutions in the sense of “smart grid” or “vehicle to grid” are those which are flexible and can charge different types of vehicles or can even feed the saved electricity in the batteries to stabilize the network but at present this is pointless within a regional and useable e-station network. For the promotion of electro-mobility in the region in the next 5-7 years, it is sufficient to improve the public access to the electricity for charging the batteries.

Particularly suitable locations for charging stations are those where a vehicle can be left for at least 45 minutes, as this is accepted as a limit in which the charging time brings an improvement to the batteries.

Suitable locations for electro-power stations are in particular

- places of work (independent branches)
- schools (especially secondary schools and vocational schools, primary schools are only interesting for the teachers)
- central areas in small towns with a local, regional central function or the district capital Völkermarkt
- P&R parking places of the public transport
- Tour destinations, tourist centres (e.g. Petzen cableway, Obir caves, lake beaches)
- Restaurants, hostels, inns
- Event locations (theatres, museums…)

At the electro-service stations already installed for public use the electricity is free of charge. This is a part of the strategy to make people take notice of the electro-mobility and to promote it. As the number of electro cars will only increase fairly slowly in the next few years, also an optimistic expectancy, the supply of electricity running costs of the charging stations will not be particularly high. Even in highly frequented electro-service stations in public areas for 2 private cars the running costs will hardly be more than € 350 a year, as from experience the privately owned cars are mostly charged at home.

The delivery of electricity for nothing should be kept with the new service stations to be established in the future.

But it must be considered if a simple form of charges should be planned. In this case there are simple systems like “park and charge” which are used in Germany, Switzerland and also in Austria. Here the electricity connections are found in lockable boxes. For an annual all-inclusive fee the e-drivers are given a key for the electro-service station and so they are able to charge their batteries.

Picture 18: Typical *„Park & Charge" Station*
(three phase connection, 2 x isolated ground receptacle and 1 x CEE socket with FI-switch, 3x 16A fuse)
Source: Bundesverband solare Mobilität eV, www.park-charge.de (6.7.2009)

7.2.1.4 Public Transport

From a complete economical view (political economical total costs) as also from an ecological one (energy efficiency, damage to nature and countryside, emissions) the public transport by bus and train is the most favourable form of transport. However a condition is an adequate use of them, which depends in the first place on the offers made to potential passengers. Particularly in rural areas the public transport must offer good connections to the individual traffic in the sense of a park and ride system, as only the main route can be driven although the scattered villages must also be offered a service. Thus those groups (e.g. elderly, children, the poor etc.) who have no direct use of a car or other individual forms of transport (bike, moped) are also basically provided for. In these cases a public system based on demand like for example the go-mobile, taxi-buses or thematic buses for touristic demand are to be established.

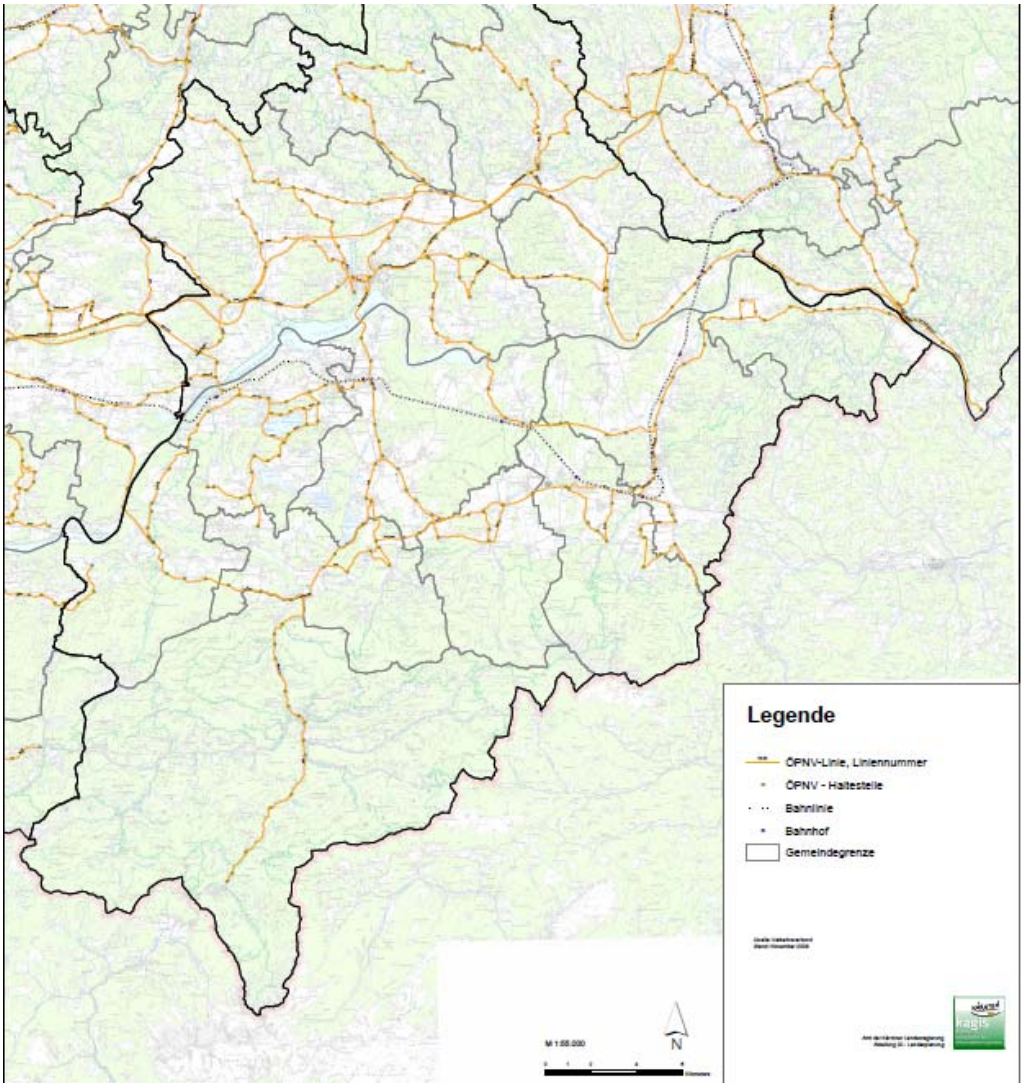
A regional general concept for public transport is an unalterable condition to reach a specific improvement in the offers and effective movement in favour of the forms of public transport. Within this study only step-by-step working points can be suggested.

The suggested measures in public transport concentrate on the following spheres

- **Expanding the bus supplies** within the region for specific mobility needs such as tourists / recreation seekers
- **Improvement of the combined traffic with Austrian Railways**

The placing of a tourist region in which a car-free holiday is possible demands an improvement of the bus supply from the tourist location to the tourist destinations. The local

people can also profit from these offers. In picture 18 the bus stops and train stations are shown.



Picture 19: Map of local public transport (train and bus)
Source: Verkehrsverbund 2009 (picture sent per e-mail 25.08.2009)

It will be a task of detailed planning how the individual destinations are combined with the bus routes.

The Austrian buses are well used particularly in the early morning between 6.00 and 8.00 a.m. which means that extra buses at this time would create higher costs. So it makes sense not to set the thematic buses at these times.

In a pilot phase a test run should take place with one bus route which passes strongly frequented sights (e.g. Wilderstein waterfall, Obir stalactite caverns). As an alternative the bus could run as a taxi-bus out of the main season. Basically these would run at the times given in the timetable and along the same route to the same bus stops but only when booked

in advance (at the latest 1 hour beforehand). Through this the efficiency and economy can be improved as unnecessary journeys can be avoided.
In the above mentioned general concept other requested and flexible bus and taxi systems are to be investigated for their suitability for mobility needs in the region. Also specific but repeatedly occurring transport needs for particular groups or for special occasions must be drawn into the concept. Examples for this are

- disco buses especially for young people and in connection with the problem "alcohol at the steering wheel"
- shuttle services to big events and parties

Most important requirements from these **tourism buses** are

- travelling time according to a regular timetable
- At least 3 trips daily: morning, midday and late afternoon during the main season (middle of June to beginning of September)
- The routes must connect the main tourist resorts around the lakes Klopeiner See and Turnersee with other lakes and the most important day trips
- the connecting together of the regional trains and the bus routes must be regarded

A further crucial point to be dealt with is the improvement of the P&R offers in connection with the electro mobility (e-car and e-scooter) for the traffic between the region and the central area of Carinthia (in particular business commuters). As a first step at least 3 parking spaces for e-cars with charging facilities and at least 5 e-scooter spaces also with charging facilities should be provided. Also when the Koralm railway is completed in approx. 10 years, these measures should be carried out as the present station will be closed and totally renewed. Investment costs would be minimal for the installation of electro power stations in the proximity of the new railway station as it will have electricity available.
As an additional incentive for commuters to use these P&R offers the Austrian railways could allow them, in combination with the buying of season cards for a month or a year, the free use of the service stations.

7.2.2 Awareness raising, information and promotion measures

7.2.2.1 Regional/local mobility offices

A) Initial situation in Carinthia

By order the Carinthian government the Verkehrsverbund Kärnten GmbH is responsible for the organisation of the public transport in Carinthia.

The planning of new regional traffic concepts and the development of modern infrastructures belong to the central tasks of the Verkehrsverbund GmbH.
For the general passenger's information the single traffic enterprises are responsible themselves. The information of the passengers is moved mostly centrally and more or less independently of each other.
Besides, big enterprises help themselves of central solutions like the ÖBB call centre in Vienna. Regional suppliers serve informmation about the Internet and have partially information centres (public transport Klagenfurt - Heiligengeistplatz).
However, for rural population without Internet access it is hard to get bundled information about the public transport in general.

B) Organisation of a local mobility centre

The mobility centre should be built up on the basis of a wide cooperation. Possible cooperation partners would be[21]:

- Traffic enterprises
- Tourism
- Regional management
- Völkermarkt city
- Municipalities
- Welfare association
- Verkehrsverbund Carinthia
- etc.

Mobility head offices are a necessity in order to establish an effective and soft mobility in the region. The establishment of a mobility centre is an important requirement to promote the alternatives to private cars. Besides the journey being too long, with often confusing routes and poor coverage of areas, the lack of information often presents insurmountable hurdles for possible passengers of the public transport. So tourists and local people need competent and easily called upon information in the sense of a “door to door travel advice” which must be available at a counter as also by telephone or internet. Apart from the task of answering all questions about mobility (e.g. timetable information, individual travel advice, transportation connections, bicycle rentals, car sharing etc.) the mobility centre should take over the function of a regional competence centre in mobility, transportation as well as tourism and nature conservation.

[21] In discussion with Putzl J. (Verkehrsverbund Kärnten GmbH) – note for the file;

C) Duties and responsibilities

In the interest of a local consultation of the passengers existing sales places or already existing information / service centres (municipality, post, tourism office...) can be used.

The extent of the mobility consultation could be differentiated case by case and could be established step by step. The expenditure and the costs linked with the information bureau are linked with the available personnel resources.

If the personnel resources do not exist or the costs are too high for a customer friendly business flow (opening times), so-called "MobilAgents" could be also entrusted with the consultation (for free telephone and Internet access the consultation delivers the information service for free).

In particular the mobility centres have the following functions[22]:

- Timetable and rate information to all kinds of public transportation in the region
- Carsharing
- Rent a car, (e-) bicycle, scooter, segway (fun e-vehicles) etc.
- to **inform and put on the market the current offers as also the supplementary ones** in the region (e.g. car-free holidays, mobility passes, car sharing, (e-) bicycle rentals)
- to answer promptly and competently questions about environmental-friendly mobility (individual and as is required)
- to offer instructions and courses in the sphere of soft mobility
- to **advise businesses, municipalities and other organizations** about soft and environmental-friendly mobility (e-mobility, public transport and services, …)
- to do **lobby work for the public transport system and soft mobility** in the region and continually work on their improvement.
- tourism information, regional leaflets
- Carinthian card shop
- Individual mobility planning with public transfer (vacation, excursions, …)
- Train and bus booking service

In Germany there are already over 40 mobility centres (e.g. in Bochum, Cottbus, Münster, Wuppertal, etc.), for which joint quality standards have been developed. Graz was the first city in Austria which set up a mobility centre.

In the meantime there are mobility centres in other provinces, e.g. in Salzburg and in Burgenland. These have been very well accepted and have led to a better use of public transport and other alternatives to private car transport.

[22] Schmidtmann 2007

The province of Carinthia is planning to set up a mobility centre in combination with mobility service stations in the regions under an assisted project ("Access") within an EU programme "Alpine Space". The co-ordination will be carried out by the **linked transport system** of Carinthia. At a first meeting, a concerted action regarding the regional service stations was agreed upon between the regional management of southern Carinthia / Karawanken and the transport system.

From the point of view of the region, Völkermarkt and/or the railway station Kühnsdorf, as the junction of public transport, would be an ideal location for these service stations. Here not only the local trains and in the future long distance trains, but also the various post bus routes are connected with one another. Also this railway station is only a few kilometres from the tourist area of Klopeiner See and Turnersee. At the same time (e-) cycle rental, car sharing and similar offers, especially for tourists could be placed here as it brings an ideal combination with the mobility centre. However it is important that the main regional office is complemented by further sub service stations. Mobility advice centres could be integrated in existing institutions like municipalities and tourist information centres.

The implemented project in Germany *"aufdemland.mobil"* goes further and is following a new form of spreading information which relies on these pillars:

- bus stops
- restaurants
- regional internet portals and
- mobility guidance in local schools and firms

In recent years the idea of **"rural service stations"** has been developed in the sense of the new organization of a productive provision, in particular for outlying rural areas which suffer from little infrastructure. Here it concerns local locations which combine a large number of services and so they can become the central service station for their surrounding areas. The spectrum includes a fundamental performance in the following sectors:

- **mobility offers**
  -information, ticket sales, vehicle rentals
- **tourism offers**
  -information, selling / booking, events service
- **regional products**
  -regional articles for consumption and handwork products, restaurants and other eating places
- **other services**
  -libraries/reading corners, carrying out of event and locality

7.2.2.2 Publicity work / awareness of ideas

Cars have become an absolutely dominant mean of transport in daily traffic everywhere and in particular in the rural districts of highly developed industrial countries as in the Alliance Region. Public transport, cycling, combined means of transport and other alternatives have little value as far as image in the general consciousness of the local people. Travelling by car has become so deeply rooted that the personal mobility needs of each single alternative are hardly considered. Experiences from the current projects in the region, for example the establishment of the electro-charging station in Völkermarkt, the purchase of an electro-car for the regional group respectively for Sittersdorf and the electro-bike project "E-Na-Tour", show that electro mobility has caused a big media interest and the development has also been closely followed by the locals. The new vehicles and their technology are the target of this interest rather than the basic assessment of soft mobility and the attitude of the individual towards mobility. A fundamental strategy is to achieve more consciousness of the ideas and concept of soft mobility through the general interest in electro-vehicles.

Communication and information are important bases when the movement habits of the population should be influenced. The positive elements like the improvement of living quality, raising the pleasure (reading in the train, no stress in traffic jams, movement in the fresh air etc.) personal advantages when using more environmental-friendly transport (or eco-transport) should also play an important part as well as the environmental aspect. The offers should appeal to a possibly wide part of the population and be open for everyone:

"Pleasure instead of frustration when on the way"

The basis of soft mobility could, for example, be imparted at events and workshops. But one must take care that not only the 'dry' theory is imparted but all senses should be addressed, in that a practical part in the form of a demonstration and the trying out of alternative vehicles is integrated. These events and courses should not only address the interested public, but also be specifically offered to particular relevant groups. Here are those of particular interest:

- tourist firms
- schools
- municipalities
- public locations

The realization of representative projects which are good examples are of essential meaning for the attention of the public to make them take part and to copy them. Here the publicity must make sure that such projects become known and thus accepted by the general public.

It is for example very probable that the increased use of electro-bikes by tourists will encourage the locals to leave their cars at home and do their small errands by bike or e-bike.

7.2.2.3 Model projects and promotion measures

The realization of model projects together with the specific financial assistance of activities, measures and investment are an absolute necessity for the development of soft mobility in the region. The following list does not claim to be complete and should only give a general view over the spectrum of suggestive measures in this sphere.

Mobility package for car-free tourism

A first step for an attractive car-free tourist mobile offer was taken in the year 2008 when the project "E-Na-Tour: e-biking to the protected areas of the region" was developed. There are other attempts in the region where single efforts are being made to encourage car-free tourism. In the last few years several hotels around Klopeiner See have been offering all inclusive holidays together with Austrian railways (journey by train) which include a pick-up service between station and hotel.

These offers should be developed further. They have been successfully carried out for years in several Austrian tourist areas and also in other European countries.

Important components of alternative mobility offers for car-free tourism are for example[23]:

- train journey with a shuttle service to and from the railway station
- mobility pass for the use of all public transport in the region and further services (e.g. cheaper taxi tariffs, bus trips to excursion destinations, use of alternative means of transport)
- provision of an e-bicycle or e-scooter for the duration of the stay

It has been proved successful to offer these services as all-inclusive offers. Similarly, in the exemplary municipality of Werfenweng in Salzburg where those holidaymakers who arrive in their private cars deliberately choose not to use their cars as they are given a mobility-pass or have the use of an e-bike in exchange for their car keys[24].

Particularly suitable for alternative mobility offers is the section which offers "Holidays on the Farm", where relaxation amid nature experiences is the central point away from the hustle and bustle of everyday life. It can be presumed that these guests are particularly receptive to, for instance, the e-bike, with which one is out in the fresh air, and despite the mountainous

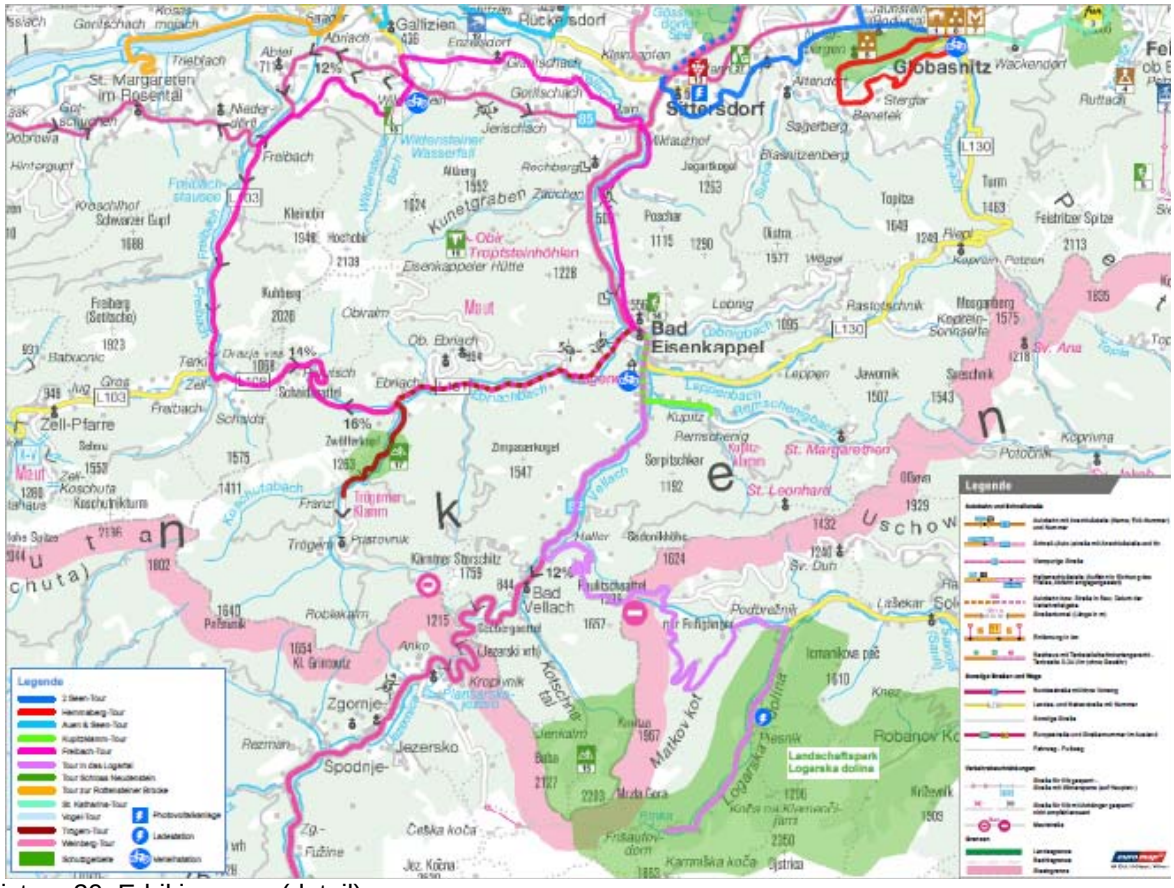
[23] Ibesich 2009

[24] This applies to guests who don't travel by train but by car.

terrain has a relatively large active radius without having to strain oneself too much physically, and all that with a “good environmental conscience.”

The mobility package for car-free tourism (holiday without a car) should be developed and solicited as an independent line of offers. For this there must be close co-operation between the tourist enterprises and the transport services. The tourist enterprises should form an association, a working team, or something similar to achieve higher cost efficiency and to present a joint effort on the tourism market. For example costs could be reduced by the joint purchase of e-bikes and the offer of “Holidays without a Car” would be more efficiently marketed.

The first step is already done in the region by developing an e-biking-map in co-operation with the tourism agency, municipalities, restaurants, accommodations and several service partners (see following map).



Picture 20: E-biking map (detail)
Source: Plaimer / Unglaub 2009

Picture 21: E-biking map (cover and flipside)
Source: Plaimer / Unglaub 2009

In picture 20 five recommended e-biking tracks for touristic purposes are obvious. Additional

- three e-bike rental places (Gallizien, Globasnitz, Eisenkappel)
- four battery and/or reloading stations (Gallizien, Globasnitz, Eisenkappel and Logar valley in Slovenia)
- the PV-plant in Sittersdorf, which was established for the additional electricity demand caused by e-mobility

are pointed out. Beyond that a detailed description of the tracks, the natural sites and all important partners (service stations, restaurants, medical centres, tourist offices etc.) are listed. In the map a detailed (easy to understand) instruction how to use an e-bike is mentioned as well.

An important impulse could also come from the Alliance Region becoming a member of the "Alpine Pearls". This title for effective management in tourist mobility for Alpine destinations was originally thought to be for single communities. The Alliance Region could possibly be the first region to become a member and so would achieve an interesting exclusive position in the Alps.

Combination of traffic

Both park and ride at the regional railway stations and the possibility of taking a bicycle on the train is for travellers in the central Carinthian area, in particular season-ticket holders**,** an interesting alternative to using one's own car. This environmentally friendly form of commuter transport should be promoted and solicited. In addition the available capacity for transporting bikes on trains must be increased by Austrian Railways.

A season ticket for e-scooter and e-car drivers combined with a "park & charge" parking space at the stations should be offered to promote electro-mobility.

Acquiring of electro-vehicles

In the sphere of a car-free tourism mobility package vehicles with electro impulse should be used. Thus, for example, small buses (9 seats) could be used for the shuttle-bus service between the station and accommodation, or for day trips. The purchase of a small electro-bus has already been planned for the hotel project “Campus futura” in Bleiburg.

In Austria there are also several local authorities who use e-cars as utility and service vehicles. The latest example in Carinthia is the community of Kötschach-Mauthen which has bought a small truck.

In 2008 a second-hand electric Citroen Saxo was bought by the council of Sittersdorf. At the moment a concept is being worked out as to how this vehicle can be used most effectively for public or private use (in addition to the official trips by the employees of the council its use in the social sphere is in consideration, e.g. a taxi service for elderly and frail people on a voluntary basis).

7.3 Organisation structure and strategy

A successful and efficient promotion and development of soft solar electric mobility calls for the close co-operation of all those involved within the region and also the inclusion of supra-regional partners as the realization of a highly complex scheme is being dealt with.

The most important participants for the realization of soft solar electric mobility are:

- municipalities and regional management
- (local) energy providers
- tourism enterprises / other firms
- environmental organisations including transport enterprises
- tourism associations
- official and private transport firms / transport system of Carinthia
- car branch (manufacturers, sales, service)
- external experts

Should the idea of soft solar electric mobility establish itself to a leading strategy for the region, the necessary organisation structure could be developed to realize this, best with public financial assistance for strategical projects. In this case the climate and energy foundation of the federal government provides funds for projects whose focal point is “climate and energy model regions”. Other assistance ways are possible but cannot be entered in detail here.

To note is, and this is shown by numerous examples from other model regions, that a successful strategy to realize innovative concepts is supported by three pillars which must be equally followed parallel to one another:

1. The realization of noticeable model projects and single measures as motivation proof of the possibility of carrying it out for all participants and the public
2. The working out of a tried masterplan and concrete realization strategies from the region
3. The development of a transparent organisation structure which includes all participants with respective decisioncompetency

The parallel development of all three components is important because, if done individually, the working out of a master plan and development from organization structure (before a single project can be carried out) can lead to the whole process faltering. Complicated plans and discussion processes resulting from a missing general visibility could put many participants off. When realizing a project without a previously prepared total concept it is very important to see that the proposed measurements are clear and obviously within the basic idea of the total concept.
The Alliance Region of Southern Carinthia / Karawanken has the advantage over many other regions that the pilot project has already been carried out or is now being done and so only the two other components need to be worked out.

7.4 Cost calculation

Reflecting the market situation and already running projects (national and international) a rough approach should take place. The project should be calculated on the one hand, and on the other hand it should be defined, in which dimension a regional initiative could save CO_2 emissions. The realisation should happen within the next 5 years. Each position discussed in this chapter should be divided in two scenarios.

- A: **Moderate scenario** - should describe a realistic case but based on a consequent strategy in the regional development; extra money must be invested (additional investments), the regional co-operation is straight oriented on mobility goals; national subsidies and governmental support are necessary; public and regional projects will be realized;
- B: **Minimum scenario**: regional goals are defined, but no additional money is available; single and isolated projects are dealing with mobility; no support from national (governmental) institutions; the level of co-operation is rather low; things are going on without an exact strategy; the activities are concentrated on private level;

7.4.1 E-power-stations

Considering chapter 7.2.1 the improvement and setting up of the needed infrastructure is discussed. In picture 14 the relevant e-power-stations (eps) are located.

There are three versions of eps - "light", -"intelligent" and the eps-“box” www.lebensland.com, 14.10.2009)

- Eps "light" - variation offers a child proof-lock, but no utilities for authentication and payment are foreseen; this version is for enterprises or municipalities who want to offer a special service to their employees or inhabitants, without paying;
- Eps "intelligent" – as above but with 4 outlets, a screen and a reading module RFID and is suitable very well for the public or private use.
- Eps “box” – small solution with one outlet, flexible fitting on the wall;

Costs: eps including electric equipment and control; fundaments, mounting, information platform, costs for grid-connection, trenching; exclusive additional parking places if necessary;

Eps box: 370,- netto (C_b) Eps light: 4.000,- (C_l) Eps intelligent: 7.000,-(C_i)

Regional needs:
Scenario A: 55 eps (20 intelligent x_i, 15 light x_l and 20 boxes x_b) until 2015
Scenario B: 20 eps light x_{lb} (see picture 14)
Estimated expenses:

A: $Costs_{total} = x_i * C_i + x_l * C_l + C_b * x_b$ = 20*7.000,- + 15*4.000,- + 20*370 = **207.400,-**
B: $Costs_{total} = x_{lb} * C_l$ = 20*4.000,- = **80.000,-**

The costs are relevant for the next five years and should be divided over this period (see table 11)

7.4.2 PV-plants

The number of pv-plants is linked to the additional need of energy, which must be covered by renewable and regional energy sources. The additional energy should be produced only by PV (assumption).

Additional energy needs:

43056 inhabitants are living in **16280 households** (see table 1); in the district of Völkermarkt **25065 cars are registered**[25]; the difference between households and registered cars gives a rough number of "second-cars" - that means **8785 second-cars** could be assumed; in the next five years the e-car market will start up, and the first e-cars will be well (A) or poorly (B) accepted;

Assumption: Number of second cars in the region = $cars_{registered}$ – households = **8785 cars**

Considering figure 8 about 55% of all inhabitants will buy a new car within the next five years; the focus is concentrated on the second-cars, registered in Völkermarkt;

Assumption: **out of 8785 second-cars 25 % of the owners will compensate their old conventional car with an e-car in the next 5 years;** **A**: 25 % out of 8785 will be e-cars = **2196 e-cars** will drive end of 2015 **B**: 5 % = **439 e-cars**

It is also possible, that in the next 5 years an e-car could be easily used as a "main-car", not only the number of second-cars would be crucial. In the following, this estimation is not considered.

Additional energy demand (AED): caused by e-cars running until 2015

Assumption: e-car km / year = á **14.000 km / year**

Assumption: energy kWh / 100 km = á **16 kWh / 100 km**

$AED_{kWh/e\text{-}car/year}$ **= 14000 km / year * 16 kWh / 100 km = 2240 kWh / e-car / year**
additional energy demand for one e-car / year

=>	A:	$AED_A = 2196_{e\text{-}cars} * 2240_{kWh/e\text{-}car/year}$ =	4.919.040 kWh / year
=>	B:	$AED_B = 439_{e\text{-}cars} * 2240_{kWh/e\text{-}car/year}$ =	983.360 kWh / year

PV-plant: estimated production (kWh) in South Carinthia / kW_{peak} / year and dependend on montage

- 800 kWh/kW_{peak} (façade, horizontal montage)
- 1000 kWh/kW_{peak} (30º south)
- 1300 kWh/kW_{peak} (tracking system, 2-axis)

Assumption: 1000 kWh / kW_{peak} as average value ($e_{kWh/kW)}$)

[25] Source: Statistik Austria, Kraftfahrzeuge Kfz-Bestand 2008

PV-plants needed until 2015 ($PV_{A/B\ kWpeak}$):

A: $PV_{A\_kWpeak} = AED_A / (e_{kWh/kW)}) = 4.919.040\ _{kWh\ /\ year} / 1000\ kWh / kW_{peak} = \pm 4900\ kW_{peak}$ PV
B: $PV_{B\_\ kWpeak\ =} AED_B / (e_{kWh/kW)}) = 983.360\ _{kWh\ /\ year} / 1000\ kWh / kW_{peak} = \pm 1000\ kW_{peak}$ PV

approximately 10 m^2 module surface is needed for one kW_{peak}

49.000 m^2 are needed (!) for the moderate scenario A[26]

Calculated costs / kW_{peak} (including VAT): 4000,-/kW_{peak_pv}[27]

A: PV $costs_{total} = PV_{A\_kWpeak} * costs_{calculated/kW}$ = 4900 * 4.000,- = € 19.600.000,-
B: PV $costs_{total} = PV_{B\_kWpeak} * costs_{calculated/kW}$ = 1000 * 4.000,- = € 4.000.000,-

7.4.3 Traffic infrastructure

In picture 14 the most important investments in new bicycle routes (green lines) are worked out. About 25 km should be built in the next five years.

Calculated costs / m (including VAT): € 300,-/m

A: Costs of traffic infrastructure = 25000 m * 300,- = € 7.500.000,-
B: nothing will be built (no costs)

No other infrastructure is planed (e.g. parking lots etc.) because with the increase of e-mobility the demand of additional traffic infrastructure (conventional cars) will stagnate!

7.4.4 Additional infrastructure

Only in the moderate scenario the regional investments will take place. The development of an energy-region based on e-mobility needs additional investments:

- Sign posting etc. € 100.000,-
- Education: development of an education centre[28] € 75.000,-
- Information centre (mobility service centre), see 7.2.2.1 € 100.000,-
  Including networking system, rebuilding, office equipment, excluding running costs (personal, ….)

Sum € 275.000,-

In the minimal scenario (B) no cost will occur!

[26] That means about 500 plants with 100 m^2 distributed in the region; realistic approach – see Bavaria;
[27] Costs are high estemated at present level in Austria (in Germany already 3.000,-/kW_{peak} possible); included are insurance, permissions, digging, unforeseeable costs etc.
[28] See http://www.jufa.at/62.htm (09.09.2009)

7.4.5 E-vehicles

E-cars: average costs € 25.000,-/car[29](gross) are assumed

A: E-car $costs_A$ = 2196 * 25.000,- = € 54.900.000,-

B: E-car $costs_B$ = 439 * 25.000,- = € 10.975.000,-

E-scooter

1864 scooter are running in the district of Völkermarkt[30]!

Assumptions: 50 % of the owners will buy a new one within the next 5 years – and 50 % will buy an e-scooter (additional subsidies up to € 500,- are available) and additional need caused by increasing awareness, events, information, changes in individual mobility behaviour and new products could be assumed;

=> 466 new scooters compensating conventional scooters

=> and circa the same number for "rookies"

=> end of 2015 about 1000 e-scooter will be registered

=> average costs € 2.500,- / e-scooter (gross) are assumed

A: E-scooter $costs_A$ = 1000 * 2.500,- = € 2.500.000,-

B: E-scooter $costs_B$ = 300 * 2.500,- = € 750.000,- (two-thirds less than A)

E-bicycles

The definition of an outlook concerning e-bicycles is quite difficult. Just on the basis of first regional experiences (see 6.2.1.1 and 7.2.2.3) combined with statements of experts at Eurobike 2009[31] some conclusions could be taken:

- Demand increases
- Several products with high quality are already available
- Interesting for special tourism offers
- Target groups: handicapped and older people, groups, families
- Alternative for every day trips

With ten e-bicycles the test phase of practicability within the Alliance Region is already finished. The feedbacks of users was partly enthusiastic, residents and tourists got the chance to rent the bikes for day trips (see picture 20 and 21). Tourism agencies, enterprises and public institutions will enlarge/extend their offers, in public the general awareness (level) and acceptance will increase.

[29] An additional approach could be just to consider the extra costs of e-cars compared with conventional cars.
[30] Source: Statistik Austria, Kraftfahrzeuge Kfz-Bestand 2008
[31] See www.eurobike-show.de (04.10.2009)

In Carinthia 590 out of 1000 households have at least one bicycle[32]. The result of a bicycle-survey done by VCÖ says that 23 % of the interview partners are interested in e-bikes. 11 % will buy a new bike[33]. Deducing from this data a rough estimation for the Alliance Region could be done:
16280 households in the region ownes 9605 bikes that means 1056 new bikes/year (11%)

- A: 5 % of new bikes will be e-bikes and demand will increase up to 20 % until 2015 (supported by buying packages and subsidies, information and awareness, health initiatives etc.) – average percentage ± 12 % over 5 years (126 new e-bicycles / year)
- B: 3 % up to 10 % (± 5 %) (53 new e-bicycles / year)

Average costs € 1.500,- / e-bicycle (gross) are assumed;

A: E-bicycle $costs_A$ = 1056*5*0,12 % *1.500,- = € 950.400,- respectively
B: E-bicycle $costs_B$ = 1056*5*0,05 % *1.500,- = € 396.000,-

Others

Other (fun-) vehicles are not mentioned here, because these vehicles will not compensate trips with a conventional car or scooter; just for fun is of course relevant in the field of increasing the awareness, but CO_2 savings are not relevant;

7.4.6 Miscellaneous

For the realisation period of 5 years additional cost units must be taken into account:

- External services: experts, moderation, further research and development
  => 35.000,-/year => € 175.000,-
- Network and education: synergies and co-operation with public transport, development of education programs etc. => 20.000,-/year => € 100.000,-
- Public relation: brochures, tourism package development, events, press, tests of e-vehicles etc. => 25.000,-/year => € 125.000,-

SUM € 400.000,-

No accompanying measures will be done in scenario B!

[32] Source: Statistik Austria VCÖ 2009
[33] Source: VCÖ 2009

The summarisation of all costs is listed below:

Table 11: Costs of change (€)

	A moderate szenario			B minimum szenario		
	2010-2011	2012-2013	2014-2015	2010-2011	2012-2013	2014-2015
construction						
E-power-stations	30.000	70.000	107.400	10.000	40.000	30.000
PV-plants (siehe Ausschreibung)	600.000	7.000.000	12.000.000	200.000	1.200.000	2.600.000
traffic infrastructur	1.500.000	3.000.000	3.000.000	-	-	-
information signs	25.000	60.000	15.000	-	-	-
education centre	50.000	25.000	-	-	-	-
mobility centre	100.000	-	-	-	-	-
e-vehicles						
e-cars	900.000	20.000.000	34.000.000	75.000	3.900.000	7.000.000
e-scooter	200.000	1.300.000	2.000.000	150.000	250.000	350.000
e-bicycles	150.000	300.000	500.000	50.000	120.000	226.000
others	-	-	-	-	-	-
external services						
experts	35.000	35.000	35.000	-	-	-
network and education						
public traffic co-ordination						
education programs	20.000	20.000	20.000	-	-	-
public relation						
PR & information	25.000	25.000	25.000	-	-	-
SUM	3.610.000	31.835.000	51.702.400	485.000	5.510.000	10.206.000
			A **87.147.400**		B	**16.201.000**

Scenario A will cause 87 million Euro (including private and public expenses) and scenario B will cost approximately 16 million Euro. It should be taken into account that all investments related to e-mobility were considered, so that for the next 25 years no extra costs will occur (except for vehicles and renewable energy sources).

7.5 Cost reductions and compensations

E-vehicles:

a) Concerning e-cars only the extra cost could be calculated

Assumption: e-cars will generate 20 % extra costs compared with a conventional car:

A: extra $costs_{e\text{-}cars\_A}$ = 54.900.000,- * 20 % = € 10.980.000,- (€ 43.920.000,- reduction)

B: extra $costs_{e\text{-}cars\_B}$ = 10.975.000,- * 20 % = € 2.195.000,-

b) Concerning e-scooters: 30 % extra costs

A: extra $costs_{e\text{-}scooter\_A}$ = 2.500.000,- * 30 % = € 750.000,- (€ 1.750.000,- reduction)

B: extra $costs_{e\text{-}scooter\_B}$ = 750.000,- * 30 % = € 225.000,-

c) Concerning e-bicycles: 30 % extra costs

A: extra $costs_{e\text{-}bicycles\_A}$ = 950.400,- * 30 % = ± € 285.000,- (€ 665.400,- reduction)

B: extra $costs_{e\text{-}bicycles\_B}$ = 396.000,- * 30 % = ± € 118.800,-

Sum of cost reduction related to e-vehicles: € 46.335.400,- (scenarion A)

Tax savings:

	2010-2011	2012-2013	2014-2015
number of cars	36	836	2196
costs/year/car 205,-	14760	342760	900360
running time e-car 10 years	73800	1640000	2788000
sum of tax savings			**€ 4.501.800,-**

Fuel savings:

Assumption: e-power: 16 kWh / 100 km will cost € 3,20; (20 €Cent / kWh)

6l fossil fuel / 100 km will cost € 7,20 (€ 1,2 / l)

fuel savings (only cars)	2010-2011	2012-2013	2014-2015
number of cars	36	836	2196
km/year (14000km/car)	504000	11704000	30744000
costs of fossil fuel	36288	842688	2213568
costs of e-power	16128	374528	983808
difference	20160	468160	1229760
fuel savings total			**€ 1.718.080,-**

E-power income:

Assumption: 10€Cent / kWh (additional e-power rates are not assumed)!

e-power income (PV)	2010-2011	2012-2013	2014-2015
kW installed	150	1900	4900
income (1000 kWh/kW)	30000	380000	980000
income until 2015			**1390000**
income over running time 2010-2020 (20 years)			**8250000**

Summarisation:

Scenario A

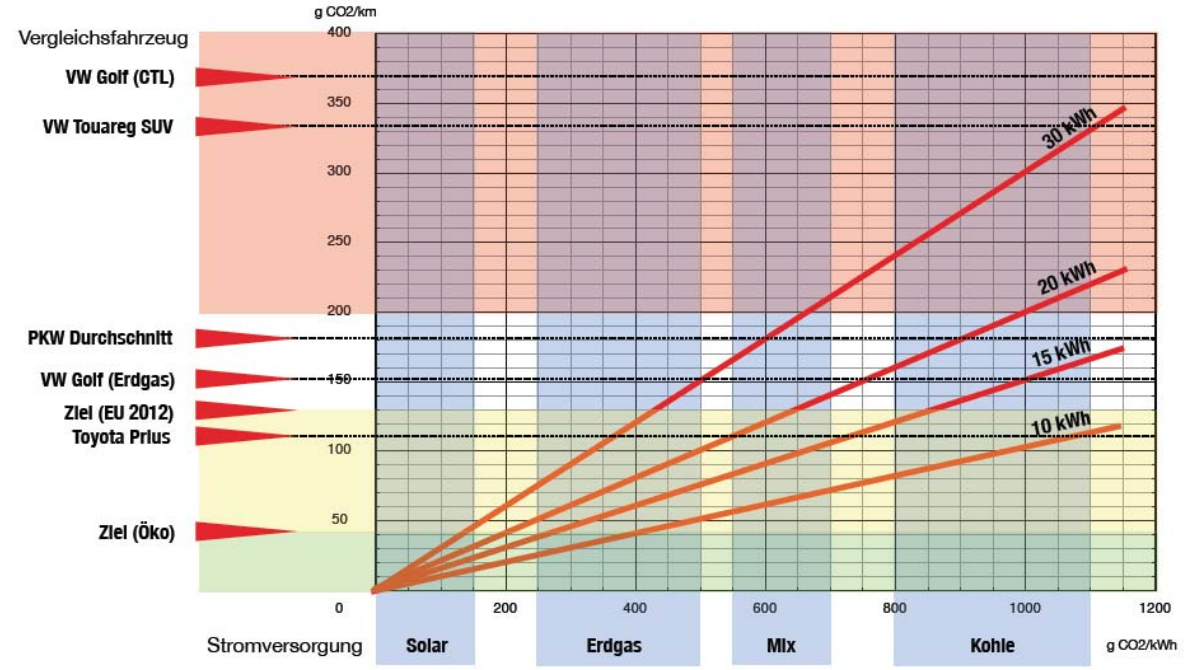
total investments	**87.147.400,00 €**
e-vehicles	46.335.400,00 €
tax savings	4.501.800,00 €
fuel savings	1.718.080,00 €
e-power income	8.250.000,00 €
additional e-mobility costs	**26.342.120,00 €**

Considering cost reductions and compensations the total investment costs of private and public institutions will amount 26 million Euro until 2015, if the return of investments (running time of e-vehicles and PV-plants) will be considered. The extra cost of e-scooters and e-bicycles compared to conventional vehicles is not taken into account.

However, the high investment is needed to initiate a process which will support a sustainable development of mobility and to increase public awareness with regard to an individual change of mobility behaviour.

7.6 CO_2 reduction

A detailed discussion on this question in the frame of this work (energy mix, emission factor etc.) is not possible. A rough overview should give picture 22.



Picture 22: CO_2 emissions in comparison with e-cars
Source: Deutsche Gesellschaft für Sonnenenergie, DGS

The CO_2 emissions per kilometre (Y axis) of an electric car are depending on the CO_2 emission of the respective energy provider (x axis). According to specific power consumption per 100 km (red lines) the CO_2 emission can be estimated for a certain e-car and energy provider.

On the left side along the Y axis the CO_2-emission value is applied per kilometre (EU objective for 2012 amounts to 130g/km).

For conventional vehicles, as for example a VW GOLF, a different output arises according to fuel (natural gas approx. 150 g/km, liquefied coal (CTL) approx. 370 g/km)

With electric vehicles the output depends on the one hand on the power consumption (red lines). E-vehicles require between 10 and 20 kWh per 100 kilometres. On the other hand the respective power stations play a determining role. Their CO_2 emission related to 1 kWh electricity is outlined on the X axis.

A car with 15 kWh power consumation/100 km could fulfil the EU-limit (130g/km) also with electricity generated by coal.

For detailed and further information see the Global Emission Model of Integrated Systems, called GEMIS (Umweltbundesamt, 2009).

However, e-mobility will play a dominant factor, if the additional need of energy is produced by renewable sources (in the Alliance Region 100 % by PV)[34]. Concentrated on the region and the defined assumptions in chapter 7.4 the reductions are devided on e-cars, e-scooter and e-bicycles compared with a middle class conventional car (c-car) with 130g/100km. Savings could only be relevant, if the tour is compensated by e-drive (definitely relevant with e-bicycles). The numbers of e-vehicles were estimated in chapter 7.4.

- **e-car versus c-car**

assumption: e-car emission 30g/km (PV see picture 22), 100 % instead of using c-car with 130g/km CO_2 emission

	2010-2011	2012-2013	2014-2015
number of cars	36	836	2196
km/year (14000km/car)	504000	11704000	30744000
e-car emission (0,03kg/km)	15120	351120	922320
c-car emission (0,13kg/km)	65520	1521520	3996720
CO_2 reduction	50400	1170400	3074400
total (tons)			**4.295,20**

Minimal scenario B: 887,60 tons

- **e-scooter versus c-car**

assumption: 3500 km/year, 70 % instead of using the c-car; CO_2 emission 30g/km (PV)

	2010-2011	2012-2013	2014-2015
number of e-scooter	200	600	1000
km/year (2450km/scooter)	490000	1470000	2450000
e-scooter emission (0,03kg/km)	14700	44100	73500
c-car emission (0,13kg/km)	63700	191100	318500
CO_2 reduction	49000	147000	245000
total (tons)			**441,00**

Minimal scenario B: 122,50 to

- **e-bicycle versus c-car**

assumption: a weekly shopping, distance 4 km and instead of using the car; CO_2 emission 30g/km (PV)

	2010-2011	2012-2013	2014-2015
number of e-bicycles	252	504	756
km/year (208km/bicycle)	52416	104832	157248
e-scooter emission (0,03kg/km)	1572,48	3144,96	4717,44
c-car emission (0,13kg/km)	6814,08	13628,16	20442,24
CO_2 reduction	5241,6	10483,2	15724,8
total (tons)			**31,45**

Minimal scenario B: 13,23 to

Total CO_2 reduction within 5 years of moderate initatives could be about 4.767,65 tons;

[34] VCÖ 2009

8. National and international programs on E-Mobility

8.1 National activities

8.1.1 Werfenweng

The support of a car-free and sustainable tourism is the aim of Werfenweng/A, also part of a regional mobility concept in Pongau, organised by local mobilty office, called Mobilito and located in Bischofshofen. The municipality has 280 inhabitants, tourism and agriculture are the main sources of income;

Tourists who arrive by train or leave the car key at the hotel can use ecologically friendly transport systems for free. The soft mobil offer called SAMO includes a private taxi driver who presents his service within the village free of charge. Additional e-cars, bicycles and horse carriages can be lent. A „Werfenweng-Shuttle“ carries guests and locals within Salzburg and pick up guests from the railway station also for free.

Several e-vehicles are available, e.g. e-vehicles just for fun:

Arrow 1-2 persons; Bigá 1 person; Fun Rider e-bicycle; Alpine-Flyer, a special e-bicycle; Village-Velo with three wheels, 2-3 persons; Twip, e-vehicle for one person; E-Scooter; Segway and E-Frizzi, e-car for 6 persons;

Not only e-vehicles also cars with hybrid and biogas technology are used. So a complete offer could be arranged.

Project results:

In 2000 about 1123 "SAMO keys" were distributed, in 2002 the number increased up to more than 3000. These are approx. 10% of all guests. SAMO also makes the journey by train attractive: In 1999 12% of the guests arrived by train, in 2002 already 25%[35];

Werfenweng is on the way to being a self-sufficient energy region.

With a wind generator and pv-plant sustainable energy is generated. With all activities attention is paid to the fact that the required raw materials are produced within the region.

Already 99 e-vehicles are operating (together with Bischofshofen);

Development of overnight stays: + 49,26 % in winter seasons between 1996/1997 until 2005/2006; + 3,56 % in summer season between 1997 until 2005;[36]

Environmental effects:

Triplication of the guests arriving by train between 1997 and 2001 (from 9 % up to 25 %), that means a reduction of 1.2 Mio km driven by car and a CO_2 reduction of 375 tons[37].

[35] Brandauer, 2009
[36] Holzer, 2009
[37] Holzer, 2009

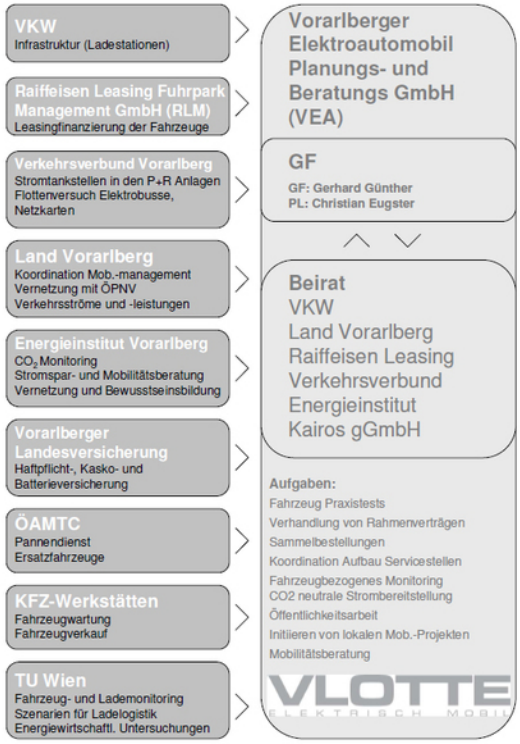
8.1.2 Vlotte

With a buget of about € 15 Mio. (30 % financed by Klima- und Energiefonds) an e-mobility region in the province of Voralberg is in realisation.

Targets:

Within the first year 2009 of the VLOTTE project, 100 electric vehicles and two e-busses will be in use. In doing so, profund experiences about practicability, consumption, cruising ranges, service costs, different accumulator technologies, the actual use in charging infrastructure as well as different car types and changes in mobility behaviour will be gained and evaluated[38].

In 2010 additional e-vehicles will be in use, the construction of PV plants (about 24.000 m^2) and/or 500 kW water power plants. About 40 new power stations, a research on fast charging possibilities and the planning of a mobility concept should be continued.



Picture 23: Vlotte – Structure and partners
Source: Vorarlberger Kraftwerke AG

VLOTTE - success factors:

Three advantages could be defined:

1. competence, knowledge, experience and public awareness are already present in a broad range; highest concentration of e5-initiatives; preliminary projects (minus99) etc.
2. high level of co-operation and willingness of common realisation (see picture 23) including the province of Vorarlberg (national strategy)
3. topography: eighty percent of the population lives in the Rhine Valley on 11 % of the province's land area. Although public transportation, pedestrians and cyclists are highly accepted (compared with the rest of Austria), people are still dependent on motorised, individual mobility.

However, the transferability is mainly dependent on the willingness of co-operation. Wherever a project like VLOTTE should be established, the degree of involved sectoral partners together with policy will define the success.

[38]Source: www.vlotte.at (22.10.2009)

8.2. International programs

8.2.1 Better Place

Better Place is maybe the most impressive initiative in establishing e-mobility in the world. A global network based in California (USA) includes Israel, Denmark, Canada, Japan and Australia. The activities and goals are divided in 6 work packages[39]:

- *E-cars:* The project team is currently working with the Renault-Nissan Alliance, which will be among the first to introduce EVs, and is also in discussion with major auto manufacturers around the world
- *Batteries:* With battery manufacturers such as A123 Systems and AESC a co-operation is fixed. Further advances in battery performance (including power, range, charge time, lifetime and cost) are expected as $1 billion per year is invested into lithium-ion battery research, with an increasing proportion going into automotive applications.
- *Charging:* Better Place intends to deploy charge spots at private homes, workplaces and public locations such as parking lots and streets. Additional a *battery switch stations* are designed to allow drivers on a long trip to switch a depleted battery for one with a full charge, in less time than it takes to fill a tank with gasoline
- *In-car service:* A new on-board software platform is developing that will provide subscribers with advanced navigation and other telematic services in their vehicles, thus creating an enhanced driving experience for the consumer.

Picture 24: Better Place In-car service
Source: Better Place

- *Energy:* The project will provide utility companies with energy demand management capabilities that can minimize charging requirements during peak electricity consumption hours by leveraging connectivity with the car and known user profiles.
- *Standards:* Establishing global standards will accelerate wide-spread adoption of EVs and positive driver experiences. The standardization of components such as electric plug connectors, communication protocols and battery modules are areas of focus.

[39] Source: www.betterplace.com (22.10.2009)

What's going on in Better Place?

Denmark:

In conjunction with DONG Energy (Danish Oil & Natural Gas), Better Place Denmark closed approximately €103 million Euro (770 million Danish Kroner) in equity and convertible debt for the initial deployment of their electric car charging network in Denmark.

Monday, 26 Jan 2009

Israel:

Better Place Israel signed an agreement with Jerusalem to begin the deployment of a charging infrastructure for electric cars in Jerusalem.

Monday, 20 Oct 2008

Australia:

AGL Engery will provide all of the renewable energy - from wind and other sources - needed to power the electric vehicles and work with Better Place to optimize the network. Macquarie (Australien Investment Group) will provide financial advice to help raise AUD $1 billion for the initial network build.

Thursday, 22 Oct 2009

Japan:

With funding from Japan's Ministry of Economy, Trade and Industry's Natrual Resources and Energy Agency, Better Place is partnering with Tokyo's largest taxi operator. Tokyo has approximately 60,000 taxis.

Tuesday, 08 Sep 2009

Canada:

Ontario is aiming to transition its auto sector for future growth from electric vehicle production. Working with Better Place, the Province of Ontario has become the first in Canada to take a step toward sustainable transportation with electric cars powered by renewable energy. It's a forward-looking move that reflects the provincial government's commitment to create jobs, strengthen an economy where the car industry represents a quarter of all manufacturing output, and end the use of coal-fired electricity by 2014. The collaboration will not only fuel economic growth in Ontario, which is home to about one in three Canadians, but it also will serve as a model for the rest of Canada.

Wednesday, 14 Jan 2009

Califorina (USA):

California has defined a plan for a sustainable transportation model in which state and local government are working in partnership with the private sector to move the state from greenhouse gas-emitting cars that run on fossil fuel, toward clean, electric cars fueled by

renewable energy, supported by an open network infrastructure. Better Place estimates the network investment in the Bay Area will total $1 billion when the system is fully deployed.

Wednesday, 19 Nov 2008

Hawaii (USA):

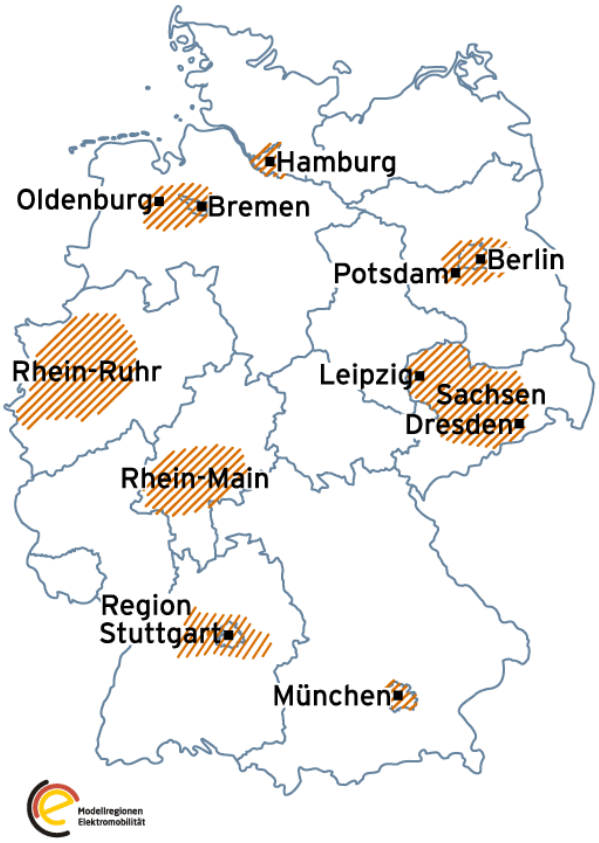
In many ways, Hawaii is already a trend-setter in the pursuit of energy independence: The state initiated the Hawaii Clean Energy Initiative, a renewable energy plan designed to encourage the growth of green technology infrastructure. In an announcement that extends the state's environmental leadership, Better Place will be partnering with Hawaii to make mass adoption of electric vehicles powered by renewable energy a reality in the state by 2012. The state's partnership with Better Place will play a significant role in the economic growth of Hawaii and will serve as a model for the rest of the U.S. for how green technology infrastructure can fuel job creation.

Monday, 01 Dec 2008

8.2.2 Germany

The Federal Government promotes with a total of 500 million Euros the construction and the market preparation of the electric mobility from 2009 to 2011.

Amongst others 8 regions are promoted with a total of 115 million Euros (out of the BMVBS program "Electric mobility in model regions"). Partners from science, industry and the involved local authority districts work closely to promote the construction of an infrastructure and the awareness of the electric mobility in the public space[40].



Picture 25: E-mobility regions in Germany
Source: BMVBS

[40] Source: Federal Ministry of Transport, Building and Urban Affairs (www.bmvbs.de), 22.10.2009

8.2.3 Urban examples

8.2.3.1 London

With the smart fortwo electric drive a pilot operation for a purely electrically driven vehicle already launched in 2007. In London, 100 first generation smart fortwo electric drive vehicles are being tested (leased) by public authorities such as the police, amongst others[41].

London was selected as the perfect test city due to its high population- and infrastructure-density, which has resulted in high traffic, parking shortages, severe noise and pollution. Participation in the project was first offered to companies that operate their own vehicle fleets and those who drive in inner city areas.

Picture 26: London's police drive electric
Source: Daimler AG

8.2.3.2 Berlin

With "e-mobility Berlin", Daimler and RWE have lunched a joint project for electric cars in Berlin. The initiative covers all components for the efficient use of battery-powered vehicles. As a part of the project, Daimler will supply more than 100 electric Merceds-Benz cars and will also take care of their maintenance. RWE will be responsible for the development, establishment and operation of the charging infrastructure with about 500 power charging points, as well as the power supply and central system control[42].

It is again a good example of what can be achieved when politics, energy suppliers and the automotive industry join forces.

The project is also being supported by the German Federal Government.

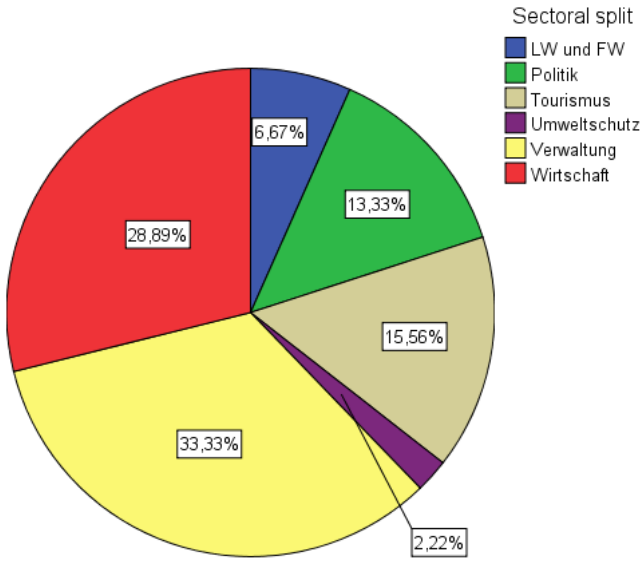
Picture 27: E-mobility Berlin
Source: Daimler AG

[41] Source: www.daimler.com (22.10.2009)
[42] Source: www.rwe-mobility.com (22.10.2009)

9. Analysis of the regional position related to e-mobility

The aim of the master thesis at hand is to realize the listed measures step by step. However the success of realisation depends mainly on the degree of regional understanding by opinion leaders and their willingness to support the ideas of the e-mobility concept.
Hence, a questionnaire “E-mobility - a chance of sustainable regional development?” was sent to regional decision makers (qualitative survey) to get a picture of the general acceptance and appreciation. Exact 60 questionnaires were sent out, the rate of return was at least 45 (75 %) because of the personal contact to the respondents. With the choice of the respondent attention was paid to the fact that all areas (sections) of everyday life are more or less presented. Additional it was important that institutions with creative and financial competences were involved. Figure 2 gives an overview out of which sectors the participants come from[43].

Figure 2: Sectoral split of respondent

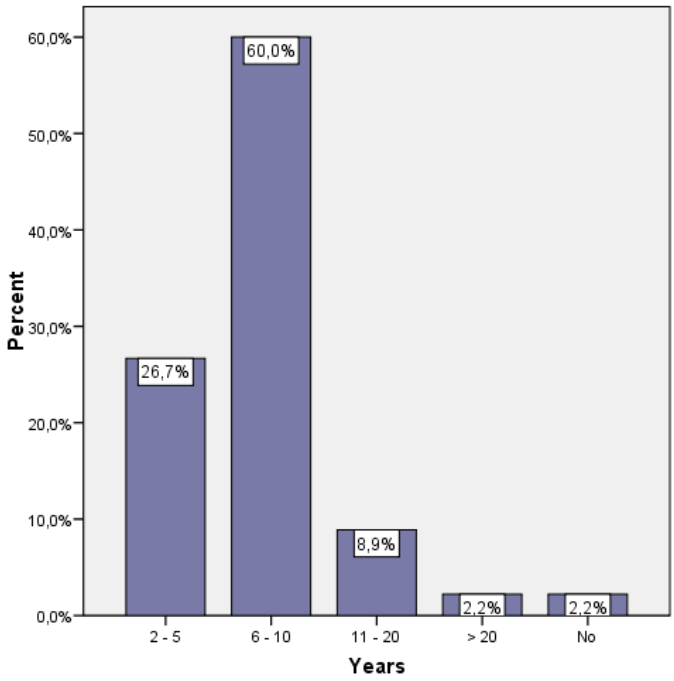


The sectors politics (mayors), administration (municipal chief officers), tourism (agencies, enterprises), economy, agriculture, nature protection are represented. Only out of the cultural sector no response is documented. However the most important partners and/or institutions in the field of regional management are involved. In the following the questions and the analysis are documented.

[43] Source of all figures in chapter 9: Plaimer 2009

1. Do you basically belief in a future of e-mobility? If so, in which time frame?

Figure 3: Belief in e-mobility

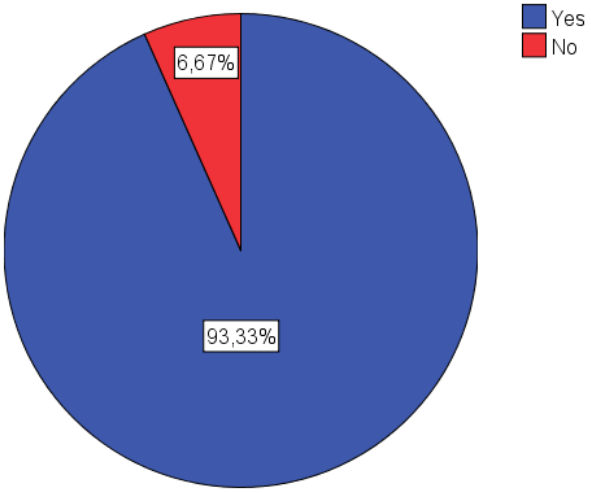


About 86 % of all respondents are convinced that e-mobilty will play a relevant role in the individual motorized transport within the next 10 years. But the mayority (60 %) is thinking that additional 5 years for developing the market is needed.

However, out of 45 persons just one does not believe in any chance of e-mobility!

2. Are regional basic approaches meanigful to increase the public awareness with its associated investments (e-service stations, photo-voltaic stations, e-vehicles, etc.) now?

Figure 4: Public sensitisation



No question, the broad majority confirm the opinion, that any activities should be done, which increases the public awareness on the topic. It is a clear signal that sustainable solutions for establishing the e-mobility at regional level should be done, although the market for electric vehicles still does not exist. The clear result could also be interpreted, that a bottom–up approach should give relevant impulse for the automotive industry to support new ideas on mobility. It is relevant to point out, that more than 90 % say, that the time of acting in different fields and levels is already attained. Activities like “lebensland Kärnten” or different support programs of Klimafonds are absolute on the right way, focusing the regional/municipality level (energy regions, infrastructure, …).

3. Independent of the e-mobility development – what could be done to reduce the regional individual traffic in an effective way - immediately, middle- and long-term or not realizable?

The figures of this question are summarized and attached in the annex.

Not only e-mobility can be the one and only solution of a sustainable mobility development. Regional concepts must integrate a mixture of different measures. It turns out, that mobility centres, bicycle and pedestrian infrastructure, events and any information activities should be done immediately.

The development of public transport, the acceptance of car sharing services, provisions by law could be relevant in the medium-term. More or less unrealistic and almost no chance of realization are measures linked to the change of the individual purchase behavior, the reconstruction of still existing traffic infrastructure (waste in landscape) and changes strongly influenced by law.

4. By reducing the running costs (fuel, insurance, taxes) would you accept an environmental issue in higher prices for a new e-car?

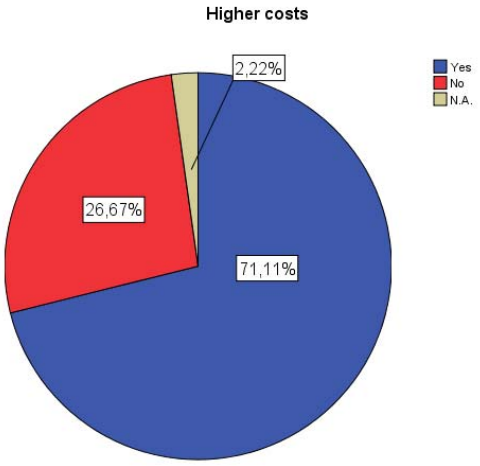


Figure 5: Acceptance on higher prices for e-cars

It is surprising, but more than 70 % agree on higher prices (costs of investment) when therefore the running cost will be lower.

Added question:

Should the more costs be compensated by subsidies?

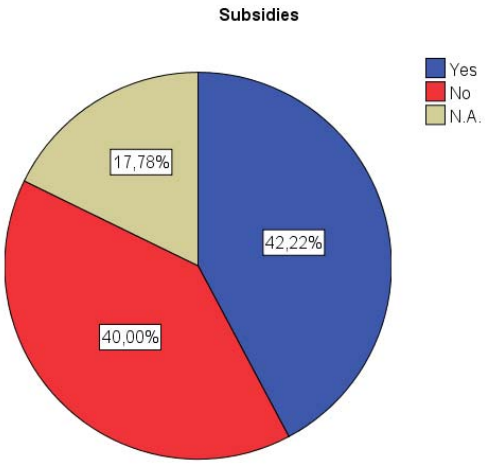


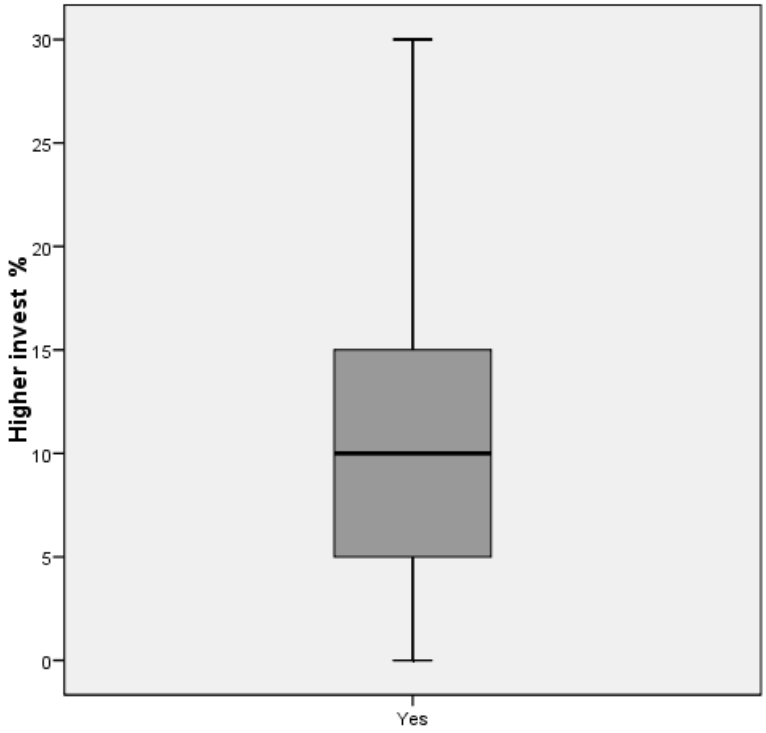
Figure 6: Compensation by subsidies

Considering the sectors in figure 2 the result is reflecting the public administration and the economy level. Pro and cons are in balance while almost one-fifth are quite unsure. Asking private persons or employees, the result would be different.

Added question:

If you agree on higher prices for a new e-car, how many percent could the price be more expensive?

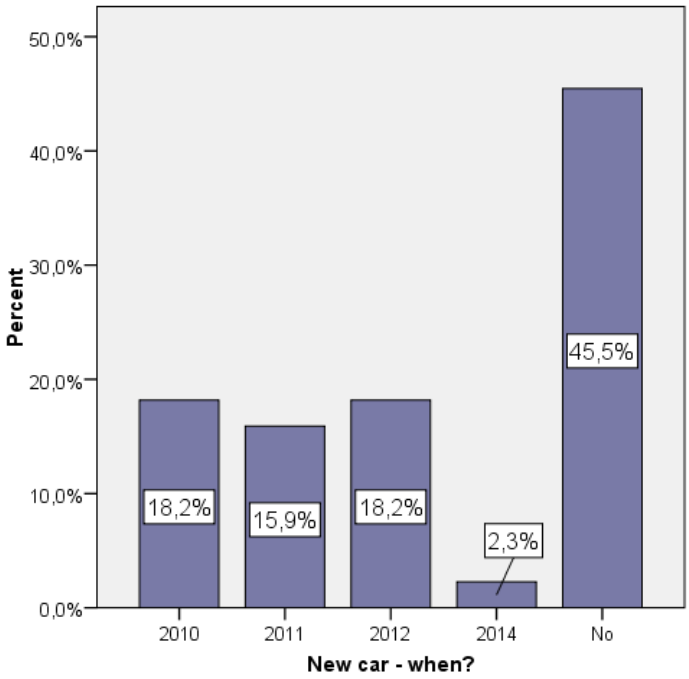
Figure 7: Higher costs accepted [%]



In figure 5 more than 70 % of the respondents agree on higher costs for a new e-car. In figure 7 the scale of the accepted extra costs compared with conventional vehicles is shown. 25 % of the persons will not accept extra costs, but perhaps less than 5 %. But the graph demonstrates that 50 % will accept 5 up to 15 % of additional costs (with an average value of 10 %). The rest of the respondents are willing to pay more than 15 % extra costs. The highest value was mentioned with 30 % additional costs.

5. Are you expecting to buy a new car? If yes, when?

Figure 8: New car expected?



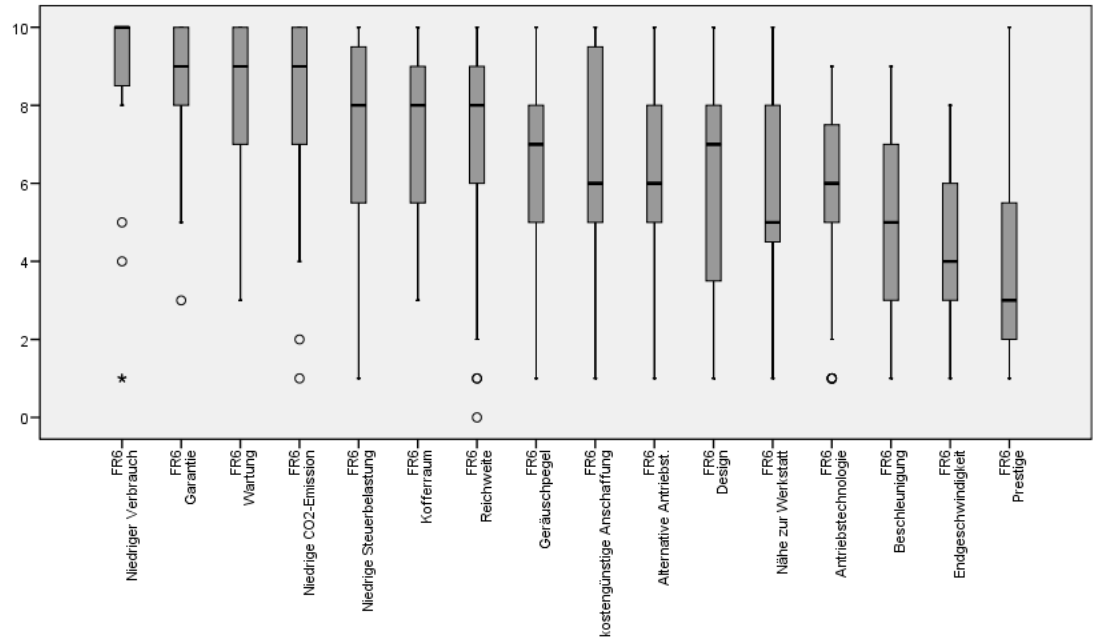
More than 50 % of the respondents will buy a new car within the next three years. Almost the half is not thinking about – but an additional rate of ± 10 % must be considered, because of unforeseeable circumstances (like accident etc.).

So the rate of new cars within the next three years will increase up to approximately 60 % (!)

An attached question, concerning main or second car would be helpful, but it is missing. A rough estimation would say, that 55 % of the new cars would be used as a main (first) car and the rest would be used as a second car within the single household (relevant number – these cars could be compensated by e-cars!)

6. Which aspects would be important if you will buy a new car?

Figure 9: Buying decision factors



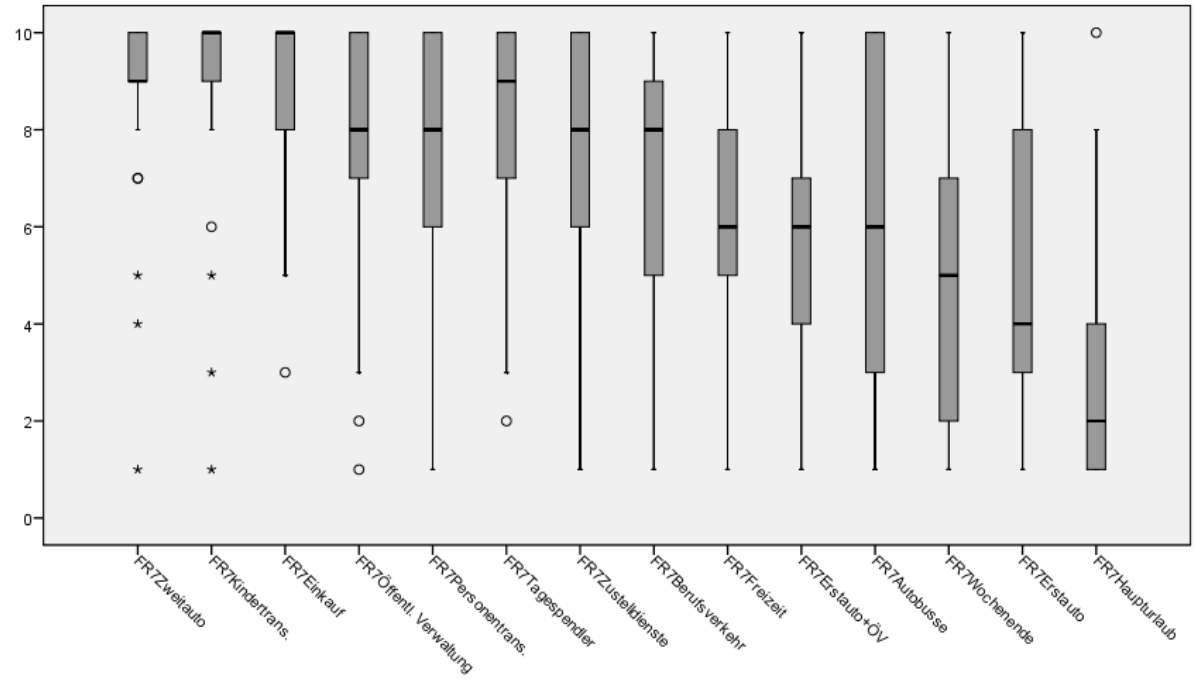
In figure 9 the relevant quality factors and buying decision aspects are listed according to priority (from left to right). There is a significant tendency noticeable. Relevant decision factors for buying a new car are:

- factors of environment (consumption, CO_2 emission)
- guarantee and less maintenance costs, taxes

The decision is also influenced by practical needs, like volume of the trunk, range etc. It is amazing, that costs are not as relevant as assumed and also the result, that design with a broad spectrum is more relevant compared with prestige (the brand has lowest ranking!). Maximum speed, horse power (speed-up), service partner and the engine itself are moderately important.

7. In which fields of operation are electric vehicles immediately applicable (range about 150 km)?

Figure 10: E-car – fields of application



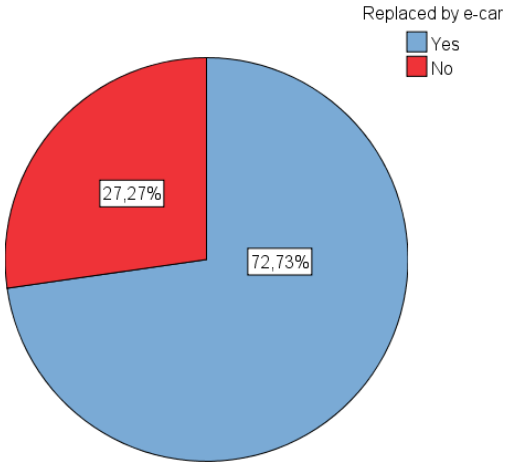
Considering a limited range of the e-car the result is no surprise. In households, where two cars are placed, the second car could be an e-car anyway. However, the ranking shows already a high acceptance in the different fields of operation (e.g. public administration, commuter traffic or for daily distances). But it is also obvious that the combination of public transport systems (e-mobility combined with public transport) in the rural area must be developed. It is also clear, that an e-car is not practical for long distances, like holidays. No explicit result is evident in the question concerning the use of e-busses. A broad spectrum of answers is maybe caused because of a failed test in the region.

8. Actually, every second-car could be replaced with an e-car, although the range is just 100 km. Do you agree?

Figure 11: E-car can replace the second car in a household

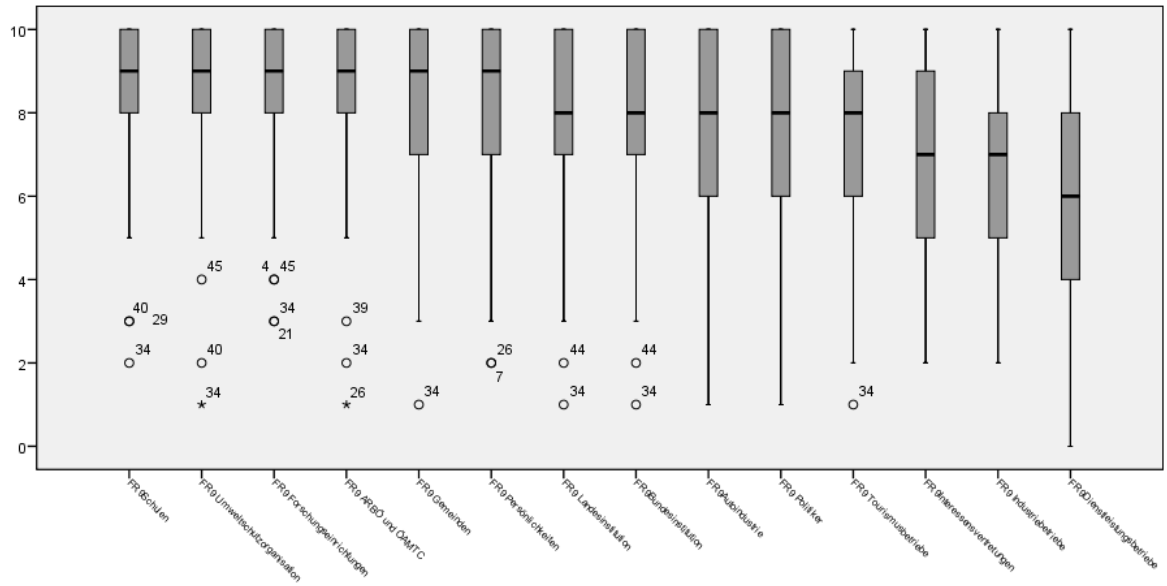
The number of families with 2 cars is growing and especially in the rural area, each household is in possession of at least two cars (on average).

The result shows a clear picture: almost three-quarters of all respondents can imagine that the second car of each household could be replaced by an e-car, even though the range is only about 100 km.



9. E-mobility: Who is in which dimension able to work on the public awareness?

Figure 12: Who can support public awareness?



All partners who are dealing more or less with the topic of mobility should overtake the responsibility of information and education. Figure 12 can not show a significant priority, the estimation of each listed institution is on a high level. However, people have to change their mobility behaviour, but this fact doesn't mean any reduction of comfort. The biggest change must be implemented in our brain – in discussions always the range of e-supported engines are mentioned; but about 80 % of all car trips are shorter than 50 km in one direction;

10. Which activities should be initiated now to sensibilize the population?

Figure 13: No activities of sensiblization should be done now!

92 % of the involved people are sure, that the public sensibilization should be done right now. All listed measures

- new support programs
- congresses, discussions etc.
- relevant infrastructure
- forcing renewable energy resources
- local strategies and
- environmental measures

were highly accepted (about 90 %).

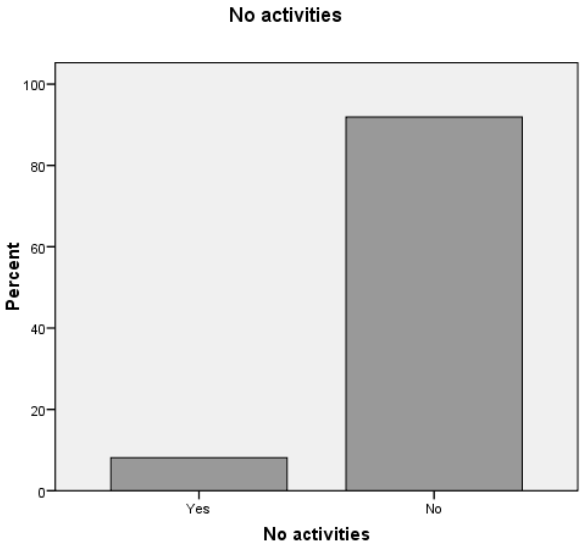
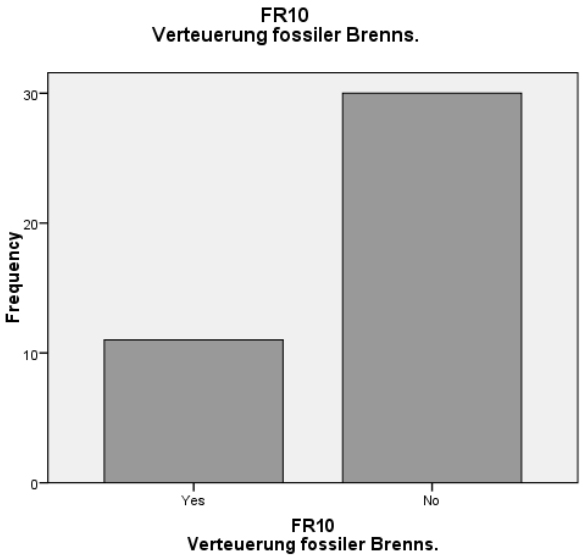


Figure 14: Cost increase of fossil fuels

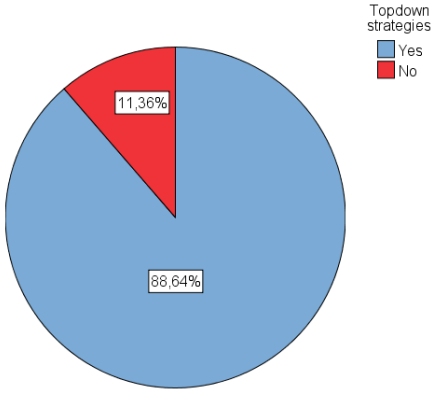
With one exception: one quarter would accept the increase of costs concerning fossil fuels;

Of course, fuel costs about € 1,50 would be the best sensibilization factor and would change the individual mobility behaviour sustainability.



11. Do you think, that the legislation should expand the support of renewable energy resources and the idea of electric mobility (top-down- approach, national strategy)?

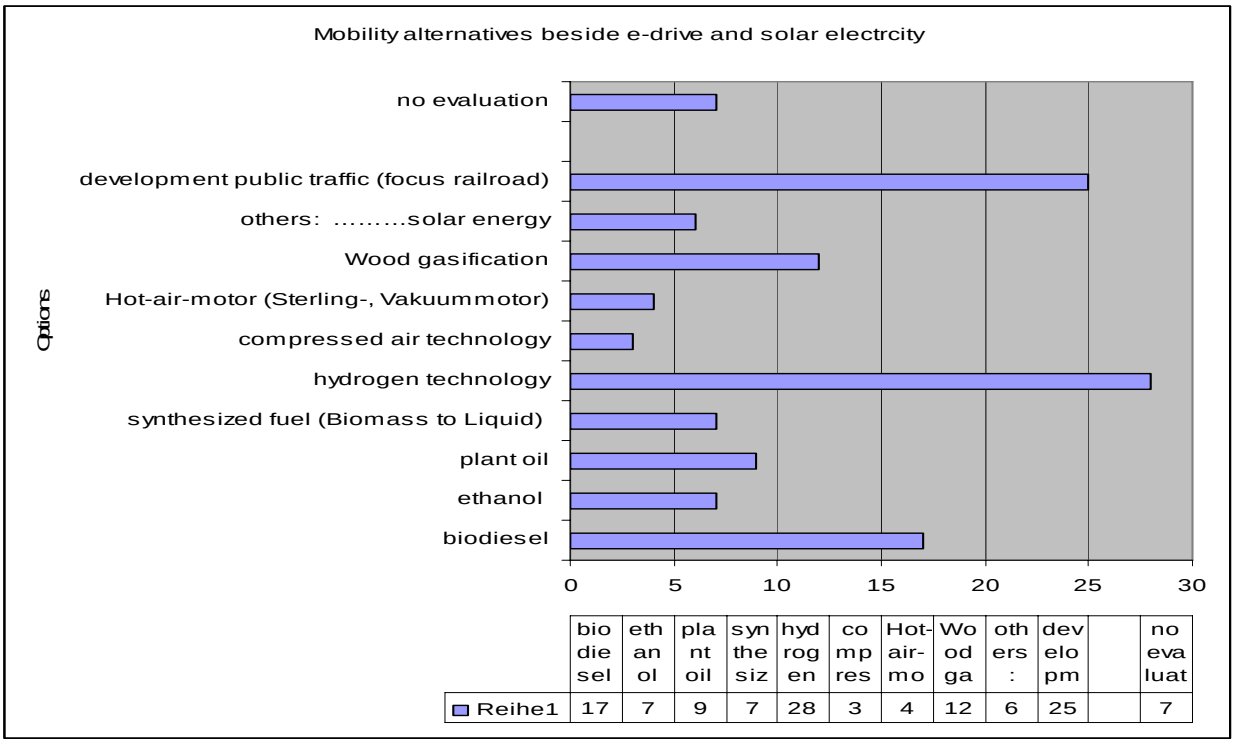
Figure 15: Top-down strategies necessary?



The answers give a clear picture: almost 90 % of the respondants are convinced that the federal state should promote the use of renewable energies and the establishment of e-mobility[44].

12. Can you see any approaches to reduce our dependency on fossil energy sources beside e-mobility?

Figure 16: Mobility alternatives apart electricity



A rough overview on alternatives apart from electric drive and solar energy is shown in figure 16. In general the feedback of respondents was quite unsure and the missing knowledge was mentioned several times. However, hydrogen, biodiesel and wood gasification is seen as a future option and the figure shows as well a mixture need of all alternatives. It is significant, that beside the improvement of new technologies the consequent extension of public transport in rural regions must be realized parallel.

[44] This result confirms to the speech of A. Ajanovic et.al 2008 in Istanbul.

10. Conclusion

The most important conclusion of this work is that considering the e-car market the realisation chance of an offensive e-mobility strategy is quite high because of a significant positive confirmation by the respondents. The measures of the e-mobility concept define a basis for further activities towards an e-mobiltiy model-region. According to the regional strategy additional projects concerning infrastructure (e-power stations, pv-plants, acquisition of e-vehicles) as well as increaseing the public awareness should be realised step by step (moderate scenario).

However, it is important to mention that investments, at public and private level, must be calculated. The willingness of private investments are strictly linked to national support systems (subsidies) as well as the offer spectrum on the e-vehicle market. Therefore regional, national and maybe European strategies should be presented, so that the additional demand on electricity could be covered sustainably and the additional costs of e-vehicles could be compensated in a first step.

E-mobility concepts could be realised in any region (in urban as well as rural areas), but it requires a high level of co-operation and a commitment to support public transport.

Anyway, sustainable mobility concepts based on renewable electricity will play a dominant role in regional development and will support any activities in protecting our environment by reducing CO_2 emissions.

The Alliance Region “Südkärnten – Karawanken” managed by the Regionalmanagment Carinthia will work on further projects, for instance

- Education center of renewable energies Bleiburg
- Establishing an “Energy region” according to the tender of Klimafonds
- Extension of the e-bicycle offer
- Installation of a local mobility office
- Installation of additional e-power station in co-operation with “lebensland Kärnten”
- Public presentations and discussions
- Establishment of an (e-) mobility working group

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Annex

Questionnaire

Additional figures (question 3)

EU-LEADER-PROJECT „SOLAR MOBILITY CARINTHIA“
Peter Plaimer

Questionnaire[45]

“E-mobility - a chance of sustainable regional development?”

Are innovative and regional approaches in rural mobility a partial solution in order to strongly influence the climate and to decrease the dependence on fossil fuels?

Your assistance would be an immense support for our research.
Don’t hesitate to call back, ++43 664 5026257

13 questions

1. Do you basically belief in a future of e-mobility? If so, in which time frame?

no □ go to question 11.

yes, in the next 2-5 years □
yes, in the next 6-10 years □
yes, in the next 11-20 years □
yes, but later □

2. Are regional basic approaches meaningful to increase the public awareness with its associated investments (e-service stations, photo-voltaic stations, e-vehicles, etc.) now?

yes □ no □

[45] Target group of the questionnaire are regional and interregional opinion leaders

3. Independent of the e-mobility development – what could be done to reduce the regional individual traffic in an effective way - immediately, middle- and long-term or not realizable?

	immediately	Middle-term	Long-term	Not realizable
Development of the public transport network				
Car sharing				
Mobility centers				
development of bicycle routes				
Possibilities for the pedestrians				
Events (car-free days, bike-festivities, etc)				
Statutory provision (bans and rules)				
Changing purchase behavior (reducing imports, forcing regional products and services)				
Free use of the public transport system				
Structural measures (slowing measures, deconstruction of parking areas, …).				
Road shows and advertising for e-mobility				
others ……..				
others ……..				

4. By reducing the running costs (fuel, insurance, taxes) would you accept an environmental issue in higher prices for a new e-car

yes ☐ no ☐

if yes, how many percent could the price be more expensive? ……..%

should the more costs be compensated by subsidies? yes ☐ no ☐

5. Are you expecting to buy a new car?

☐ yes ☐ no

if yes, when will you buy a new car?

☐ 2010 ☐ 2011 ☐ 2012 ☐ 2013 ☐ 2014

6. Which aspects would be important if you will buy a new car?

	not important 1	2	3	4	5	6	7	8	9	Very important 10
Cost-efficiency										
Less consumption										
Less CO_2 emission										
Low tax										
Garage near by										
Low maintenance										
Guarantee										
Design										
Low acoustic level										
Producer/prestige										
Volume of the trunk (boot)										
Approved engine										
Alternative engine										
Range										
Speed-up										
Maximum speed										

7. In which fields of operation are electric vehicles immediately applicable (range about 150 km)?

	1……not at all 1	2	3	4	5	6	7	8	9	10……..perfect 10
Commuter traffic										
Daily distances (home to job)										
Shopping										
Leisure activities										
Weekend trips										
Holidays										
Children shuttle (kindergarten, school, sports …)										
Delivery service (post, …)										
Passenger transport (taxi, hotel-shuttle,…)										
Autobus										
Public government										
Family:										
Main car										
Main car in combination with public transport										
Second car										

8. Actually, every second-car could be replaced with an e-car, although the range is just 100 km. Do you agree?

yes ☐ no ☐

9. E-mobility: Who is in which dimension able to work on the public awareness?

1…….no competence 10……..perfect

	1	2	3	4	5	6	7	8	9	10
Schools										
Townships										
State institutions										
Federal institutions										
Industrial companies										
Tourism companies										
Environmental organisations										
ARBÖ and ÖAMTC										
Automobile industry										
Service companies										
Special interest groups										
Personality in public life										
Politicians										
Research institution										
others:										
others:										

10. Which activities should be initiated now to sensibilize the population?

	yes	no
No activities at the moment		
New support program		
Road shows		
Establishing infrastructure		
Supporting renewable energy		
Cost increase of fossil fuels		
environmental measures		
Local and regional focus		
others		

11. Do you think, that the legislation should expand the support of renewable energy resources and the idea of electric mobility (top-down- approach, national strategy)?

yes ☐ no ☐

12. Can you see any approaches to reduce our dependency on fossil energy sources beside e-mobility?

biodiesel	☐
ethanol	☐
plant oil	☐
synthesized fuel (**B**iomass **t**o **L**iquid)	☐
hydrogen technology	☐
compressed air technology	☐
Hot-air-motor (Sterling-, Vakuummotor)	☐
Wood gasification	☐
others …… ……	☐
development of the public traffic system (focus railroad)	☐

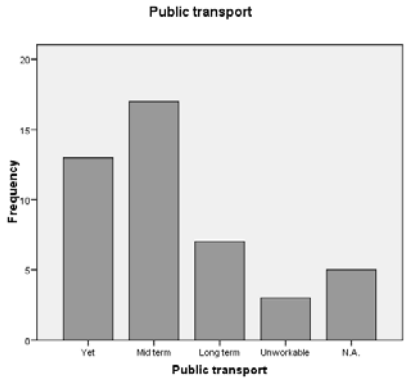
13. Your scope / field of activity:

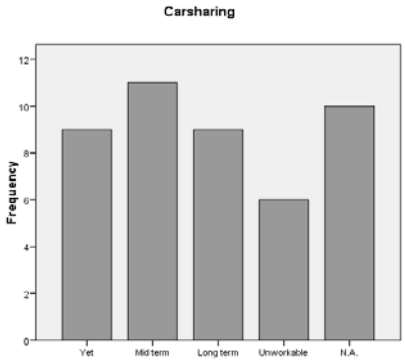
policy	
administration	
tourism	
economic system	
agriculture and forestry	
culture	
nature and environmental heritage	
others	

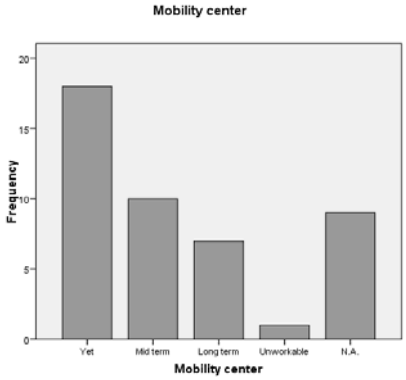
Thank you!

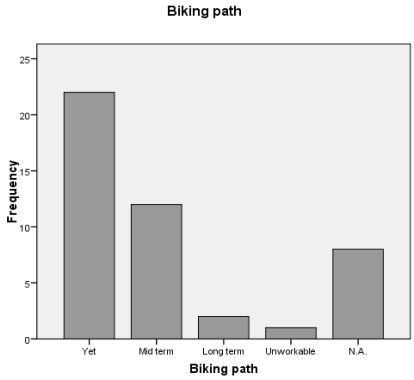
Please send your response as soon as possible to: Peter Plaimer, Klagenfurter Str. 10, 9100 Völkermarkt od. peter.plaimer@rmk.co.at; Fax 05 90904 582

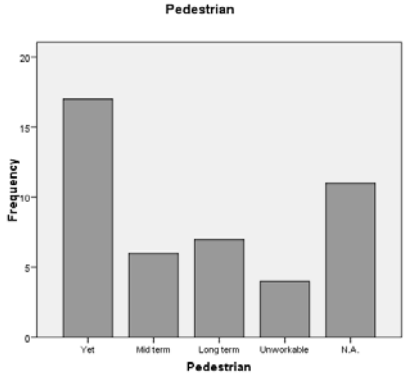
Figures linked to question 3:

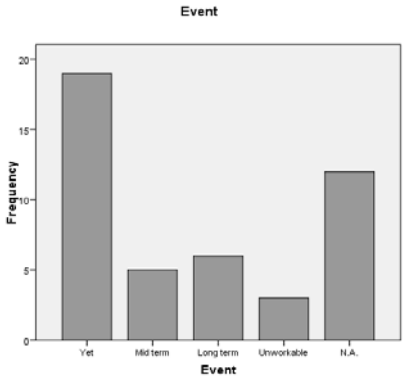


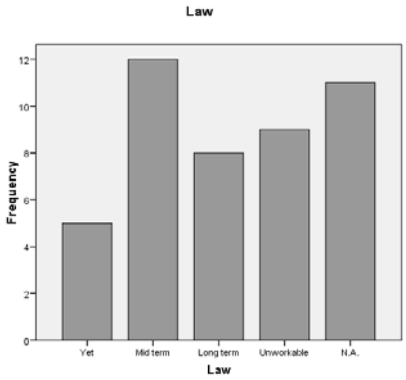


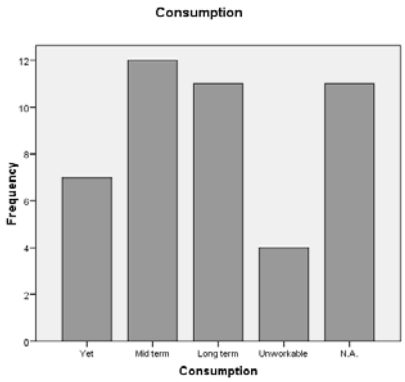


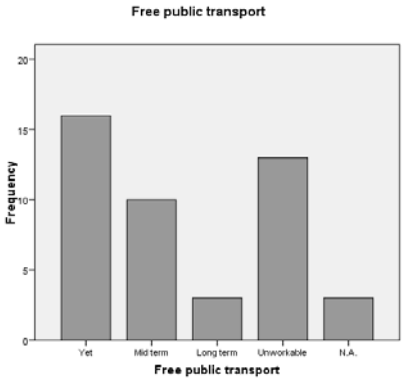


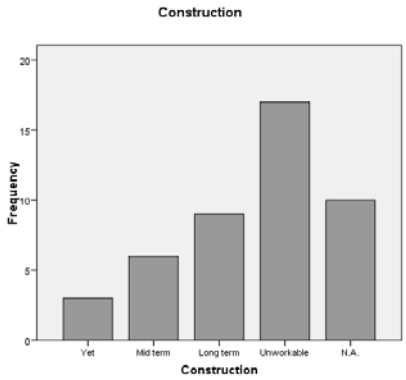


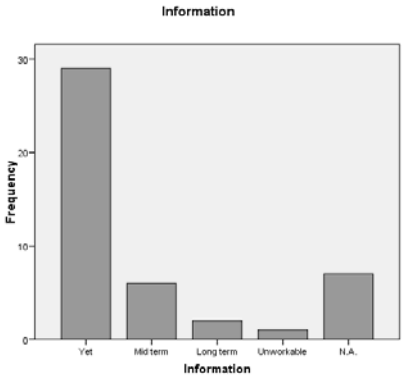







Free public transport
Frequency
20
15
10
5
0
Yet
Mid term
Long term
Unworkable
N.A.
Free public transport


Construction
Frequency
20
15
10
5
0
Yet
Mid term
Long term
Unworkable
N.A.
Construction


Information
Frequency
30
20
10
0
Yet
Mid term
Long term
Unworkable
N.A.
Information