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**Abstract:**

A SWOT of the cluster competencies in each region, in view of the Smart City trends.

**Keyword list:** Smart Cities, Embedded Systems, Ecosystem, Competencies, SWOT, Smart Living, Smart Energy, Smart Mobility

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# 1 Summary

This report is the third deliverable of work package 2 within the CLINES project. It includes four SWOT analyses of the participating clusters concerning technology, policy framework and funding in the field of Embedded Systems and Smart City top three domains: Smart Mobility, Smart Environment and Smart Living. The analysis is compiled by the project partners: AAU (Denmark), GAIA (Spain), DSPV (Belgium) and TUM (Germany).

The SWOT analysis takes significant results of the deliverable 2.1 “Description of Cluster Competencies” and the analysis of trend roadmap in Deliverable 2.2 “Trend Roadmap” identifying strengths and weaknesses in four regions and puts them in connection with opportunities and risks identified in the area of Embedded Systems and Smart City.

This document provides first a short overview of general aims of the SWOT analysis and the methodology behind the approach. The second part includes all four regional SWOT reports that examine the SWOT results for each region.

The results of this deliverable will be disseminated and discussed in the upcoming partner workshops.

## 2 Introduction

In work package 2 the main focus is to analyse the four regions participating in the CLINES project and outline the research agendas and investment environments and conditions prevailing in these specific regions. The SWOT analysis by each cluster assesses the regions status-quo concerning technology, policy framework and funding in field of embedded systems and the top three Smart City domains: Smart Mobility, Smart Environment and Smart Living.

Three Smart City areas have been identified in the deliverable 2.1 “Description of Cluster Competencies Integrating” as promising the most economic return: Smart Mobility, Smart Living and Smart Environment in the regions. This SWOT determines if those business needs are well supported by the regional cluster competencies taking into account access to technology, funding opportunities and regional policies.

SWOT evaluation will serve as the basic document for the identification of the level of integration between existing regional research agendas and regional business strategies in order to step toward bringing an embedded systems innovation ecosystem into existence as outlined in the Joint Action Plan (WP4).



Figure 1. CLINES Eco-System

### 3 SWOT Analysis Methodology

A Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership.<sup>1</sup> The work of the European Smart City project<sup>2</sup> as well as numerous other sources<sup>3</sup> using six characteristics in which a city performs in a forward-looking way: Smart Governance, Smart Economy, Smart Mobility, Smart Environment, Smart People and Smart Living.

We have deployed these same six characteristics in deliverable 2.1 “Description of Cluster Competencies” to show the core competencies of partners within the embedded systems area and also competences within selected applications areas – focusing on the complex of Smart Cities.

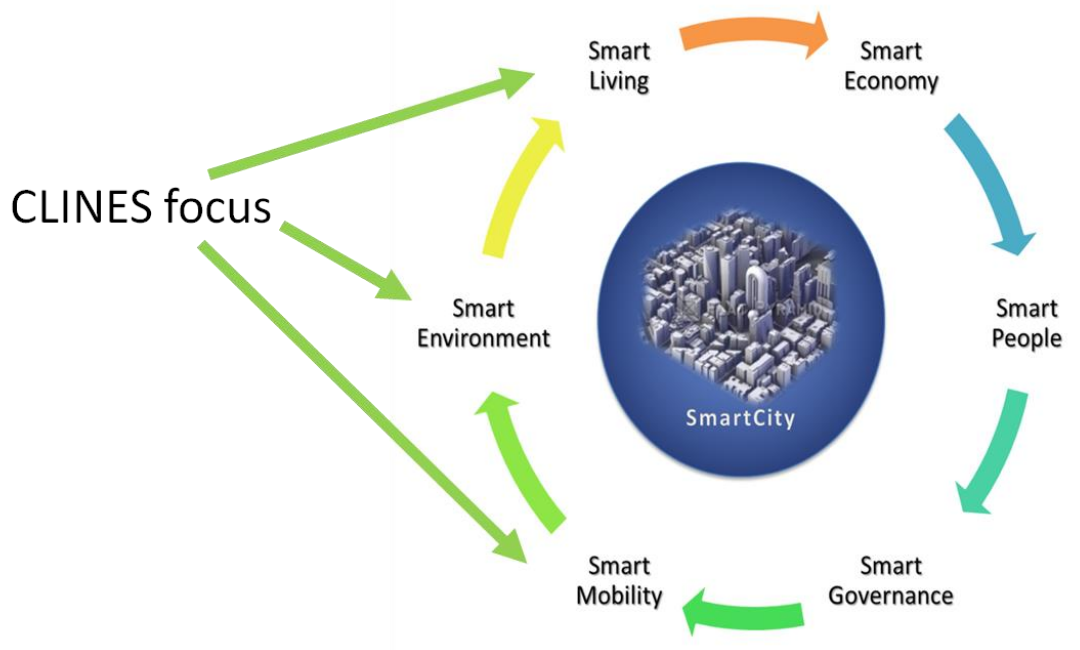


Figure 2. CLINES Smart City focus

Smart Mobility, Smart Environment and Smart Living build the top 3 Smart City priorities within the CLINES Ecosystem. The identification of Strengths and Weaknesses gives us an overview of the cluster competencies, in terms of these fields, and allows us to determine if those business needs are well supported by the regional cluster.

a) Strength and Weaknesses - Internal factors

For the cluster SWOT the analysis of strength and weaknesses includes the aspects technology competencies, funding possibilities and policy frameworks. The information on these aspects for each region is already gathered in D 2.1.

<sup>1</sup> Source: Mapping Smart Cities in the EU, EU DG Internal Policies, Dept A Economic and scientific policy 2014

<sup>2</sup> Source: <http://www.smart-cities.eu/>

<sup>3</sup> Source: R. Giffinger, C. Fertner, H. Kramar, R. Kalasek, N. Pichler-Milanovic and E. Meijers, Smart Cities – Ranking of European Medium-Sized Cities, Research Report, Vienna University of Technology, Vienna, Austria, 2007

Technology competencies: technologies state of art, innovation, access to research results, local projects, local economy and existing infrastructure, etc.  
 Funding possibilities: local venture capital, regional funding programs, economic status, etc.  
 Policy frameworks: Local policies, leadership, industrial laws, cluster initiatives, etc.

b) Opportunities and Threats: External factors

Opportunities and risks are external factors influencing the analysis, which are due to the trends and challenges of Smart City domains as identified in Deliverable 2.2. Opportunities are outside factors that are independent but might affect the regional situation. Threats are barriers to be overcome but they are not under the regional influence. Here it is especially important to take into account only such factors that might be relevant for the topics of the SWOT, in our case the use of trends and business potentials that are identified in Deliverable 2.2.

### 3.1 SWOT Matrix template

The SWOT results will be presented in a SWOT Matrix as it is demonstrated below:

**Table 1: Smart Mobility in Region x**

<b>Strengths</b>	<b>Weaknesses</b>
Technology competencies	
Funding possibilities	
Policy frameworks	
<b>Opportunities</b>	<b>Threats</b>
Trends in Smart Mobility	

### 3.2 How to carry out a SWOT

The Following steps are recommended to conduct the SWOT:

1. List your region’s strengths and weaknesses according to your cluster profile in Deliverable 2.1. The examples should include strengths and weaknesses relating to technology, funding and regional policies. At this stage the list does not need to be definitive.
2. Concentrate on the status-quo; do not think about strategies at this stage!
3. Create a list of external opportunities and threats factors according to Deliverable 2.2 and Deliverable 2.3. Opportunities are not the same as your internal strengths, and are not necessarily definite. An opportunity for one region could be a threat to another.
4. Take the list of ideas within each category (SWOT) and reduce them to 5- 10 ideas per category.
5. Review each category separately and discuss each of these ideas in your team.
6. Present SWOT results for each Smart City domain in your region in a SWOT Matrix.

## 4 SWOT: BAVARIA

This section contains a SWOT analysis of the Bavarian situation concerning technology, business and funding in the fields of Embedded Systems and Smart Cities carried out by the project partner TUM.

The analysis relies on the results of the deliverable 2.1 “Description of Cluster Competencies”, the analysis of the trend roadmap in the deliverable 2.2 and the catalogue of funding sources in the deliverable 2.3.

The SWOT analysis will consist of the completed SWOT matrices for the top three Smart City domains: Smart Mobility, Smart Environment and Smart Living.

### 4.1 SWOT Analysis for Smart Mobility in Bavaria

In networked mobility, modes are no longer competing with each other; they cooperate and strengthen the transport system. In the future, vehicles can wirelessly exchange information with each other or with the transport infrastructure. This so-called Car-to-X communication makes an important contribution to increasing traffic safety and efficiency and enables a variety of new services. ICT and in particular Embedded System technologies play a significant role in the implementation of innovative mobility solutions.

The Free State of Bavaria offers a broad industrial basis for Smart Mobility scenarios: large, renowned car and commercial vehicle manufacturers, an innovative supplier industry, global technology companies and energy providers. In addition Bavaria has numerous highly reputable universities and research institutions with a strong research environment in the individual disciplines involved in Embedded Systems and the automotive industry.

The entire value chain in electro mobility from the development and production of batteries, through the series production of electric vehicles to the integration of the vehicles into energy and traffic systems is already visible in Bavaria.

However, the integrated networking of mobility and transport is still a great challenge for the automotive industry, infrastructure operators and other modes of transport. It is therefore crucial for success in these areas to close the gap between research and application. The centre “Networked Mobility”<sup>4</sup> which has been established in 2014 by the Bavarian State Government follows this approach. This concept is being implemented by the Fraunhofer Institute for Embedded Systems (ESK) in close cooperation with the Fraunhofer Institute for Integrated Circuits (IIS) and the Bavarian economy. The focus will be on Bavarian automotive and commercial vehicle manufacturers, suppliers, particularly SMEs as well as companies in the communications and mobile communications technology and manufacturers of infrastructure equipment.

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<sup>4</sup> <http://www.stmwi.bayern.de/digitalisierung-medien/bayern-digital/>

**Table 2: Overview SWOT –Bavaria (Germany) Smart Mobility**

Strengths	Weaknesses
Technology competencies	
<ul style="list-style-type: none"> <li>• Automotive industry has a strong presence in Bavaria: world renowned premium producers (BMW Group, Audi, MAN, Continental Automotive Group) and more than 1.100 suppliers (Rexroth AG, Brose, Dräxlmaier Group, Schaeffler, etc.)</li> <li>• Many manufacturers of individual components in the field of Embedded Systems have their headquarters in Bavaria: Siemens, Intel, T-Systems, Infineon Technologies AG</li> <li>• Presence of high reputation universities with a strong research environment of high quality in the individual disciplines involved in Embedded Systems and the automotive industry with strong links to industry and high levels of university spin out formation</li> <li>• Strong presence of innovative SMEs and producers in the area of Embedded Systems for the automotive sector</li> <li>• The most prominent specializations are: real-time, safety, connectivity and data processing</li> <li>• Ambitious research institutions such as Fraunhofer Institute for Integrated Circuits (IIS), Fraunhofer Institute for Embedded Systems and Communication Technologies (ESK), fortiss institute for software intensive systems, Fraunhofer Research Institute for applied and integrated security are located in Bavaria.</li> <li>• The complete value chain including materials, components, systems research, development and manufacturing for Embedded Systems is available in Bavaria.</li> <li>• Many Smart Mobility pilot projects have been started and are running regionally, for example: Drive Now, MVV Handy Ticket, Planning Sustainable Urban Mobility in the Alpine Space, PRÖVIMM-P*R und ÖPNV Information Make People Mobile, The Inzell initiative: an initiative by BMW and the city of Munich</li> <li>• Mobility Atlas Bavaria: The central interactive portal of the Bavarian Government for Smart Mobility includes information about products</li> </ul>	<ul style="list-style-type: none"> <li>• Weak attention to usability engineering and security by Embedded System companies</li> <li>• Lack of standardization and heterogeneity cause lack of interoperability, poor process standards which leads to island solutions.</li> <li>• Highly fragmented research in individual disciplines and isolated research question</li> <li>• The role of Embedded Systems as a cross-sectional innovative technology is hardly perceived.</li> <li>• Broad implementation beyond the pilot stage of the Smart Mobile projects is often not planned.</li> <li>• Lack of orientation towards end-users: Embedded Systems technology has a strong focus on technologies without considering the impact on the application.</li> <li>• Close collaboration between experts from Embedded System technologies and the application field mobility is needed.</li> <li>• Usable and beneficial links between Embedded Systems technology and Smart City applications do not always exist.</li> <li>• There are few experts with know-how in various segments of the mobility ecosystem that can match innovative technologies to trends.</li> <li>• There is a lack of free Wi-Fi across the cities in order to facilitate transport IT solutions.</li> </ul>



<p>and companies, funding possibilities and best practices.</p>	
<p><b>Policy frameworks</b></p>	
<ul style="list-style-type: none"> <li>Cluster-like initiatives boost networking in the fields Embedded Systems and Automotive: BICCnet, Cluster Automotive Bayern, Cluster Sensorik - SENSORS made in BAVARIA, Intelligent Transport Society Bavaria (ITS Bavaria), Bavarian Research Cooperation for Electro Mobility (FORELMO)</li> <li>Sustainable mobility is part of the Munich strategic concept „Munich Perspective“.</li> <li>Bavarian high quality standards and climate and energy policy objectives: Bavarian „Industry 4.0“ program , Bavaria program2020, “Networked Mobility“<sup>5</sup></li> <li>Bavarian broadband center<sup>6</sup></li> </ul>	<ul style="list-style-type: none"> <li>Improvement of the cooperation within the triple helix “Government, Business and Research Institutes” in the field of Embedded Systems and Smart Mobility is needed.</li> <li>Different authorities in State of Bavaria and municipal authorities are responsible for making decisions on roads and transport. Processes are needed to bring together all public actors involved as well as private investors from the corresponding industries.</li> <li>Lack of a central office that acts as a go-between for Smart Mobility ideas and initiatives and involves diverse stakeholders.</li> </ul>
<p><b>Funding possibilities</b></p>	
<ul style="list-style-type: none"> <li>Smart Mobility is in focus of many Bavarian funding programs: Hightech Strategy 2020, High-Tech Gründerfonds, point Nine, Kizoo, T-venture, BayTP, BayEMA</li> </ul>	
<p><b>Opportunities</b></p>	<p><b>Threats</b></p>
<p><b>Trends in Smart Mobility</b></p>	
<ul style="list-style-type: none"> <li>There will be around 50 billion moving, smart devices in 2020, of which around 5 % will be connected vehicles. <sup>7</sup></li> <li>Pike Research estimates that from 2012 to 2020 \$31.2 bn will be invested worldwide in the digital systems and infrastructure for smart transport solutions.</li> <li>Customer demand for seamless, integrated and valued mobility services creates new business opportunities</li> <li>Embedded Systems technologies provided in Bavaria are highly regarded globally. Smart Mobility solutions may help to acquire new customers in developing areas across Latin America and Asia.</li> </ul>	<ul style="list-style-type: none"> <li>Techno-Societal impact on privacy from connected drives</li> <li>Increased risk of manipulation and attacks by the openness of systems</li> <li>Behavioural change is required from authorities and end-users.</li> <li>European Cities are slow to adopt new ITS. The lack of speed with which city councils are adopting technology forces businesses to seek revenue opportunities in Asia and Latin America</li> <li>Growing competition for the production of e – Cars from Asia</li> <li>People are critical to the success of Smart Mobility concepts and do not always react or</li> </ul>

<sup>5</sup> <http://www.stmwi.bayern.de/>

<sup>6</sup> <http://www.schnelles-internet-in-bayern.de/>

<sup>7</sup> Megacity Challenges – A Stakeholder Perspective”, Report sponsored by Siemens, 2006

<ul style="list-style-type: none"> <li>• Increasing traffic congestion in cities and the desire to reduce corporate environmental footprints</li> <li>• The new generation is increasingly more interested in cars as a mean of mobility when required, rather than as a status symbol.</li> </ul> <p><i>Technology Trends</i></p> <ul style="list-style-type: none"> <li>• Integration of e-mobility in Smart Grid approach</li> <li>• The integration of smart control systems: automotive, telematics, embedded systems and e-payment in a scalable mobility concept for urban centres.</li> <li>• Connected and automated electric cars create new market opportunities.</li> </ul>	<p>behave as research or technological developments may suggest.</p> <p><i>Technology</i></p> <ul style="list-style-type: none"> <li>• Lack of IT security and lack of protection in the field of Embedded Systems</li> <li>• Heterogeneity will factor greatly in the design, implementation, and operation of Embedded Systems.</li> <li>• Standardization of the EU charging &amp; Smart Grid infrastructure</li> <li>• If car industry does not come up with solutions, the IT companies (Google, Apple) will do so and the profits of the automotive industry will shrink</li> </ul>
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## 4.2 SWOT Analysis for Smart Environment in Bavaria

Smart Environment refers to the use of new technologies to protect and preserve a city’s environment. In a number of studies Smart Environment is characterized by the following factors: Smart Energy, Smart Water Management and Smart Waste Management. The Smart Energy domain is identified in the deliverable 2.1 “Description of Cluster Competencies Integrating” as promising the most economic return in Bavaria. It is the reason why we focus in this report on the Smart Energy. This section contains a SWOT analysis of the Bavarian region including industry, SMEs, research and local policy, in regard to Smart Energy products and services.

The nuclear disaster in Fukushima, Japan in March 2011 has led to a political reassessment of nuclear energy in Germany. Bavaria has created an energy plan, which lays out concrete, realistic steps and measures for an accelerated conversion of Bavaria's energy supply<sup>8</sup>.

Smart Energy is defined here as a technology that makes use of data and information to improve the management of energy. Key elements of the Smart Energy ecosystem are Smart Grids, Smart Appliances, Gateways and Smart Meters. The topic of Smart Grids, intelligent networks, is the most important innovation field within Smart Energy. Smart Grids hold the key to the energy systems of the future, because they make it possible to distribute energy from renewable sources without putting electricity networks at risk. Smart Grid technologies do not just have to be wanted by politics but must also be accepted by the general public. The topic of data protection therefore plays an important role in terms of acceptance.

Numerous R&D projects in Bavaria aim to explore ways to make Bavarian cities more energy efficient and carbon neutral through better understanding of the urban energy systems<sup>9</sup>.

<sup>8</sup> Energy and Natural Resources: <http://www.stmwi.bayern.de/energie-rohstoffe/>

Siemens 10reports about the first successful pilot project where a village in southern Bavaria produces more environmentally friendly electricity than it consumes- which makes it an ideal place to test Smart Grid technologies. This pilot project is managed by Siemens together with the local utility and two universities.

**Table 3: Overview SWOT- Bavaria (Germany) Smart Energy**

Strengths	Weaknesses
Technology competencies	
<ul style="list-style-type: none"> <li>• A large number of companies with significant market positions in the segments of Embedded Systems and Smart Energy have their headquarters in Bavaria.</li> <li>• Expertise in enabling ICT: Bavaria is already a key player in Embedded Systems.</li> <li>• Strong presence of innovative SMEs and manufacturers in application domains for Smart Energy: Smart Grid, Sensor Technology, Smart Micro Grid Information and Control, Virtual Power Plants, Grid Control Unit, Grid Hub, Gateway/Smart Meter, Home Energy Management</li> <li>• More than 20 highly dedicated research institutions with focus on Smart Energy topics: Smart Grid reference architectures, Smart Grid security, self-balancing Smart Grid Node, energy storage, energy optimized building, entire value added energy chain (Fraunhofer AISEC, fortiss, ZAE Bayern, Energy Campus Nuremberg, etc.)</li> <li>• Real-life demonstration of a Smart Energy region in Bavaria: IRENE project in Wildpoldsried, a village that harvests energy</li> <li>• Real R&amp;D projects with triple helix partnerships: Smart Micro Grid Information and Control (SMIC), Smart Energy Region Oberland, Smart Grid City in Upper Franconian</li> </ul>	<ul style="list-style-type: none"> <li>• Gaps in Data Management: Fibre-optic networks are needed area-wide to serve to transmit data for remote-readable energy meters</li> <li>• Weak attention to usability engineering, security and big data by companies in the Embedded Systems sector</li> <li>• Robust implementation of both design security and data security for networked embedded equipment such as Smart Energy Meters as well as controllers throughout the Smart Energy Grid</li> <li>• Suitable system architectures for Embedded Systems in energy monitoring which support robust algorithms</li> <li>• Concepts for stable, distributed controllers in the domain of Smart Grids</li> </ul>

<sup>9</sup> Energy Research and Technology in Bavaria, <http://www.energie-innovativ.de/energie-versorgung/energieforschung-und-technologien/broschuere-energieforschung-und-technologie-in-bayern/>

<sup>10</sup> [http://www.siemens.com/innovation/apps/pof\\_microsite/pof-spring-2012/html\\_de/smart-grids.html](http://www.siemens.com/innovation/apps/pof_microsite/pof-spring-2012/html_de/smart-grids.html)

<p>towns</p> <ul style="list-style-type: none"> <li>• Energy Atlas Bavaria<sup>11</sup>: The central interactive portal of the Bavarian Government for energy saving, energy efficiency and renewable energy includes information about products and companies, funding possibilities, best practices and Bavarian energy policies.</li> </ul>	
<p>Policy frameworks</p>	
<ul style="list-style-type: none"> <li>• Cluster-like initiatives boost networking in the fields Embedded Systems and Smart Energy: BICCnet, Sensor Technology Cluster, Cluster Mechatronics and Automation, Work Group Smart Grid Security , Green Factory Bavaria, Technology Cluster “ Smart Grids”, Bavarian Hydrogen Center Nuremberg, Competence Center for Power-Heat Cogeneration</li> <li>• Strong support from Bavaria’s energy efficiency policy: The objectives of the energy policies pursued by the Bavarian Ministry of Economic Affairs are efficiency, supply security and environmental sustainability. The guidelines to that end are outlined in Bavaria’s energy concept, "Energie innovativ" <sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Market regulations that ensure balance and the merging of market and grid aspects in the distribution network.</li> <li>• Legislative framework for data protection (security and privacy) and data access control (data access point management)</li> <li>• Reaching a consensus within the stakeholders from politics, business, civil society organizations, consumers and science is a lengthy process</li> <li>• Publicity campaigns are needed to increase consumers awareness on energy saving and energy efficiency features</li> <li>• Lack of real-time or dynamic pricing: Home Energy Management products will not be popular with consumers without real-time pricing.</li> </ul>
<p>Funding possibilities</p>	
<ul style="list-style-type: none"> <li>• Smart Energy is in focus of many Bavarian funding programs: FuE-Program „ Additional funds for Smart Grid“, Bay INVENT, BayTOU, BayTP, Aufbruch Bayern, Basic energy research 2020+, Bayern Kapital, BVK, ECAPITAL, Bilfinger Venture Capital, Robert Bosch Venture capital GmbH, T-Venture</li> <li>• 35 funded research projects by the Bavarian Government in the period 2012- 2017<sup>13</sup></li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

<sup>11</sup> <http://www.energieatlas.bayern.de/>

<sup>12</sup> Bavarian’s energy concept: <http://www.energie-innovativ.de/>

<sup>13</sup> Energy Research and Technology in Bavaria

Opportunities	Threats
<b>Trends</b>	
<ul style="list-style-type: none"> <li>• Increased pressure on global fossil fuel supplies and pollution and global warming impact from using still plentiful fuels like coal</li> <li>• Germany’s energy policy: Opt out of nuclear energy by 2020 and a rapid transition to renewable energy sources</li> <li>• Zpryme Research forecast global market size of \$220 bn for Smart Grid technology globally. The Home Energy Management market worldwide is expected to reach \$85 bn by 2015<sup>14</sup>.</li> <li>• Embedded System technologies as an important enabler for the successful integration of renewable energies</li> <li>• Upgrading of electric grids to Smart Grids opens new markets, market roles, value chains and jobs.</li> <li>• Denmark’s successful experiences with the integration of fluctuating energy sources into an electricity system based on conventional generation and end-use structure</li> <li>• Real-life demonstrators in Germany: E-Energy model regions located in Cuxhaven, Harz, Rhein-Ruhr, Aachen, Rhein-Nekar and Baden Württemberg<sup>15</sup></li> <li>• Trade and transport of electricity all over Europe</li> <li>• Cloud-based services: Cloud-based technology services are enablers for delivery of innovative services to both ends of the supply chain from utilities to consumers</li> </ul>	<ul style="list-style-type: none"> <li>• Confidence in the secure data exchange between end consumers and energy providers</li> <li>• Understanding and management of whole system (complexity trap): ICT, energy technology, environment, markets, politics, business and civil society</li> <li>• Lack of a legal framework to support the evaluation of Smart Grids: Market regulation, the design of incentives, standardization</li> <li>• Energy utilities are not interested in selling less electricity.</li> <li>• Interconnections and dependencies of system components</li> </ul> <p><i>Technology</i></p> <ul style="list-style-type: none"> <li>• Smart Grid is a safety –critical infrastructure</li> <li>• Embedded Systems that satisfy low-power requirements and are suitable for self-powered sensor and actuator nodes, are still largely in development</li> <li>• Standards are required to ensure the data flow between different system components: electrical system components, interface technology between products</li> </ul>

### 4.3 SWOT Analysis for Smart Living in Bavaria

Smart Living combines the use of Information and Communication Technology (ICT) with everyday life. Connected Living, Smart Home and Ambient Assisted Living (AAL) have been used for years as the major trends in the living area. However, they have not been enforced properly yet, even though society's need for the use of these technologies is increasing due to demographic change and the transformation of energy. According to recent studies, this situation will fundamentally change in the next ten years with affordable, compatible, intuitively usable and

<sup>14</sup> Home Energy Management Systems Products Market, November 2011, SBI Energy

<sup>15</sup> Smart Energy Model Regions in Germany: <http://www.e-energy.de/de/modellregionen.php>

personalized applications that provide more comfort, safety, energy efficiency and self-determination in old age.

With the development of broadband 16access the Bavarian Government is creating the necessary digital infrastructure in Bavaria to transmit large volumes of data at high speed, thus enabling the basis for many Smart Home services, such as cloud IT or streaming movies in high definition quality. Furthermore the Smart Home & Building certification program, sponsored by BMWi17 aims to facilitate a smooth interplay of all the components for the Smart Home and building sector, providing certificates for plug-and-play applications that can be used across the systems.

This section contains a SWOT analysis of the Bavarian region in regard to Embedded Systems and Smart Living. Analysis will consider separately two principal topics: Ambient Assisted Living and Smart Home.

**Table 4: Overview SWOT – Bavaria (Germany) – Smart Living**

Strengths	Weaknesses
Technology competencies	
<ul style="list-style-type: none"> <li>• Key academic strengths in the field of medical technology in Bavaria: Biomedical Engineering, Healthcare Technologies, Life Sciences, Bioinformatics, Robotics</li> <li>• Significant research base in electronics, sensors and informatics</li> <li>• Research Groups with focus on Ambient Assisted Living topics: Bavarian Technology Center for Domestic living, University Erlangen-Nuremberg, The Institute of Psychogerontology (ipg) of the Friedrich-Alexander-University Erlangen-Nuremberg; The Institute of Energy and Building at the Georg Simon Ohm University of Applied Sciences, Helmholtz Center Munich, Julius-Maximilians-University Würzburg</li> <li>• Innovation research topics: domestic living; handling of applications for senior friendly information technology using language; senior friendly communication center; efficiency in supply by assistive, modular technologies in demand-oriented scenarios, robots in medicine (tele-medicine, motion compensation, assistance robotics)</li> <li>• Competencies in the mobile communications and network technology as key technology for healthcare systems: Sensors, WLANS, Satellite and Cellular Mobile Systems, Biosensors</li> <li>• Innovative SMEs in the application domains for</li> </ul>	<ul style="list-style-type: none"> <li>• Key technical challenges: data security (encryption, authentication and authorization) devices connectivity and interactivity and power requirements of devices, scalability and survivability, human-computer interaction, trusted computing technology to ensure end-to-end integrity protection, manipulation of the sensor’s environment to falsify recorded sensor data , interoperability of different solutions, wireless transmission of multimedia medical data</li> <li>• Big Data challenge: reliable and evidence-based software that handles continuously generated “ big data”</li> <li>• Lack of companies which focus their business expertise on service solutions, training, consulting and support for the elderly</li> <li>• Consideration of needs and limitations of older adults regarding their interface with technology, elderly friendly user interface</li> <li>• Increased bandwidth for wireless transmission of multimedia medical data</li> </ul>

<sup>16</sup> Bavarian broadband center: <http://schnelles-internet-in-bayern.de/>

<sup>17</sup> Federal Ministry for Economic Affairs and Energy

<p>Assisted Living Technology: assistant emergency call systems, networking with rescue coordination centres, assistant fall detectors, Sensors in carpet, assist control of the complete building technology, assistant health monitoring, tele care, telemedicine, tele monitoring</p> <ul style="list-style-type: none"> <li>• Wide range of companies in the enabling technologies: wireless power technologies, energy scavenging, low-power communication, robotics, communication technology, cognitive radio, data security, remote patient monitoring, data integration from various analytic sources, digital patient networking, smart data reduction methods for medical data analysis software</li> <li>• Funded Bavarian R&amp;D projects: Adaptable Living Assistant ALIAS, SensFloor-Large area sensor system in care; ADELE, Temperature and Humidity monitoring , I'CityForAll (Age Sensitive ICT Systems for Intelligible City For All), Join-In in Munich-Moosach</li> <li>• The AAL industry is slowly but surely getting into full swing: concepts, standards, and strategies to AAL are discussed extensively in many conferences and research institutions</li> </ul>	
<p><b>Policy frameworks</b></p>	
<ul style="list-style-type: none"> <li>• Companies and research institutions are organized in regional clusters: Bavarian Telemedallianz (BTA<sup>18</sup>), Cluster Medical Technology, Forum MedTech Pharma, Medical Valley EMN e.V.</li> <li>• Since 2013 the Bavarian government has been supporting telemedicine procedures, first telemedicine methods have already been approved and are accessible to all insured patients</li> <li>• The importance and advantages of AAL Technology is already recognized by the Bavarian government</li> </ul>	<ul style="list-style-type: none"> <li>• Low political and clinical collaboration and cooperation to facilitate the wider application of Ambient Assisted Living</li> <li>• Better access to ICT in the public sector</li> <li>• Private companies and public services which cover installation and initial training on the use of eHealth equipment</li> <li>• Regulation and standardization in health telemedicine sector in patient care; accreditation and certification</li> <li>• Improvement of social and political conditions for use and acceptance of telemedicine for optimizing patient care</li> <li>• Regulatory issues need to be addressed: personal data security and location privacy, trustworthiness of the gathered physiological parameter information</li> </ul>
<p><b>Funding possibilities</b></p>	
<ul style="list-style-type: none"> <li>• A range of Venture Capitals: T-Venture, Siemens Venture Capital (SVC), Robert Bosch Venture Capital GmbH, Bilfinger Venture</li> </ul>	

<sup>18</sup> BTA initiates and coordinates telemedicine initiatives and projects in Bavaria, <http://www.telemedallianz.de/uns.html>

Capital, High-Tech Gründerfonds, Bayern Kapital, Wellington Partners Venture Capital	
<b>Opportunities</b>	<b>Threats</b>
<b>Trends in Smart Living</b>	
<ul style="list-style-type: none"> <li>• The demographic shift and the need for a better health-social care to keep people well and independent for longer</li> <li>• The global increase in the elderly population: it is estimated that by 2030 more than 1 billion people will be aged 65 years or older<sup>19</sup></li> <li>• VDI and VDE <sup>20</sup>calculate that the AAL market volume in Germany is at least a billion EUR per year.</li> <li>• Research Agenda of the Federal Government of Germany for Demographic Change: The New Future of Old Age<sup>21</sup></li> <li>• European funded projects in the field of AAL technology are designed to drive standardization and interoperability and prove effectiveness in several European markets</li> <li>• The DFKI <sup>22</sup>Competence Center Ambient Assisted Living (CCAAL) <sup>23</sup>: A cross-project and cross-department virtual organization within the German Research Center for Artificial Intelligence coordinating and conducting research and development in the area of AAL</li> <li>• CARDIAC-EU: A platform that brings together the various stakeholders in the area of accessible and assistive ICT with a view to identifying research &amp; development gaps, emerging trends, and generate a research agenda roadmap<sup>24</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Different standards and lack of the interoperability</li> <li>• Ethical implications of in-home monitoring</li> <li>• Efficient markets for AAL products and services develop slowly</li> <li>• Lack of familiarity of elderly people with ICT based services and technologies</li> <li>• Telecare, telehealth and other ICT applications in these fields remain locked up in segregated silos.</li> <li>• Skills gap: Lack of sufficient knowledge in AAL fields</li> <li>• Difficulty of demonstrating of ROI: Practices and health departments do not see direct and immediate financial benefits of telehealth and telecare</li> </ul>

**Table 5: Overview SWOT – Bavaria (Germany) – Smart Home**

<b>Strengths</b>	<b>Weaknesses</b>
<b>Technology competencies</b>	
<ul style="list-style-type: none"> <li>• Large number of companies with significant market position in the segment of Building Automation: energy harvesting wireless</li> </ul>	<ul style="list-style-type: none"> <li>• Key technical challenges are: connect meters with home LAN; standards for control and monitoring inside the house with emerging</li> </ul>

<sup>19</sup> Why population aging matters: a global perspective, 2011. US National Institute on Aging

<sup>20</sup> Verband der Elektrotechnik Elektronik Informationstechnik e.V. (VDE), Verein Deutscher Ingenieure e. V. (VDI)

<sup>21</sup> <http://www.das-alter-hat-zukunft.de/en>

<sup>22</sup> German Research Center for Intelligent Solutions for the Knowledge Society:

<sup>23</sup> <http://ccaal.dfki.de/>

<sup>24</sup> <http://www.cardiac-eu.org/index.htm>



<p>switches, sensors and controls, wireless radio technology</p> <ul style="list-style-type: none"> <li>• Competence for enabling technologies: smart power management, internet of things, IT security, M2M communication, compact power electronics, mobile communication</li> <li>• Wide range of high-tech companies (from hardware to software): intelligent hardware components, intelligent measurement and control device, user interface solutions, smart meters, energy management monitoring and controlling, home security, communication devices</li> <li>• University of applied Sciences Rosenheim, chair Building Automation and Technology: Major activities are related to all aspects of application and understanding of Building Automation Technologies</li> <li>• FAPS - Institute for Factory Automation and Production Systems<sup>25</sup>: Research and development of solutions for improving the quality of life through self-determined, intelligent living</li> <li>• E Home-Center, interdisciplinary research group at the Friedrich-Alexander-University Erlangen-Nuremberg: Products, services and solutions for resource-efficient, sustainable and intelligent living taking into account social, environmental and economic trends</li> <li>• VDE “Smart Home &amp; Building certification program”<sup>26</sup>: Developing a program for the establishment of cross-system interoperability and IT security in the Smart Home which is supported by all stakeholders</li> <li>• High activity in the Smart Home market within Bavarian based companies: EnOcean, INTEL, Infineon, itemis, BMW, Deutsche Telekom, Epson, Gruber naturholzhaus, HSG IMIT, Hamamatsu, Heraeus, Home2 net, InnoSenT, Murata, Robert Bosch, Schreiner Group, Texas Instruments, TQ Systems, VDE</li> </ul>	<p>standards for “outside building”; privacy and security, storage integration, simple user interface</p> <ul style="list-style-type: none"> <li>• No compelling and collaborative business models, in which the economic benefits would be detectable; unbalanced price-benefit ratio</li> <li>• Inadequate customized marketing;</li> <li>• Customer benefit is not yet apparent.</li> <li>• Holistic user interface is needed for comfort, safety, energy and health as an overarching goal</li> <li>• Missing integrators for a Smart Home solution "from one source"</li> </ul>
<p>Policy frameworks</p>	
<ul style="list-style-type: none"> <li>• Cluster: Nürnberger Initiative für die Kommunikations-Wirtschaft</li> <li>• Initiative Smart Home Deutschland, <a href="http://www.smarthome-">http://www.smarthome-</a></li> </ul>	

<sup>25</sup> <http://www.faps.de/1/startseite/index.html>

<sup>26</sup> [http://www.zertifizierungsprogramm-smarthome.de/SMARTHOME\\_EN/Pages/Startpage.aspx](http://www.zertifizierungsprogramm-smarthome.de/SMARTHOME_EN/Pages/Startpage.aspx)

<p><a href="http://deutschland.de/?id=21#80">deutschland.de/?id=21#80</a></p> <ul style="list-style-type: none"> <li>Initiative Connected Live e.v, <a href="http://www.connected-living.org/">http://www.connected-living.org/</a> : Networking of stakeholder telecommunications companies and utilities in the topic, but also equipment manufacturers, online businesses, specialists in building automation and other players from many other industries</li> </ul>	
<p>Funding possibilities</p>	
<p><b>Opportunities</b></p>	<p><b>Threats</b></p>
<p>Trends in Smart Home</p>	
<ul style="list-style-type: none"> <li>According to BSRIA the global market for automated buildings is currently worth more than \$20 billion and is continuing to grow year on year despite a global recession.</li> <li>The increasing digital networking provides infrastructural foundations and ensures the dissemination of new devices such as smart phones, which are useful as control solutions for Smart Home applications.</li> <li>Growing environmental awareness brings the issue of "energy efficiency" section into the center and promotes smart control of heating and household appliances.</li> <li>Increasing consumer willingness to pay for Smart Home devices and services</li> <li>Cross-industry Smart Home solutions and business models that increase market acceptance</li> <li>Convergence of industries between electric and IT</li> </ul>	<ul style="list-style-type: none"> <li>The price of home automation solutions is currently too high.</li> <li>Technology is at the forefront, so that simplicity could be lost.</li> <li>Insufficient acceptance due to too many island solutions and a large number of initiatives and businesses</li> <li>Establishment of an open standard could lead to uncertainty. Fear of disclosure of company know-how</li> <li>Many systems work unencrypted.</li> <li>Lack of interfaces for interoperability of protocols, services, or bus systems and standards as obstacles</li> </ul>

## 5 SWOT: BASQUE COUNTRY, SPAIN

This section contains a SWOT analysis of the performed on the GAIA-Cluster in Basque country, Spain concerning technology, business and funding in field of embedded systems and smart City carried out by the project partner GAIA.

## 5.1 SWOT Analysis for Smart Mobility in the Basque Country, Spain

The concept of Smart Mobility, due to the nature of the companies included in GAIA and the products and services they offer, looks at **the business’ whole chain of value**:

- Part of the **industry** (leading industry, auxiliary industry etc.) that manufactures the instruments necessary for the provision of services (vehicles, systems, components etc).
- This industry is increasingly based on **R+D activities**
- The value chain continues with **infrastructure managers, mobility and transportation operators, logistics companies** etc.

This is why, within the Smart Mobility concept, we are taking on management optimisation, infrastructure traffic mobility vehicle efficiency, accident and travel time reduction, and high-performance vehicles with lowered environmental impact.

Security is considered a transversal issue, and something that is also taken on and considered in all its aspects as a fundamental factor, more specifically, of the transport sector. It affects both passengers and merchandise in the air, terrestrial and maritime sectors, and depends highly on the national and international political situations.

At a national level, and considering the ICT service provision market for the mobility sector, it has reached approximately 680 million.

**Table 6: Overview SWOT – Basque Country (Spain) – Smart Mobility**

Strengths	Weaknesses
<b>Technology Competencies</b>	
<ul style="list-style-type: none"> <li>• Among the company’s offers bespoke products or solutions are predominant, from the point of view of standardisation, and systems from the point of view of integration degree with:                             <ul style="list-style-type: none"> <li>○ Communications</li> <li>○ Gateways</li> <li>○ Management ERPs</li> <li>○ Navigators</li> <li>○ Electronic control and monitoring systems</li> <li>○ Logistics</li> </ul> </li> <li>• Companies with developments in telematics and control systems for intelligent traffic management, and deployment of traffic infrastructure equipped with automatic access and toll control systems, as well as user-friendly communication and information systems for the driver.</li> <li>• Solutions for the oversight and management, in real time, of fleets, with automatic vehicle and merchandise identification, standardisation of vehicle internal</li> </ul>	<ul style="list-style-type: none"> <li>• Characterised by companies with small invoice volumes, except for the scant corporate groups that are included in GAIA.</li> <li>• Very heterogeneous, hardly specialised offer from the market’s point of view. It is hard to achieve global positioning in the Smart Mobility sector, since this includes highly variable value chains).</li> <li>• Few companies offer on-board systems.</li> <li>• Companies more centres on ICT than electronics.</li> <li>• International presence concentrated in just a few companies.</li> </ul>

<p>information busses, tariff management systems, etc.</p> <ul style="list-style-type: none"> <li>• Systems for image scanning techniques, biometric recognition, digital passport scanning, radio-frequency identification for cargo, and integrated and automatized Internet ticketless travel.</li> </ul>	
<p><b>Funding Possibilities</b></p>	
<ul style="list-style-type: none"> <li>• There are local programmes and calls for tender that promote the development of R+D+I in the Smart Mobility sector.</li> </ul>	
<p><b>Policy Framework</b></p>	
<ul style="list-style-type: none"> <li>• Promotion by local administration and country cluster initiatives to drive Smart Mobility forward in the region.             <ul style="list-style-type: none"> <li>◦ Ibilnet: <a href="http://www.ibilnet.com/ibilnet/c/index.html">http://www.ibilnet.com/ibilnet/c/index.html</a></li> <li>◦ Mobility Lab: <a href="http://www.openlivinglabs.eu/livinglab/mobility-sustainable-territories">http://www.openlivinglabs.eu/livinglab/mobility-sustainable-territories</a></li> </ul> </li> </ul>	
<p><b>Opportunities</b></p>	<p><b>Threats</b></p>
<p><b>Trends in Smart Mobility</b></p>	
<ul style="list-style-type: none"> <li>• The <b>impact of high fuel prices</b> continues, and is leading to the development of other types of vehicles, such as the electric vehicle.</li> <li>• Optimisation of the electric and electronic architecture on board the vehicles (fuel supply, operation, instrumentation), as well as the use of on-board diagnostic systems and the integral management of consumption cycles.</li> <li>• Technological innovations related to security aspects through reliable and robust electronic systems (the introduction of telematics “black boxes”/digital tachograph in cars and lorries offers an excellent opportunity to reduce the number of accidents).</li> <li>• In the field of air transport, the possibility to develop new, higher capacity airplanes, which will change the field of air transportation with new possibilities for on-board services. Of these services, those related to in-flight connectivity are among the most relevant.</li> </ul>	<ul style="list-style-type: none"> <li>• Presence of other, international companies of greater size and dimension that can cover all the value chains.</li> </ul>

## 5.2 SWOT Analysis for Smart Environment in the Basque Country, Spain

*Cities consume half of the energy produced in the world.* In the face of this fact, public administrations are supporting and promoting projects and initiatives that set the bases for what will be the *reconversion* of current cities into more *ecological, smarter* urban areas.

In many buildings, it’s customary to find lights on at night or empty rooms with the air conditioning system on. To mention other examples, many parks have sprinkler systems that turn on to water the grass when it’s raining, and leaks in poorly maintained water and wastewater systems lead to large amounts of water waste.

With the help of technologies, the different elements that make up an urban network (buildings, drainage system, parks, etc.) will be supplied with intelligence that will let them interact among each other and make autonomous decisions that lead to efficient energy use and respect for the environment.

It is evident that energy use is one of the most pressing needs of cities today. Faced with the need to control and ration energy consumption, some European cities have implemented “smart grids,” or intelligent electronic networks, that ensure an optimal energy distribution, monitoring its use through smart meters and sensors.

Another vital aspect for the sustainability of a city is water management. The problems related to distribution efficiency, leaks and water quality are serious challenges that must be tackled to guarantee the water supply for thousands of people in the future. In order to achieve these parameters for rational water use, ICTs become an essential tool for smart management.

**Table 7: Overview SWOT – Basque Country (Spain) – Smart Environment**

Strengths	Weaknesses
Technology Competencies	
<ul style="list-style-type: none"> <li>• Meteorological prediction and mapping                             <ul style="list-style-type: none"> <li>○ Geographical information systems</li> <li>○ Sensor networks and Internet</li> <li>○ Smart devices (smart meters)</li> </ul> </li> <li>• Active management for the energy distribution network                             <ul style="list-style-type: none"> <li>○ Smart measurements (air quality etc.)</li> <li>○ Process conditioning systems</li> </ul> </li> <li>• Building management</li> <li>• Remote communication technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Smart water management</li> <li>• Establishment of systems for anticipated alarm and reaction to water demand                             <ul style="list-style-type: none"> <li>○ Smart pipes</li> <li>○ Real-time risk evaluation</li> <li>○ Efficient flood management</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>• Management and protection of natural spaces:             <ul style="list-style-type: none"> <li>○ Management, planning and simulation tools using cloud computing</li> <li>○ Information-communication systems on the Internet, and mobile applications</li> <li>○ GIS (Geographic Information Systems)</li> <li>○ Simulation and planning systems</li> <li>○ Systems for calculating environmental impact</li> </ul> </li> <li>• Domotechnics             <ul style="list-style-type: none"> <li>○ Control of lights and shutters</li> <li>○ Temperature control</li> <li>○ Control of energy use</li> <li>○ Control of household appliances</li> </ul> </li> <li>• Security             <ul style="list-style-type: none"> <li>○ Control of presence and access</li> <li>○ Surveillance cameras</li> <li>○ Technical alarms</li> <li>○ Remote control</li> </ul> </li> </ul>	
<p>Funding Possibilities</p>	
<ul style="list-style-type: none"> <li>• There are local programmes and calls for tender that promote the development of R+D+I in the Smart Environment sector.</li> </ul>	
<p>Policy Framework</p>	
<ul style="list-style-type: none"> <li>• Different departments and agencies of the Basque Government and clusters are working on this issue</li> <li>• The III Programa Marco Ambiental (III Environmental Framework Programme) develops the challenges set forth in the EcoEuskadi 2020 strategy, dealing with social and environmental sustainability.</li> <li>• Support for the development of initiatives such as Ingutech: “Opportunities for the development of integrated, technologically advanced solutions for sustainable management and the protection of natural spaces.”</li> </ul>	

Opportunities	Threats
Trends in Smart Environment	
<ul style="list-style-type: none"> <li>• The implementation and success of “smart grids” require the awareness and participation of the user or final consumer as another element in the smart network.</li> <li>• New distribution model for electricity, the user is aware of his or her consumption as well as the tariff that applies in real time.</li> <li>• Smart networks are meant to reduce the emission of CO2.</li> <li>• Design and development of an efficient management platform that will inform on collection needs based on different parameters in different areas of the city through the use of wireless sensor technologies, and offer optimal and efficient routes that change dynamically depending on the needs of each day.</li> </ul>	<ul style="list-style-type: none"> <li>• The implementation and success of “smart grids” require the awareness and participation of the user or final consumer as another element in the smart network.</li> <li>• In some cases it may imply large public and private investments and the development of legal issues, especially regarding the large volume of personal information that will be generated and distributed through the network.</li> <li>• The countries that are “market leaders” such as Germany, the Czech Republic and Romania, don’t have a legal framework for the development and installation of smart meters, others do have a framework, and some countries are still indecisive or haven’t made statements on the issue.</li> <li>• To this day, we don’t know the state of the containers, regarding the level to which they are filled, until they are full. This creates two inconveniences: on one hand, some containers may be filled excessively, while on the other some are completely or partially empty.</li> </ul>

### 5.3 **SWOT Analysis for Smart Living in the Basque Country, Spain**

Current cities should place smart social-health attention services at the disposal of their citizens, in order to improve on the current level of their quality of life. For this, the components, processes and participants that make up the social-health system must be connected, and the information available must be useful as well as accessible. This requires the integration of all the information and the development of advanced analyses that will allow results to improve (faster, more detailed and more efficient analyses).

In the past few years, we have been talking about the ePatient, understanding by this a patient that is traceable, efficiently monitored, electronically aided wherever he or she is, and interacting with medical professionals through ICTs.

The experts believe that the healthcare system of the future will be focused on a greater personal responsibility, on the part of the patient, in the management of his or her health, concentrating on health maintenance and disease prevention, a situation for which the right balance between technologies used for diagnosis, those of therapeutic use, and those linked to prevention and the health maintenance of the population, must be found.

Within the concept of Smart living, there is also work being carried out in that direction, which is focused on seeking the wellbeing of citizens and achieving more amicable, rational, productive, sustainable and secure relationships between the individual and his or her environment.

The trend is to evolve towards biometric applications, gesture and body recognition, communications and localisation techniques, etc., applied at a both the residential and non-residential levels, as well as the surrounding environment.

**Table 8: Overview SWOT – Basque Country (Spain) – Smart Living**

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Technology Competencies</li> </ul>	
<ul style="list-style-type: none"> <li>• Devices for diagnosis and analysis (biochips, biosensors) that increase the degree of autonomy of patients:                             <ul style="list-style-type: none"> <li>○ Telemetry</li> <li>○ M2M and H2M interface</li> </ul> </li> <li>• Efficient remote medicine system: follow-up and monitoring.</li> <li>• Computerisation of administrative and bureaucratic processes:                             <ul style="list-style-type: none"> <li>○ Document management</li> <li>○ File management</li> <li>○ SMH: Smart medical history</li> <li>○ Electronic prescription</li> </ul> </li> <li>• Advanced training technologies (virtual reality, augmented reality, etc.).</li> <li>• Inter-operability of computer equipment and systems in the same healthcare centre.</li> <li>• Usability and accessibility</li> <li>• Smart Home                             <ul style="list-style-type: none"> <li>○ Smart Environments</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Social-health systems are not inter-connected with each other; there is no inter-operability between them.</li> <li>• Small companies</li> <li>• The offer is barely focused, in relation to the social-health demand.</li> <li>• Companies focused more on ICT than electronics.</li> <li>• Users and prescribers in general are unaware of the existent offer.</li> <li>• International presence barely above token (centred on just a few companies).</li> </ul>
<ul style="list-style-type: none"> <li>• Funding Possibilities</li> </ul>	
<ul style="list-style-type: none"> <li>• Private investment. There is important private capital interested in investing in technologies providing services for older and/or disabled people, since, given the demographic evolution of developed countries, they find an important possibility for elevated investment returns in this segment.</li> <li>• There are local programmes and calls for tender that promote the development of R+D+I in the Smart Living sector.</li> </ul>	



Policy Framework	
<ul style="list-style-type: none"> <li>• Development of thematic environments that produce new services or contents in Healthcare Telecommunications and Information Society (for example, “Mi carpeta personal de salud” [My Personal Health File]).</li> <li>• <a href="https://micarpetasalud.osakidetza.net/b65CarpetaSaludWar/login/inicio?locale=es">https://micarpetasalud.osakidetza.net/b65CarpetaSaludWar/login/inicio?locale=es</a></li> </ul>	
Opportunities	Threats
Trends in Smart Living	
<ul style="list-style-type: none"> <li>• Reduction of healthcare costs and human error rates through the use of ICTs.</li> <li>• Home assistance for dependant persons.</li> <li>• Communication with the social environment, elimination of barriers.</li> <li>• Remote treatment management.</li> <li>• Standardisation of information, data and processes.</li> <li>• Within the concept of the smart home, there are areas of opportunity in creating homes capable of learning and adapting to the user in a smart way through natural interaction.</li> <li>• “Portable” healthcare assistance, integrated into PDA-style mobile devices, with ICT support, ever lighter and more comfortable to carry.</li> </ul>	<ul style="list-style-type: none"> <li>• There is no specialised medical machinery developed locally; it must be purchased abroad.</li> <li>• Low demand, although it is growing. At the moment, demand is low, but it is growing, and the growth rhythm is expected to increase progressively.</li> <li>• Differentiation between buyer and final user. The final users of healthcare products are mostly ill or disabled people, as well as older people, and this is a huge market that is on the rise. However, the buyers are healthcare or social services providers, insurance companies, residential homes for the elderly, ... These clients are few and powerful, and seek more services than products, which is where they can have business opportunities in the form of cost reduction or added services for which they can charge, ...</li> <li>• Legislation: sector very close to healthcare, any failure in the solution would have severe consequences, so determining civil liabilities for each case would be very important when developing and implementing these products or services.</li> </ul>

## 6 SWOT: Flanders

### 6.1 SWOT Analysis for Smart City Solutions in Flanders

The following table gives a global overview of strengths, weaknesses, opportunities and threats across all subdomains of the Smart Cities topic, from the Flemish perspective (and the embedded technologies angle). In the paragraphs that follow, we will zoom in on the individual subdomains of smart mobility, smart living as smart environment.

**Table 9: Overview SWOT – Flanders (Belgium) – Smart City**

Strengths	Weaknesses
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Solid technology base through top universities and research centres (in particular imec, iMinds, VITO, and the newly created center covering Smart Vehicles and Smart Machines)</li> <li>• Strong in dedicated technology subdomains (low power electronics, mixed-signal components, miniaturization, wireless communication)</li> <li>• Wide value chain from basic components to system integration, covering a large range of activities in micro- and nanoelectronics and its application domains.</li> <li>• World-class education and training offer.</li> <li>• High potential in design with highly skilled professionals.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Larger cities (Ghent, Antwerp, Brussels) are working on smart city programs</li> <li>• The Flemish Government follows a 'smart specialisation strategy', detailed in its VIA and NIB programs</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• As part of the ECSEL JIT, IWT has assigned 14 mio Euro as matching funding to support Embedded Systems projects.</li> <li>• IWT has a funding program for Key Enabling Technologies, including Micro- and Nano-Electronics</li> <li>• The NIB program is financially supported by Enterprise Flanders</li> <li>• A partnership, Belfius bank and EIB, offers 'cheap' loans to cities to support Smart City programs.</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Wide valley-of-death between research and industrial activities.</li> <li>• Large number of smaller companies and only few important players. Most of those companies are service providers focused on local business.</li> <li>• The DSP Valley community lacks companies with upstream value chain activities (ic. System integration, application development). Most companies focus on upstream value chain activities, i.e. Design &amp; development of components.</li> <li>• Several pilot projects in cities but very few projects make it to sustainable exploitation ("start-stop effect")</li> <li>• Insufficient integration of all stakeholders in the complete Smart Cities value chain</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Complexity of the Flemish ecosystem (regions, provinces, cities, municipalities). Smart city programs are not coordinated between the different levels.</li> <li>• Cities lack a coherent vision for Smart Cities (ad hoc, fragmented measures, no co-operation between cities, no spill overs or sharing of experiences, "reinventing the wheel")</li> <li>• High degree of "red tape" is a hurdle for entrepreneurship</li> <li>• Difference in vision and experience: big smart city solution providers (e.g. IBM, Siemens, and ABB) have built experience in large projects. Belgian policy makers are not ready yet for large scale implementations.</li> <li>• Cities tend to limit themselves to their central area, without taking into account the broader urban/metropolitan area (certain problems don't stop at the city borders!)</li> <li>• Insufficient international orientation of SME's</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Lack of funding for high tech products in</li> </ul>

	<p>'valley of death' phase.</p> <ul style="list-style-type: none"> <li>• No coordinated funding source for smart city projects. No cooperation between funding stakeholders (policy, banks, VC's)</li> <li>• Lack of evidence on impact and effectiveness of smart city strategies.</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Small Internal Flemish Market</li> <li>• Lack of end user involvement.</li> <li>• Involvement of SME's in tech transfer activities of research centres is not optimal.</li> <li>• Smart City business case in Flanders is not clear: only pilot activities and very few implementation activities that is not the basis for a sustainable business case.</li> <li>• Slow market uptake due to lack of standardisation.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• R&amp;D activities will further grow due to the internationalization of research and development.</li> <li>• Growing interests in highly integrated smart systems in Energy, Health and Mobility.</li> <li>• The Flemish government is supporting the development of embedded systems by focussing on the KETs, micro- and nano technology.</li> <li>• A lot of technology is available but there are a lot of interesting opportunities with regard to systems integration, application development.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• The Flemish Government has as objective :             <ul style="list-style-type: none"> <li>○ To assign more responsibilities to cities.</li> <li>○ To further elaborate a cluster policy that leverages on the 'strengths' of Flemish research &amp; Industry</li> </ul> </li> <li>• With its STEM policy the Flemish Government wants to stimulate youngsters to study Science, Technology, Engineering, and Maths.</li> <li>• Increasing interest of Flemish government to stimulate entrepreneurship as driver for future prosperity.</li> <li>• Widespread use of pilots is preparing cities</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Increasing competition from high tech companies from developing countries</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Lack of Smart City vision in small cities.</li> <li>• Smart city is more an urban strategy than an urban reality. Smart cities will appear through numerous bottom-up initiatives besides some strategic planning, and infrastructure development.</li> <li>• Top-down planning and bottom-up initiatives should complement each other. City hall is sometimes dominant. Dilemmas of citizen engagement.</li> <li>• Legal framework for smart city solutions is not clear yet. Changes in this framework can influence sustainability of business models.</li> <li>• Labour cost is too high</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Due to financial crisis, cities are confronted with budgetary constraints.</li> <li>• IWT subsidy budget requires a solid business case, which is not always available for projects with a societal character.</li> </ul>

<p>for initiative, experiment and learning</p> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Due to reform of Flemish provinces, more budget will be assigned to cities.</li> <li>• Smart City projects could be subject of standard IWT &amp; AO funding programs.</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Budgetary restrictions of municipalities increase the need for smart city solutions.</li> <li>• Untapped local market potential, even though it is relatively small.</li> <li>• General trends such as urbanisation increase the need for smart city solutions.</li> <li>• Most large smart city projects are granted to bigger companies that have expertise and financial basis to run those projects, but lack local implementation capacity. This offers opportunities to SME's to work as subcontractor on smart city projects.</li> </ul>	
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## 6.2 SWOT Analysis for Smart Mobility solutions in Flanders

SWOT Matrix for Smart Mobility in Flanders is the summarizing the results of desk research and meetings with members of the Flemish Regional Interest group. The matrix below is focusing on specific Smart Mobility related topics and is complementing the general SWOT matrix.

**Table 10: Overview SWOT – Flanders (Belgium) – Smart Mobility**

Strengths	Weaknesses
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• The Flemish research centres have specific programs covering mobility issues: iMinds, VITO, SOC Maakindustrie</li> <li>• Network/Cluster organisations are focusing on specific smart mobility topics (Flanders Bike Valley, VIM)</li> <li>• DSP Valley focuses on Smart Vehicles next to Smart Health &amp; Smart Home</li> <li>• Several pilot projects initiated, e.g. Road tolling, e-call, ...</li> <li>• Start-ups &amp; SME's actively working on solutions, e.g. Tapazz (car sharing), Blue Croner (charging stations for electrical vehicles)</li> <li>• Mobile connectivity widely available in Flemish cities as basis for mobility solutions.</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Several pilot projects are finished but do not make it to the exploitation phase.</li> <li>• Sensor networks allowing for vehicle to vehicle and vehicle to infrastructure communication not yet widely deployed.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Coordination between existing initiatives is limited.</li> <li>• Lack of coherent mobility vision ("widen your vision rather than widening roads")</li> <li>• Lack of coherent legal framework (e.g. electrical charging systems: who owns them? who exploits them? who pays to whom? what is the business model?)</li> </ul>

<ul style="list-style-type: none"> <li>• Melexis as world class player in automotive electronics</li> <li>• Leading SME's in bicycle sector: Ridley (bikes), Bioracer (clothing), Lazer (helmets), and a cluster bringing them together (Flanders' Bike Valley)</li> <li>• Several initiatives covering mobility: VIM, VIL, ITS etc.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• The Flemish government has developed a 'Mobility Plan' with as main objectives to improve accessibility, safety, quality of life, and sustainability.</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Flemish Department of mobility has a subsidy budget for innovative mobility solutions.</li> <li>• Strategic Research Centres, IWT, AO and some cluster organisations have specific funding programs for mobility projects.</li> </ul>	<p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Governmental support is spread over several administrations. There is a lack of consolidated funding opportunities to create relevant scale for smart mobility projects.</li> </ul>
<p><b>Opportunities</b></p>	<p><b>Threats</b></p>
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Technology companies evaluate smart mobility as a potential growth market.</li> <li>• Accelerate shift from automotive production to automotive design</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Leverage on Vanguard initiative with regard to smart specialization to develop a smart mobility specialization.</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Cfr. General SWOT</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Traffic jams in Flanders' major cities are increasing the need for 'smart mobility' solutions.</li> <li>• Uniqueness of Flemish Cities. Mobility challenges are local challenges which must be solved locally.</li> <li>• Cycling is a dynamic and growing market with interesting spill overs between cycling, tourism, health, sports, etc.</li> <li>• Drone, increasing momentum and interest to use drones for transport purposes. Technology for bicycles can be reused for drone development.</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Adoption of innovative solutions may take more time because of alignment of stakeholders involved.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• New regulations to govern 'side effects' of innovative mobility solutions.</li> <li>• Mobility 'stakeholders' not aligned.</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Lack of solid business case which is needed to mobilize 'commercial' money and to prove impact for mobilizing public money.</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Cooperation between big corporates (e.g. Samsung &amp; Trek bicycles) with major marketing power, will blow a way local SME initiatives.</li> </ul>

<ul style="list-style-type: none"> <li>International attention for 'cycling', enlargement of EU opens up for new markets, new partners</li> </ul>	
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### 6.3 SWOT Analysis for Smart Environment in Flanders

SWOT Matrix for Smart Environment in Flanders is the summarizing the results of desk research and meetings with members of the Flemish Regional Interest group. The matrix below is focusing on specific Smart Mobility related topics and is complementing the general SWOT matrix.

**Table 11: Overview SWOT – Flanders (Belgium) – Smart Environment**

Strengths	Weaknesses
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>iMinds, Vito, Energyville have specific research programs and test facilities focused on smart environment topics.</li> <li>Network/Cluster organisations are focusing on specific smart environment topics : i-Cleantech Flanders, Smart Grid Flanders, ODE (organisation for sustainable energy), The Flanders Innovation Hub for Sustainable Chemistry</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>The Flemish government aligns its environmental policy with EU policy.</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>Cfr. General SWOT</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>Smart Environment Systems requires integration of technology from different domains (e.g. electronics &amp; chemistry). There is few interaction between different domains.</li> <li>Management of utility infrastructure is the responsibility of a limited number of organizations.</li> <li>Several utilities are owned by global foreign players (e.g. Suez)</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>Energy: roll-out of Smart Metering approaches is lagging; government does not stimulate rollout</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>Cfr. General SWOT</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>No structured coordination between network/cluster organisations.</li> <li>Energy: slow uptake of smart metering market due to lack of good policy, and unclear business case (macro-economically profitable, but who gets the profit?)</li> </ul>
Opportunities	Threats
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>Technology companies evaluate smart environment as a potential growth market.</li> </ul> <p><u>Policy</u></p> <ul style="list-style-type: none"> <li>European 20/20/20 objective as driver for</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>Smart meter deployment does not match customer needs. Few customers see the added value for their home environment.</li> </ul>

<p>smart environment initiatives.</p> <ul style="list-style-type: none"> <li>• Protection against flooding, CO2 reduction, waste as raw material are priorities for the new Flemish Government</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• i-Cleantech Flanders (in cooperation with IWT) financially supports as part of the MIP program the definition of innovative smart environment projects.</li> </ul>	<p><u>Policy</u></p> <ul style="list-style-type: none"> <li>• Impact of policy measures depending on behavioural change of citizens (e.g. Demand side management)</li> <li>• Mismatch between short term policy programs and need for long term vision to solve environmental issues.</li> </ul> <p><u>Funding</u></p> <ul style="list-style-type: none"> <li>• Business models leveraging on government support (e.g. Support for Installation of solar panels) do not have a solid basis for sustainable growth (e.g. Several installers of solar panels went bankrupt due to the reduction of financial support by government).</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• Power of existing stakeholders in Energy market creates inertia for disruptive innovation.</li> <li>• Unresolved tension between self-sufficient, local energy supply (micro grids) and reliable global energy supply</li> </ul>
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## 6.4 SWOT Analysis for Smart Living in Flanders

SWOT Matrix for Smart Living in Flanders is the summarizing the results of desk research and meetings with members of the Flemish Regional Interest group. The matrix below is focusing on specific Smart Living related topics and is complementing the general SWOT matrix (cfr. § 3.1).

**Table 12: Overview SWOT – Flanders (Belgium) – Smart Living**

Strengths	Weaknesses
<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• iMinds and The Scientific &amp; Technology Centre for the construction sector have specific research programs related to Smart Living</li> <li>• Care living labs supports the development and testing of innovative care initiatives focusing on all aspects of care of the elderly.</li> <li>• Network/Cluster organisations are focusing on specific smart living topics (e.g. Voka health community, DSP Valley, Agoria)</li> <li>• Several important and healthy industrial players in Flanders (e.g. Renson, Daikin, Winsol, Niko)</li> </ul>	<p><u>Technology</u></p> <ul style="list-style-type: none"> <li>• Despite continuing efforts, still lack of standardization (e.g. different communication standards;)</li> <li>• Very heterogeneous living environment with numerous different technologies implemented in different ways.</li> <li>• Personal preferences of end user are dominant</li> <li>• Limited smart construction expertise at DSP Valley</li> <li>• Negative perception of Smart Home solutions (too elitist, too complex, too expensive)</li> </ul>





## 7 SWOT: BrainsBusiness/AAU

The three SWOT-analyses performed on the AAU-cluster in Denmark are the result of desk research combined with data from a survey-instrument sent out to the population and finally interviews with key respondents. While our interaction with the companies, organisations and key respondents did not always give precise indications of how the companies’ activities were posed within one of the three Smart City groups, the data-collection also showed us that there were many actions under way. The new Business Strategy from Aalborg Municipality will further advance this. Although not voted through yet, the draft indicates that Smart City Aalborg, also called ‘Smart Aalborg’, will be at the centre of the strategy plan running from 2015 to 2018. At the centre of the plan are the core research strengths and clusters relating to environment, ICT, transport, and logistics, which match the three focus areas of this project.

It is proposed that Aalborg Municipality, together with relevant partners, will establish a number of significant cross-disciplinary lighthouse projects as high-priority spearhead projects for the total smart city initiative. The focus of the ‘Smart Aalborg’ initiative will be to create synergy between technology, the society, and the citizens with the aim of building a more sustainable, innovative, and active city of Aalborg. The five lighthouse projects are

1. Open Data Lab (an open big data platform),
2. Digital infrastructure to citizens and companies (broadband dissemination),
3. Smart City Aalborg East (a Horizon 2020 urban renewal project),
4. Industrial symbiosis (resource efficiency by utilizing waste or energy surplus), and
5. Green Agents (sustainable and green citizens)

Thus, we are excited to seeing how this field will develop in the coming years. However, at the moment we do not know whether it will be local companies carrying out the work in these projected lighthouse projects.

We have chosen not to aggregate these three focus areas into an overall SWOT matrix for AAU. As such there are some overlaps in the three SWOTs.

### 7.1 SWOT Analysis for Smart Mobility in the North Denmark Region

**Table 13: Overview SWOT – North Denmark Region – Smart Mobility**

Strengths	Weaknesses
Technology competencies	
<ul style="list-style-type: none"> <li>• Many manufactures of individual component in the field of embedded systems and sensors are located in North Denmark (Xtel, Intel Mobile Communications Denmark, RTX Telecom, Gomspace)</li> <li>• Companies are highly-skilled in the Engineering Design Process (from idea to prototype)</li> <li>• Global-minded companies making solutions for</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of orientation to end-users, as most of the companies are sub-suppliers, not directly selling to the end-user</li> <li>• Large number of smaller companies, few important players</li> <li>• Companies are too technology-focused – not focusing enough on commercialization</li> <li>• Lack of large-scale production capacity (companies focused on niche-based products)</li> <li>• Lack of free Wi-Fi across the cities</li> </ul>

<p>international markets</p> <ul style="list-style-type: none"> <li>• The region was among first in Denmark to implement a smart-card for public transportation, which is an on-line information system for the public transportation system</li> <li>• Knowledge obtained from the Aalborg Municipality engagement in the FP5 and FP7 projects CIVITAS and ARCHIMEDES (“Achieving Real CHange with Innovative transport MEasures Demonstrating Energy Savings”) concerning greener and more use of public transport in the cities</li> <li>• The Intelligent Traffic Systems (ITS) project, a university-industry collaboration on intelligent cars (road pricing and parking)</li> <li>• Mobile connectivity is widely available in North Denmark cities as basis for mobility solutions</li> <li>• Strong competences in wireless communication (companies + skilled labour):             <ul style="list-style-type: none"> <li>○ 2G</li> <li>○ 3G</li> <li>○ 4G</li> <li>○ Wi-Fi</li> <li>○ Bluetooth</li> </ul> </li> <li>• Aalborg University is the country's largest engineering education, with competences especially within wireless communication (access to Innovation Accelerators in terms of skills and resources)</li> <li>• Great university-industry collaboration between companies and Aalborg University (project proposals and internship)             <ul style="list-style-type: none"> <li>○ The Aalborg model for problem-based learning</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Mobile connectivity in few rural areas is still lacking</li> </ul>
<p><b>Policy frameworks</b></p>	
<ul style="list-style-type: none"> <li>• The Aalborg City Council is part of the nationwide Smart City Network in collaboration with the Danish Ministry of Housing, Urban and Rural Affairs</li> </ul>	<ul style="list-style-type: none"> <li>• At regional level, there is no specific policy concerning Smart Mobility and Embedded Systems.</li> <li>• Lack of an overall strategy within the ICT area as well as a concerted effort</li> <li>• The ‘Smart Aalborg’ initiative will at latest be admitted to regional budget discussions in 2015.</li> </ul>
<p><b>Funding possibilities</b></p>	
<ul style="list-style-type: none"> <li>• The region supports innovation projects within the areas of Smart Cities and Embedded Systems</li> </ul>	<ul style="list-style-type: none"> <li>• No coordinated funding source for Smart City projects. No cooperation between funding stakeholders</li> <li>• At regional level, there is no programs or calls for tenders that directly promotes development of R&amp;D and innovation in the Smart Mobility sector.</li> </ul>

Opportunities	Threats
<b>Trends in Smart Mobility</b>	
<ul style="list-style-type: none"> <li>• Strong research area at Aalborg University</li> <li>• Growing interest in highly integrated Smart Solutions in Mobility, Energy, and Living</li> <li>• High-tech companies evaluate Smart Mobility as a potential growth market and expect to generate business in this area within the next three years</li> <li>• The ‘Smart Aalborg’ strategy (2015) including the lighthouse projects:                             <ul style="list-style-type: none"> <li>○ Open Data Lab (open big data platform)</li> <li>○ Digital infrastructure (broadband dissemination)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Lack of political willpower to support the necessary investments in infrastructure</li> </ul>

## 7.2 SWOT Analysis for Smart Living in the North Denmark Region

**Table 14: Overview SWOT – North Denmark Region – Smart Living**

Strengths	Weaknesses
<b>Technology competencies</b>	
<ul style="list-style-type: none"> <li>• The Aalborg Care Consortium (AACC) addresses an international market concerning elderly care (e.g. nursing home design, nursing home implementation, and care education). A consortium have been created to export the concept - already operating on the Chinese market (<a href="http://www.fremtidensplejehjem.dk/aalborg-care-consortium/aacc-english-summery.aspx">http://www.fremtidensplejehjem.dk/aalborg-care-consortium/aacc-english-summery.aspx</a>)</li> <li>• Strong wireless cutting-edge competence, which can be adapted to Smart Living solutions</li> <li>• RTX Telecom is world class player in ultra-low power wireless communication (DECT and Bluetooth) and is already in the Smart Home market, along with e.g. Zense Technology</li> <li>• Companies are highly-skilled in the Engineering Design Process (from idea to prototype)</li> <li>• Global-minded companies making solutions for international markets</li> <li>• Aalborg University is the country's largest engineering education, with competences especially within wireless communication (access to Innovation Accelerators in terms of skills and resources)</li> <li>• Great university-industry collaboration between companies and Aalborg University (project</li> </ul>	<ul style="list-style-type: none"> <li>• No standardization</li> <li>• Lack of system solutions</li> <li>• Lack of orientation to end-users, as most of the companies are sub-suppliers, not directly selling to the end-user</li> <li>• Large number of smaller companies, few important players</li> <li>• Companies are too technology-focused – not focusing enough on commercialization</li> </ul>

<ul style="list-style-type: none"> <li>proposals and internship)</li> <li>The Aalborg model for problem-based learning</li> </ul>	
<b>Policy frameworks</b>	
<ul style="list-style-type: none"> <li>The Aalborg City Council is part of the nationwide Smart City Network in collaboration with the Danish Ministry of Housing, Urban and Rural Affairs</li> </ul>	<ul style="list-style-type: none"> <li>At regional level, there is no specific policy concerning Smart Living and Embedded Systems.</li> <li>Lack of an overall strategy within the ICT area as well as a concerted effort</li> <li>The ‘Smart Aalborg’ initiative will at latest be admitted to regional budget discussions in 2015.</li> </ul>
<b>Funding possibilities</b>	
<ul style="list-style-type: none"> <li>The region supports innovation projects within the areas of Smart Cities and Embedded Systems</li> </ul>	<ul style="list-style-type: none"> <li>No coordinated funding source for Smart City projects. No cooperation between funding stakeholders</li> <li>At regional level, there is no programs or calls for tenders that directly promotes development of R&amp;D and innovation in the Smart Living sector.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<b>Trends in Smart Living</b>	
<ul style="list-style-type: none"> <li>Considered to be an attractive business opportunity</li> <li>Growing interest in highly integrated Smart solutions in Living, Mobility, and Energy</li> <li>High-tech companies evaluate Smart Living (especially Smart Home) as a potential growth market and expect to generate business in this area within the next three years</li> <li>The region policy is currently being revised</li> </ul>	<ul style="list-style-type: none"> <li>Lack of focus on user-interface (user case before business case and technology)</li> </ul>

### 7.3 SWOT Analysis for Smart Environment in the North Denmark Region

Table 15: Overview SWOT – North Denmark Region – Smart Environment

Strengths	Weaknesses
<b>Technology competencies</b>	
<ul style="list-style-type: none"> <li>The Totalflex project (Smart Grid), an university-industry collaboration between Aalborg University and Neogrid Technologies on electricity prices</li> <li>The Smart City project DGNB (sustainable construction of four North Jutland health centres)                             <ul style="list-style-type: none"> <li>The Network for Sustainable Business Development in Northern Denmark (NBE), with the aim of improving companies'</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>There is a lack of system solutions covering the whole chain from end users to the smart grid</li> <li>Lack of inter cluster collaboration</li> </ul>

<p>competitiveness by targeting its efforts towards environmental sustainability in the production and product (<a href="http://www.sustainablecities.eu/index.php?id=241">http://www.sustainablecities.eu/index.php?id=241</a>)</p> <ul style="list-style-type: none"> <li>○ World class research capacity at Aalborg University (Department of Energy Technology)</li> </ul>	
<b>Policy frameworks</b>	
<ul style="list-style-type: none"> <li>• The Aalborg City Council is the initiator of the European sustainable cities platform, <a href="http://www.sustainablecities.eu">www.sustainablecities.eu</a></li> <li>• The Aalborg City Council is part of the nationwide Smart City Network in collaboration with the Danish Ministry of Housing, Urban and Rural Affairs</li> </ul>	<ul style="list-style-type: none"> <li>• At regional level, there is no specific policy concerning Smart Environment and Embedded Systems.</li> <li>• Lack of an overall strategy within the ICT area as well as a concerted effort</li> <li>• The ‘Smart Aalborg’ initiative will at latest be admitted to regional budget discussions in 2015.</li> </ul>
<b>Funding possibilities</b>	
<ul style="list-style-type: none"> <li>• The region supports innovation projects within the areas of Smart Cities and Embedded Systems</li> </ul>	<ul style="list-style-type: none"> <li>• No coordinated funding source for Smart City projects. No cooperation between funding stakeholders</li> <li>• At regional level, there is no programs or calls for tenders that directly promotes development of R&amp;D and innovation in the Smart Environment sector.</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<b>Trends in Smart Environment</b>	
<ul style="list-style-type: none"> <li>• Strong research area at Aalborg University</li> <li>• Growing interest in highly integrated Smart solutions in Energy, Living, and Mobility</li> <li>• High-tech companies evaluate Smart Environment (especially Smart Energy) as a potential growth market</li> <li>• The ‘Smart Aalborg’ strategy (2015) including the lighthouse projects: <ul style="list-style-type: none"> <li>○ Smart City Aalborg East (urban renewal project)</li> <li>○ Industrial symbiosis (resource efficiency by utilizing waste or energy surplus)</li> <li>○ Green Agents (sustainable and green citizens)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Weaker regulation on environmental performance of companies and private homes</li> </ul>

## 8 Conclusion

The CLINES partnership engages four excellent clusters from across Europe around a common mission to link research- and innovation strategies in Embedded Systems in order to enhance product competitiveness and impact in the area of resource efficiency – more specifically focusing on the use of Embedded Systems for energy saving and Smart Cities, focusing on intelligent buildings and smart grids.

In this work step the research analysed the specific strength and weaknesses of each of the participating regions. Thereby the report forms the basis of the outputs in the next project stages, namely the work package 4, where the finalised results from regional status-quo (work package 2) will be used to deal questions of with strategy development and policy recommendations.

The four single SWOT analyses in this document focus closely on the utilisation of competences and innovation potentials and assess the general framework conditions in each of the participating regions. The studies narrow down specific strength, weaknesses, opportunities and threats in each of the CLINES regions, thereby substantially deepening the analysis carried out in the last outputs, especially D2.1 and D2.2. The result provides a clear picture what kind of problems and possibilities each region has to deal with and how competences and innovation potentials are utilised.