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Definition of Smart Energy City and State of the art of 6 Transform cities using Key Performance Indicators

Deliverable 1.2

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Publication date:
2013

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Nielsen, P. S., Ben Amer, S., & Halsnæs, K. (2013). Definition of Smart Energy City and State of the art of 6 Transform cities using Key Performance Indicators: Deliverable 1.2.

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Definition of Smart Energy City and State of the art of 6 Transform cities using Key Performance Indicators

Deliverable 1.2

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30/08/2013





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Introduction

This report summarises the work undertaken under the EU-FP7 TRANSFORM project for Work Package 1 (part 1): Becoming a Smart Energy City, state of the Art and Ambition. Part 1 starts with a clear outline of each of the participating cities. The work describes the context in terms of climate, energy assets, ambitions, targets and main possibilities in terms of energy efficiency, flows and energy production. After this first step, the work focuses on the description of what a smart energy city is (this report), what the main Key Performance Indicators (KPIs) are that should be met and how this relates to where the current cities and the living labs are. It describes at the same time the current status of city planning, energy planning tools, and existing energy data. The outline should also include information on energy production, energy flows and energy efficiency, where possible. The work will draw largely on existing Strategic Energy Action Plans, Climate Action Plans and planning documents.

This report establishes a definition of smart cities develops Key Elements, Key Performance Indicators and reports on the state of the art regarding the KPIs for the 6 Transform cities. As specified in the Transform proposal, the objective of the evaluation is to identify previous and existing initiatives as a sort of stocktaking on the way to establishing a smart city transformation pathway for each of the participating cities in the Transform project. The definition of a smart energy city and the key performance indicators will be used throughout Transform the guide the work.

Definition of Smart Energy City

According to Transform a Smart Energy City is defined as follows (draft):

*“The Smart Energy City is highly **energy and resource efficient**, and is increasingly **powered by renewable energy sources**; it relies on **integrated and resilient resource systems**, as well as insight-driven and innovative approaches to strategic planning. The application of **information, communication and technology** are commonly a means to meet these objectives.*





The Smart Energy City, as a core to the concept of the Smart City, provides its users with a liveable, affordable, climate-friendly and engaging environment that supports the needs and interests of its users and is based on a sustainable economy.”

Insight in discussion on the definition

Many have tried to defined “smart energy cities” and there is no general consensus on a definition. In particular the definition can be more of less technical and it can be defined at varying degrees of abstraction. In this case the definition has been defined very concrete which can be seen in the evaluation of the key elements. The way the definition has been written it includes the key elements which have been identified directly. So the definition reflects directly the identified 8 key elements. It should also be noted that it has been important for the team that environmental as well as economic and social elements are included in the definition.

The Transform team covers 6 different cities in Europe, with different economics and different social contexts. Specifically for the energy sector the cities are also very different in energy use, energy efficiency and energy production. At the planning level the cities also have very different traditions in city planning, energy planning and of specific relevance to the Transform project, very different traditions in monitoring and data collection.

Key Elements & indicators

The second task of the evaluation was to identify and decide on Key Elements of the smart energy city definition. However, as described above the key elements was identified in an integrated process with defining the smart energy city. Besides trying to determine elements holistically covering environmental, economic as well as social issues, it was also desired to be able to measure the energy issues consistently across different cities qualitatively and quantitatively. It was also desired to keep the number of key elements low to keep the data collection and analysis as simple as possible. The 8 elements determined are outlined below.





Definition of Key Performance Indicators

The Third task of the KPI evaluation was to define a form that could be used to assess the Key Elements in a qualitative way. Again a main idea was that the number of indicators should be manageable. Ideally the target was to have 10 Key Performance Indicators, however this was not possible. With 3-4 indicators per element the resulting number would be 20-30 indicators which were still regarded as manageable taking into account that not all cities needed to provide information for all indicators. The total number of indicators for each element is highlighted in brackets in the above list of Key Elements. In total, there are 35 indicators. The full list of indicators is provided in the first reporting from the cities in Appendix A.

List of 8 Key Elements:

- Resource system integration (6)
- Access to energy services (2)
- Resilience (4)
- Energy Efficiency (5)
- Renewable Energy (4)
- Active and engaged users (6)
- Sustainable Economy (3)
- Smart Governance (5)

Development of tool to provide cities with insight

The specific difficulty was in being able to evaluate and determine specific performance of a city. In the case where a performance can be measured in a straight line from 0 to 100% it is relatively easy to determine and monitor it. However, to really assess the performance of a city in these cross sectorial areas it was determined that such an evaluation format was not sufficient. A format developed by The Climate Group et al, 2011¹ was then considered where a performance was

¹ Information Marketplaces – The New Economics of Cities, The Climate Group, Arup, Accenture, Horizon, 2011





measured on a scale from level 1 to level 4. In this format it is possible to define what should have been achieved to fulfil a level 1 performance and what should be achieved to fulfil a level 2 performance and so forth up to level 4. To illustrate this we can use “implementation of smart meters”. In this case it would appear relevant to look at the implementation of the smart meters ie level 1: 25% implementation of smart meters, level 2: 50% etc. But this does not take the planning process into account. The political and strategic work in developing a “smart meter strategy get it politically accepted may be harder and take longer time than the physical installation of smart meters. This has been some of the considerations, which have been taken into account in developing the method. In some cases, however it is possible to connect the levels 1-4 directly to specific measurable targets.

From insight to implementation

Initially it was the aim to connect the Level 1-4 tool to specific measurable targets. But it turned out to be very difficult and in some cases impossible to defined measurable targets. The issue was not only that it was difficult to measure the process towards a quantitative target.

Use of the tool, Workflow

The Level 1-4 tool was used by the team involved in part 1 lead by the City of Copenhagen. DTU/CPH lead the creation of the questionnaires, collection of data and development of the city reports.

- 1) The process began with DTU/CPH producing a draft questionnaire to be issued to the cities. For more specific information on the KPI questionnaire see Appendix A. Several telephone meetings and video conferences were carried to determine the format. The format for the final draft of the questionnaire was reviewed by the other active parties in part 1: Accenture and Arup.
- 2) A blank questionnaire was then issued to each of the cities.



- 3) Once the data was received from the cities, it was clear that the data were difficult to evaluate and specifically it was difficult to compare the results between the cities.
- 4) The questionnaire was then shortened in text and a new simpler format produced and the data transferred to the new format. The new format of the questionnaire was returned to each city for fine tuning.
- 5) The key information from the questionnaire is presented in a 2 page format for each city, attached directly after this report.

Becoming a Smart Energy City – State of the art of 6 Transform cities

Based on an evaluation of the city reports, it can be concluded that some issues can be considered in relation to a further development of the forms. The following section will provide some conclusions about the experiences.

Introduction

The work in part 1 can be described as a sort of process where a mirror is held up by each of the participating cities, where they can examine their own current performance across a range of sectors, and thereby see what needs to be improved in order to get to a well-defined state of being a smart energy city. The idea of the Transform project is not to compare the results or performance between the 6 cities.

The Baseline Analysis which is also carried out in part 1 provides a **snapshot in time** of each city. This is a **reference point**, from which the Transformation Agenda will define the process to become **A Smart Energy City**. The Key Performance Indicators then provide a set parameters or metrics against which a city can monitor their progress towards being a smart energy city (see fig. 1).



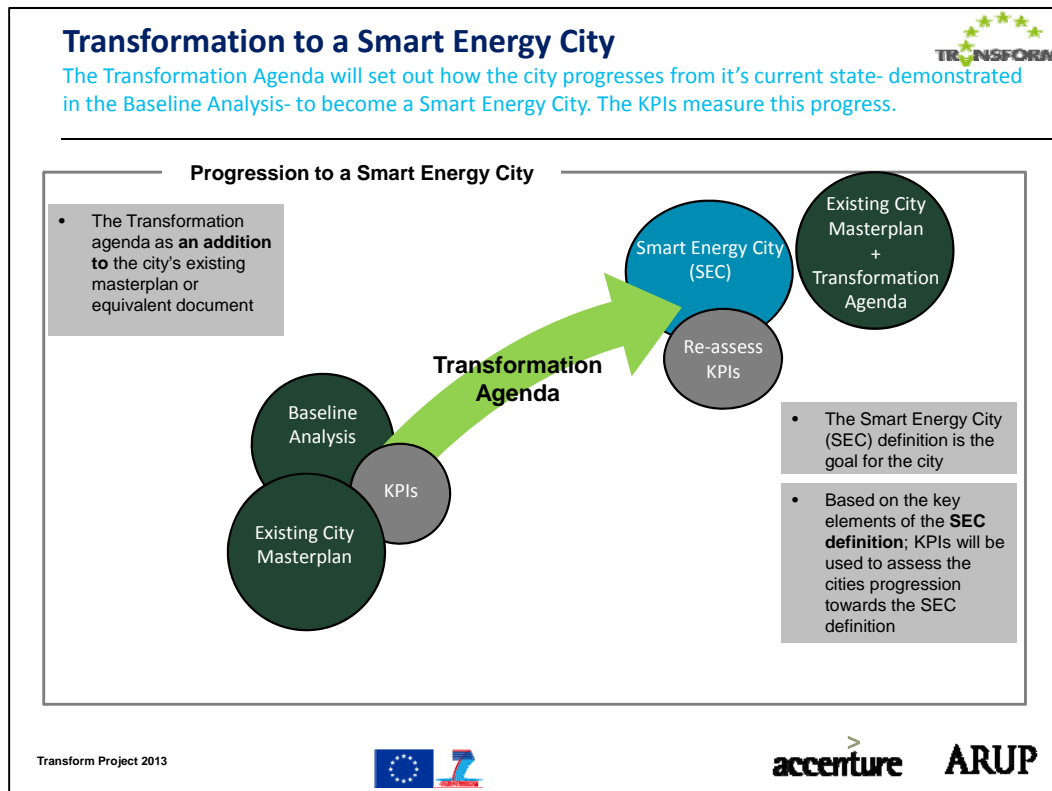


Figure 1. Illustration of the Transform progress including the positioning of the KPIs.

The findings of the KPI evaluation are summarised in a series of six summary reports; one per city. These are the **KPI reports**; the starting place from which the cities will begin their transition to Smart Energy Cities.

As well as providing a point of reference, each city will be able to use their KPI report in their intake workshop. The evaluation will help them to decide the areas they would like to focus their transformation efforts on.

Current status of the KPI reports

As of August 2013, five of the six cities have fully completed the KPI reports. Data from Vienna are based on a more aggregate evaluation of which level they have achieved, but there is currently no detailed information to support the evaluation.



Main analysis considering state of the art reports

Based on an evaluation of the city reports, it can be concluded that some issues can be considered in relation to a further development of the forms. The following section will provide some conclusions about the experiences.

Issues related to the role of the KPI's include:

- In the city reports there is in some cases a mix of information, where the KPI concept both are used in relation to both planning targets and performance indicators in relation to policies and transformation agendas
- Can KPI reports from cities be considered as a baseline for the transformation agenda?
- How can we use the KPI's in relationship to measure transformation agendas?
- Can the KPI's be directly linked to KPI's that are measured by the models that will be developed later in part 3 of the Transform project

The KPI forms can both work in relation to internal clarification in the cities and for cross cutting comparison and guidance for other cities, and this point should be made more clear. However, the questionnaires have been filled out by the cities themselves. They have not been filled out by the part 1 team. Most cities (Copenhagen, Amsterdam, Genoa, Lyon) have also decided which levels their city should be places for each of the indicators. The levels 1-4 have not been decided for these cities by the part 1 team. This is different for Hamburg where the part 1 team have decided the levels for each indicator based on the information provided by the city. In the case of Vienna only the levels have also been decided by the city without providing the background for the decided levels for each indicator. In any case, the part one team has not made any attempt to compare the information provided by the cities with the other cities. It is expected that both the information provided in the questionnaires and decision on current performance for each of the cities will be fine-tuned during the Transform project.

It can also be discussed what is the role of measuring the performance level is. It might be valuable to set targets for all cities in terms of how they could be more





advanced over time (even when being at level 4). It is also important to reflect strong as well as weak points in the city forms since this will provide a good reflective and consistent basis for the SWOT analysis. This has been done at varying degree and Lyon is a good example of reflective feedback.

More specific Issues:

- Important to balance the description of the supply system and technologies with demand, consumers and governance
- Include references to planning documents and other official reports
- Consider both energy system issues and the broader economic context

Feedback to methodology

City feedback issues

Examples of key common issues in the city reports are:

- Digital systems and big data platforms are highlighted, new opportunities
- Smart meters are rolled out in most cities
- Detailed energy plans exist including targets for renewable energy
- Public Private Partnership about investments are expected, but few details are given about how to align social and private perspectives and how to create a market

Weaknesses of the city reports include:

- Active citizen participation and challenges are not well covered
- Affordability and extra costs of clean energy, how is the city going to pay?
- Implementation of energy efficiency e.g. in buildings
- Relationship to green economy strategies
- City quality of life issues





State of the art reports

- ★ Amsterdam
- ★ Copenhagen
- ★ Hamburg
- ★ Genoa
- ★ Lyon
- ★ Vienna

Amsterdam KPIs

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KP1 Resource system @integration

	Level 1	Level 2	Level 3	Level 4
Integrated energy planning	Emergence of prosumers	Energy strategy: guidelines and roadmap	2015: new buildings 100% RES-heat and 50% RES-el	
Development of ICT use	Pilot & roll out of smart meters	Several small public wifis		
Use of ICT tools in city planning and mgmt.	Small scale decision support & monitoring tools	Planned large energy data analysis		
Flexibility and transparency of service providers	At consumer level: smart meters	At city level: publishing yearly energy consumption	data at a building level	
Waste (integration with resource systems)	Paper, batteries, metal, glass, plastics separated	Domestic waste burned in waste-to-energy plants	Sewage waste converted to biogas	
Transportation (integration with energy systems)	Bike highways discussed. E-mobility experiments.	Regulation for trucks in the inner city	Private parties: exploration of ideas of carpooling etc.	

KPI2 Access to energy services

	Level 1	Level 2	Level 3	Level 4
Access to affordable energy services	100% access to electricity	98% of households with access to affordable energy		
Level of energy services provided	No national policies on flexible tariffs	More and more products emerge		

KP3 Resilience

	Level 1	Level 2	Level 3	Level 4
Self-sufficiency distributed generation	Solar, wind, underground thermal storage	No specific goal		
Energy price shock	Not local, but national issue			

KP4 Energy efficiency

	Level 1	Level 2	Level 3	Level 4
Reduction of energy use	Financial support for measures in social housing	Low interest loans for energy measures for house owners	40% GHG emission reduction by 2015	
Increasing efficiency	Not a city issue			
Increasing efficiency in the supply system	Smart meters rollout, smart grid, home batteries	Pilot on innovative DH and DHC		
Increasing end-use energy efficiency	Unable to measure - done mostly by private parties			

KPI5 Renewable energy

	Level 1	Level 2	Level 3	Level 4
Production of electricity and heat from RES	Possibly solar&wind, cooling by deep lakes, sewage sludge to biogas	Private company: food waste to biofuels		
Level of public and private investment in developing RES	Possibly solar&wind, colling by deep lakes, sewage sludge to biogas	Private company: food waste to biofuels		
GHG emissions caused by energy production & transportation	Pilots in 3 main areas of work	40% GHG reduction by 2025		

KPI6 Active users

	Level 1	Level 2	Level 3	Level 4
Smart City-reflective behaviour	Smart meter pilots Energy loan	Hospital program Datacenter policy		
Awareness of the city's Smart energy vision	Marketing - yearly Smart City event	Amsterdam Smart City events (4x year)	Energy Cafe	
Formal& informal hubs and innovation centers	Amsterdam Smart City Green Metropole	Green Business Club	Climate Council	
Self-sufficiency by users	Climate policy	Amsterdam Smart City 3: districts as living labs	Various city-wide projects	
Engagement from users	Amsterdam Smart City: 3 districts as living labs, city wide (small) scale pilots	Policy: <i>Uitvoeringsagenda 2015-2020</i> . Hospitals		
Investment	Amsterdam Smart City: 3 districts as living labs, city wide (small) scale pilots	Policy: <i>Uitvoeringsagenda 2015-2020</i>		

KPI7 Sustainable economy

	Level 1	Level 2	Level 3	Level 4
Investment in innovation (public&private)	Vision on wind; car sharing; smart light; smart grid	Large: in DH and DC; optic fibre; use of datacenters' waste heat	University of Amsterdam, TKI IRIS, WUR	
Availability and prevalence of green jobs in the city	Jobs not a primary goal of energy transition			
Green initiatives	75% GHG emission reduction in all greenfield investments	Sustainable brownfields developments	No specific policy on retrofitting	

KPI8 Smart Governance

	Level 1	Level 2	Level 3	Level 4
Local stakeholders involved in investment and maintenance	Mostly private companies investing	Amsterdam Smart City programme	Amsterdam Smart City dsistricts; pilot projects	
Governance	Under construction from 2013			
Standards for data collection and analysis	Continuing shared data and open data projects	Analysis often up to the data user, not the keeper		
Government engagement with users	Several city labs			

Copenhagen KPIs

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KP1 Resource system integration

	Level 1	Level 2	Level 3	Level 4
Integrated energy planning	Established energy team in tech and env department	Implementation of Climate Action Plan 2025		
Development of ICT use	Pilot project but no strategy underway			
Use of ICT tools in city planning and mgmt.	Data strategy for the city adminstraion is under development	Admin has a shared documents and archive system between departments		
Flexibility and transparency of service providers	Self-service citizens service	Open data portal	One administrative entrate to the city	
Waste (integration with resource systems)	New Resrouces and Waste plan 2018	Reduce amount of waste for combustion by 20% from 2020	Increase the amount of household waste reused by 45% from 2013	
Transportation (integration with energy systems)	Policies for increasing non-car journeys, bike ot work journeys	transportation and use of C-neutral fuels	Shift of light vehicles and heavy vehicles to new fuels	

KPI2 Access to energy services

	Level 1	Level 2	Level 3	Level 4
Access to affordable energy services	The city has no influence on power prices	The city helps development of district heating - providing 98% of households with DH	It is not on the agenda in Copenhagen City	
Level of energy services provided	Has not been a priority for the city			

KP3 Resilience

	Level 1	Level 2	Level 3	Level 4
Self-sufficiency distributed generation	City wide roll out of projects for DG	Full access to self-sufficiency supply technologies		
Energy price shock	Energy security is mainly a national issue			

KP4 Energy efficiency

	Level 1	Level 2	Level 3	Level 4
Reduction of energy use	Energy reduction is an important part of the Climate Action Plan 2025	Reduce residential heat use by 20% and power use by 10% from 2010	Reduce energy use in city administration buildings by 40%	
Increasing efficiency	Pilot projects on distrcit heating and district cooling	98.5% of buildings connected to CHP production		
Increasing efficiency in the suply system	None or few initiatives on DSM			
Increasing end-use energy efficiency	Part of Climate Action Plan 2025 under energy consumption			

KPI5 Renewable energy

	Level 1	Level 2	Level 3	Level 4
Production of electricity and heat from RES	Under Climate Action Plan 2025 for district heating to become C neutral	Power production to be based on wind and biomass	Separation of plastic from waste to energy plants	

KPI6 Active users

	Level 1	Level 2	Level 3	Level 4
Smart City-reflective behaviour	Agenda 21 plan "Geen everyday life and quality of life passed	Includes a number of initiatives on behavioural change and	Section on smart citizens	
Awareness of the city's Smart energy vision	Got the Green City Award for 2014	Citizens ask for guidance on which action to take		
Formal& informal hubs and innovation centers	Part of agenda 21 citizen driven innovation	In cooperation with citizens, users,	local councils, orgs, media and research	
Self-sufficiency by users	80% of citizens think it is important that the city	to the citizens possibility to act environmentally friendly		
Engagement from users	The Agenda 21 plan includes specific initiatives	on increasing engagement		

KPI7 Sustainable economy

	Level 1	Level 2	Level 3	Level 4
Investment in innovation (public&private)	Investment in innovation is part of the Climate Action Plan			
Green initiatives	Development of Ørestaden	Coming development of Nordhavnen and Carlsberg		

KPI8 Smart Governance

	Level 1	Level 2	Level 3	Level 4
Local stakeholders involved in investment and maintenance	Development of Smart City Strategy	Part of the overall city development plan and	Climate Action Plan 2025	
e-Governance	Digitalisation strategy in place	Also run at national level		
Standards for data collection and analysis	CO2 Calculator	Yearly Environmental Plan	Environmental Impact Assessment	

Hamburg KPIs

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KP1 Resource system integration

	Level 1	Level 2	Level 3	Level 4
Integrated energy planning	Development of Climate Action Plan	Development of Master Plan for Climate Protection	Increased use of district heating and distributed generation	
Development of ICT use	Development and expansion of smart grids	Energy Plans based on "efficiency", networks", and "RE"	Hamburg established its Open Data Portal	
Use of ICT tools in city planning and mgmt.	Development of Energy Atlases for Hamburg	Implementation of "Hamburg information management"	Establishment of virtual collaboration platform for city administration	
Waste (integration with resource systems)	Innovative methods to recover energy from waste and waste water			
Transportation (integration with energy systems)	Installation of hydrogen filling stations	Hydrogen fuelled buses being tested	Integration of E-Mobility in Urban Planning	

KPI2 Access to energy services

	Level 1	Level 2	Level 3	Level 4
Access to affordable energy services	District heating covers 19% of heat requirements			
Level of energy services provided	Smart meter tariffs but no smart tariffs for private customers	High number of small scale RE, local subsidy programme	Pilot projects of smart end-use technology	

KP3 Resilience

	Level 1	Level 2	Level 3	Level 4
Self-sufficiency distributed generation	Many with with new RE technologies			
		And many new RE applications		

KP4 Energy efficiency

	Level 1	Level 2	Level 3	Level 4
Reduction of energy use	Hamburg offers an advisory program for in-plant EE for companies			
Increasing efficiency	Restructuring of Hamburgs power grid: grid automation		It covers energy, water, chemicals and waste	
Increasing efficiency in the supply system	Construction of an efficient combined cycle-plant for DH supply		Installation of heat accumulators for storage of RE	
Increasing end-use energy efficiency	Hamburg offers an advisory program for in-plant EE for companies		The city has established an eco-Renovation and retrofitting of building stock	
Reduction in primary energy demand	Specific energy savings are calculated			

KPI5 Renewable energy

	Level 1	Level 2	Level 3	Level 4
Production of electricity and heat from RES	The city strategy is to substitute finite resources with RE	Establishment of a city owned energy supplier	Initiatives within solar, deep geothermal energy and wind	
Level of public and private investment in developing RES	Realisation of a 10MW solar energy project	with participation of citizens via assets		
Penetration of RE in the city's energy portfolio GHG emissions caused by energy production & transportation	Restructuring Hamburgs power grid for integration of RE	Significant investments in wind-to-heat, solar atlas, solar energy and wind Strategy to reduce CO2		
	Implementation of Master Plan for Climate Protection	emissions by 40% in 2020 and 80% in 2050	Plans for onshore electricity supply for vessels in the port	

KPI6 Active users

	Level 1	Level 2	Level 3	Level 4
Smart City-reflective behaviour Formal& informal hubs and innovation centers	Nearly 500 projects have been realised in the Climate Action Plan 2007-12	The new Masterplan for Climate Protection offer a holistic approach to CO2	Targetting an ECO partnership, a JV between the city and commercial sector	
	The ECO-partnership encourages companies to go beyond	KlimaCampus was established in 2007 is a network of	KlimaCampus includes experts from 18 different institutes	
Self-sufficiency by users	Hamburg has had a dynamic process over the last 10 years	The process covers planning, economic, social and ecological development	The process involved most of the city's stakeholders	
Engagement from users	emission reduction has been carried out by 11 industrial companies	The self-commitment has ben expanded to 15 compnies in a new target	Council Hamburg, with 110 member organisation tries to achive more sust dev.	
Investment	The city has invested 22 million Euro per year since 2007			

KPI7 Sustainable economy

	Level 1	Level 2	Level 3	Level 4
Investment in innovation (public&private)	The ECO-partnership has been joined by 1500 companies	The EEHH network is set up to strenthen and promote cooperation		
Availability and prevalence of green jobs in the city	It is estimated 25,000 people work in the field of RE in Hamburg	It is expected to grow with 40% by 2015		
Green initiatives	BAUM, N Klub, Umwelt-Stammtisch			

KPI8 Smart Governance

	Level 1	Level 2	Level 3	Level 4
Local stakeholders involved in investment and maintenance	Many stakeholders were involved in the dev. of the master Plan	50 external stakeholders were involved		
Governance				
e-Governance				
Standards for data collection and analysis				
Government engagement with users	A Climate Protection Fund and Energy Fund can co-finance projects	The Partnership Hamburg Port has almost 1000 environmental partners	An annual Environmental Industry Summit addresses SMEs	

Genoa KPIs

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KP1 Resource system integration

	Level 1	Level 2	Level 3	Level 4
Integrated energy planning	Development of an overall strategy to improve performance	Incorporates Reg. Masterplan, Urban Mob. Plan and Sust. Energy Action Plan	Genoa is currently enagenage in updating of planning measures	
Development of ICT use	Large scale smart meter project was undertaken in 2000-2005 for all customers in Genoa	Genoa territory is served 95-98% by ADSL	Genoa has good wifi network covering 17000 subscribers	
Use of ICT tools in city planning and mgmt.	Designed a dashboard used by the Planning and Programming division	Apoint a traffic supervisor and dev. a Civil protection planning project	Developed an energy database	
Waste (integration with resource systems)	Aim at drawing up and reallise a waste management action plan	Specific actions are considered about recycling		
Transportation (integration with energy systems)	Not many opportunities to enlarge network	Modal shift to public transportation due to the Urban Mobility Plan		

KPI2 Access to energy services

	Level 1	Level 2	Level 3	Level 4
Access to affordable energy services	The cost of electricity does not exceed 10% of famliy income	Heating in winter may be expensive for some but no programme to address this		
Level of energy services provided	All Genoa households have smart meters			

KP3 Resilience

	Level 1	Level 2	Level 3	Level 4
generation	for self-sufficiency distributed	for monitoring progress	controls data on building	
Energy price shock	Not considered an issue so no programmes adopted			

KP4 Energy efficiency

	Level 1	Level 2	Level 3	Level 4
Reduction of energy use	Signed Covenant of Mayors in 2009	Developed a Sustainable Energy Action Plan	Energy effeieincy goals included in the SEAP	
Increasing efficiency of distribution networks	Developing a strategy for implementation of best practice technologies	and Implementation of management and control systems		
Increasing efficiency in the suply system	Developing specific actions aimed to increase energy efficiency in the supply system	Implementeing DSM and developing progress in PP, CHP and CCHP technologies		
Increasing end-use energy efficiency	Developing initiatives on end use energy efficiency	as part of SEAP		
Reduction in primary energy demand	Developing initiatives on energy demand reduction	as part of SEAP		

KPI5 Renewable energy

	Level 1	Level 2	Level 3	Level 4
Production of electricity and heat from RES	Production of RES is part of SEAP	Developing actions to increase RES to >20% in 2020		
Level of public and private investment in developing RES	Public and private investment in RES is part of SEAP	Developing actions to encourage public and private investments		
Penetration of RE in the city's energy portfolio	Genoa is working on increasing the flexibility of the grid	Increased flexibility will enable RES/DER integration and stabilise the grid	Implementation of storage systems will also speed up RES penetration	
GHG emissions caused by energy production & transportation	The target in SEAP is to reduce GHG emissions by 23.7% in 2020	Genoa is implementing a strategy to achieve the target	Genoa has set up a monitoring programme in 2011 to monitor progress	

KPI6 Active users

	Level 1	Level 2	Level 3	Level 4
Smart City - reflective behaviour	Development of an internal governance of the Association	Advertisement campaigns, participation to events and		
Awareness of the city's Smart energy vision	Developed a communication plan	A strategy on awareness by citizens is planned		
Formal& informal hubs and innovation centers	Technology is being supported through Technological Districts	Social activities through Palazzo Verde	Research activities through Erzelli Pole of technology	
Self-sufficiency by users	The target is to get 20% of citizens involved in involvement processes	The target is to get 10% of businesses involved in involvement processes.		
Engagement from users	Several initiatives have been boosted to increase inclusion of users	ie GAS Solidair Buying Groups, Living lab of the Project Peripheria	The general agreements of the Associates to be updated	
Investment	Genoa has made a strategy to encourage investments	It is the biggest goal of the Association		

KPI7 Sustainable economy

	Level 1	Level 2	Level 3	Level 4
Investment in innovation (public&private)	Companies can be member of AGSC by signing an MoU	Members have to present a free feasibility study		
Availability and prevalence of green jobs in the city	The objective of AGSC is related to creation of green jobs - indirectly	A new industrial cluster has opened addressing innovative companies		
Green initiatives	Few greenfield project in the near future	The focus is on brownfield development		

KPI8 Smart Governance

	Level 1	Level 2	Level 3	Level 4
Local stakeholders involved in investment and maintenance	The main objective of AGSC is to involve public	and private participation		
Governance	AGSC has the ambitious goal to become the control room	for cross departmental management		
e-Governance	Has started an initiative around territorial marketing	It foresees invloved of citizens (CityLogo)		
Standards for data collection and analysis	Genoa is implementing a database in connection with the SEAP	It includes a GIS database "Banca Dati Energia".	It includes data on en. prod., transformation and end use activities	
Government engagement with users				

Lyon KPIs

The Smart Energy City, as a core to the concept of the Smart City, provides its users with a liveable, affordable, climate-friendly and engaging environment that supports the needs and interests of its users and is based on a sustainable economy. The Smart Energy City is highly energy and resource efficient, and is increasingly powered by renewable energy sources; it relies on integrated and resilient resource systems, as well as insight-driven and innovative approaches to strategic planning. The application of information, communication and technology are commonly a means to meet these objectives.

KP1 Resource system integration

	Level 1	Level 2	Level 3	Level 4
Integrated energy planning	Decision to build energy -climate strategy in 2007	Scenarios for 20*20*20 goals	123 actions in 20 different areas	
Development of ICT use	Part of Smart City strategy	Community Management System implemented	Demonstration projects	
Use of ICT tools in city planning and mgmt.	Experiments on mobility, digital services, smart grids & innovation	Development of all-mode information platform	Data services for travellers and freight professionals experiment in 2014	
Flexibility and transparency of service providers	Cell phone services for pay for parking and tourism activities	Empl digital services for the city by 2014	Public database on GHG emissions and energy mix	
Waste (integration with resource systems)	Waste action plan (2007-2017) adopted in 2006	Recycling increased from 22.5% in 2010 to 27.8% in 2011	Recycling at waste processing plants with charitable recovering	
Transportation (integration with energy systems)	Energy-Climate Plan to reduce energy consumption by 20% by 2020	Projects implemented to support modal shift to public transport		

KPI2 Access to energy services

	Level 1	Level 2	Level 3	Level 4
Access to affordable energy services	No specific policy on energy precariousness			
Level of energy services provided	Communities have no influence on services proposed by suppliers	Communities participation in local experiments is limited		

KP3 Resilience

	Level 1	Level 2	Level 3	Level 4
Self-sufficiency distributed generation	Planned increased proportion of RE from 4% to 20% in 2020	Development of heating network	Creation of new wood burning heating units	
Energy price shock	Prices regulated at national level protecting against price shocks	Strategies to reduce energy demand to reduce price shocks		

KP4 Energy efficiency

	Level 1	Level 2	Level 3	Level 4
Reduction of energy use	Demanding building energy performance levels applied.	Experiments on smart electricity network management.	Short-distance city	
Increasing efficiency	No control over gas/electricity networks.			
Increasing efficiency in the supply system	No control over energy supply			
Increasing end-use energy efficiency	Supporting the local energy agency	in advising on energy efficiency.		
Reduction in primary energy demand	Encouraging the development of smart grid experiments			

KPI5 Renewable energy

	Level 1	Level 2	Level 3	Level 4
Production of electricity and heat from RES	Dev. of DH network to receive more biomass and so-	lar (20%RE in energy consumption in 2020)		
Level of public and private investment in developing RES	20% overall RE share	New wood-fired boilers in several Lyon communities		
Penetration of RE in the city's energy portfolio	20% overall RE share			
GHG emissions caused by energy production & transportation	Action plan within Lyon's Energy-Climate Plan		Annual evaluation of GHG emissions	

KPI6 Active users

	Level 1	Level 2	Level 3	Level 4
Smart City-reflective behaviour	Plan on education on sust.dev. from 1995, projects aiming at	understanding the challenges and motivations for	energy consumption measurement.	
Formal& informal hubs and innovation centers	Involved in clusters:	Chemistry/materials, IT, Energy, clean transportation&buses		
Self-sufficiency by users	Experiments; households not using tools e.g. smartphone apps			
Investment	Promotion of pilot projects	e.g. industrial heat recovery and ICT		

KPI7 Sustainable economy

	Level 1	Level 2	Level 3	Level 4
Investment in innovation (public&private)	Support of projects (portfolio of millions € worth).	Smart city strategy focusing on innovation.	Numerous experiments in clusters	
Green initiatives	Leading/supporting mobility projects.	Urban projects must apply sustainability criteria	Eco-district initiatives	

KPI8 Smart Governance

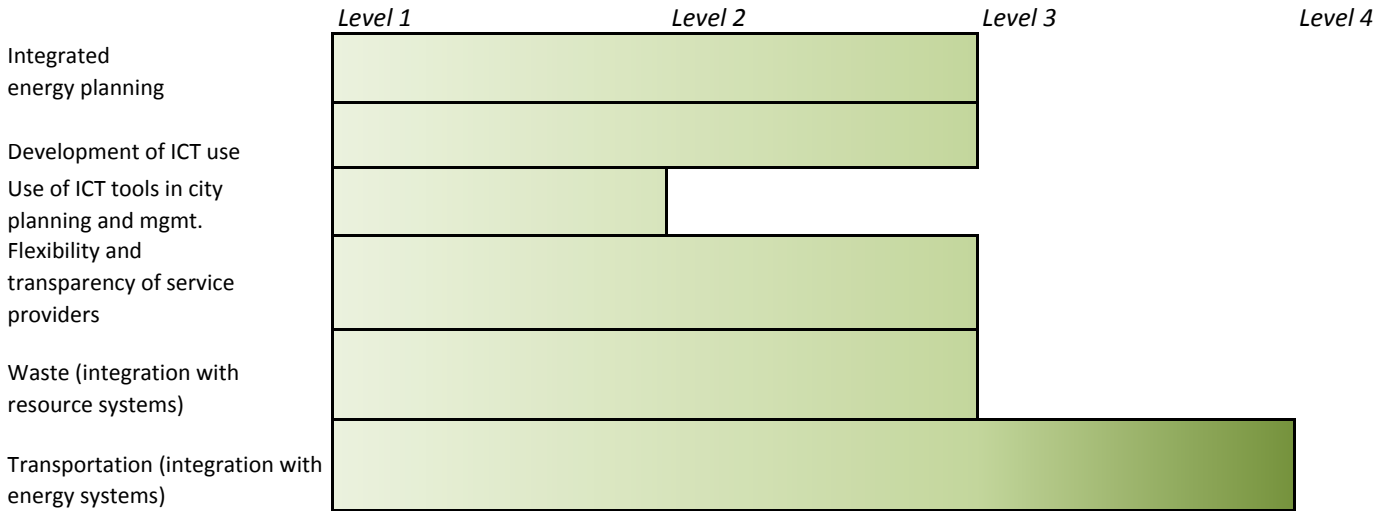
	Level 1	Level 2	Level 3	Level 4
Local stakeholders involved in investment and maintenance	GLs Smart City approach is based on collaborative projects	More than 12 collaborative projects are being carried out	A very large scale smart meter project is carried out involving 25000 households	
Governance	GL has developed a Smart City strategy	The Smart City Strategy includes an action plan, which has been implemented	GL coordinates a Opticities project with 23 partners aim to use urban mobility data	
e-Governance	Wants to developed a Smartdata set with reference and mgmt data			
Standards for data collection and analysis	Lyon is building a GIS database on energy	Climate and energy data are collected by OREGES	OREGES develops a public observation and information tool	
Government engagement with users	Decided to develop City Labs for public engagement	Around 20 City Labs are currently operating	Includes projects on comm transport, electric vehicles and energy data	

Vienna KPIs

Comment: No substantiation for chosen levels was given

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KP1 Resource system integration



KPI2 Access to energy services



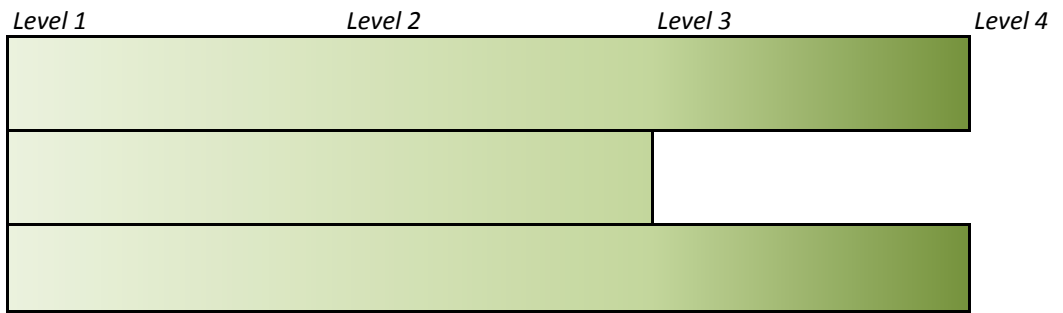
KP3 Resilience



KP4 Energy efficiency



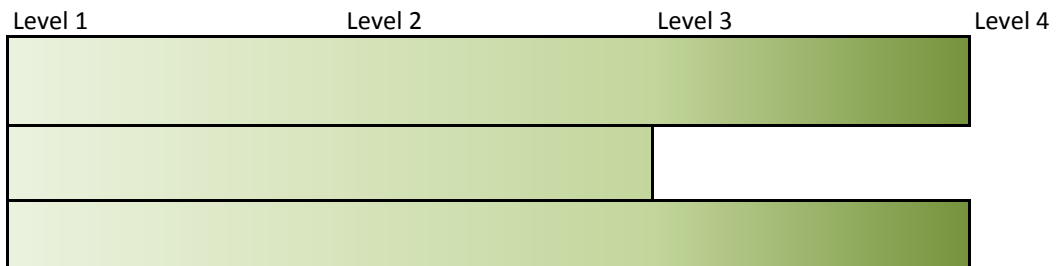
KPI5 Renewable energy



KPI6 Active users



KPI7 Sustainable economy



KPI8 Smart Governance

