TeMA

Journal of
Land Use, Mobility and Environment

This special issue collects a selection of peer-review papers presented at the 8th International Conference INPUT 2014 titled "Smart City: planning for energy, transportation and sustainability of urban systems", held on 4-6 June in Naples, Italy. The issue includes recent developments on the theme of relationship between innovation and city management and planning.

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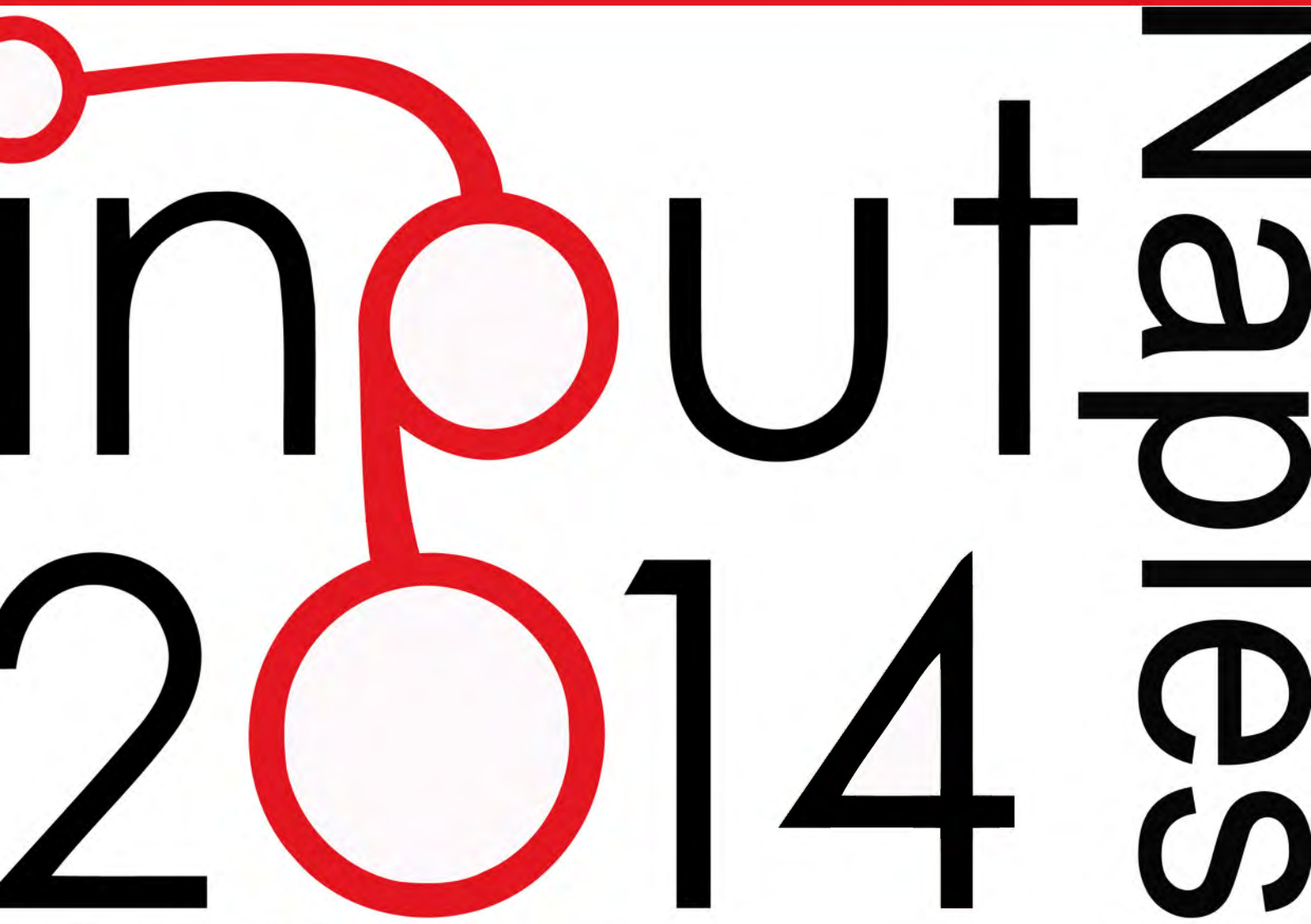

Smart City

planning for energy, transportation and sustainability of the urban system

Special issue, June 2014

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SMART CITY

PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

Special Issue, June 2014

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TeMA Journal of Land Use, Mobility and Environment

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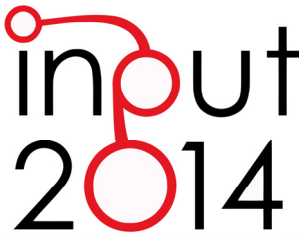
TeMA Journal of Land Use, Mobility and Environment

This special issue of TeMA collects the papers presented at the 8th International Conference INPUT 2014 which will take place in Naples from 4th to 6th June. The Conference focuses on one of the central topics within the urban studies debate and combines, in a new perspective, researches concerning the relationship between innovation and management of city changing.



TeMA Journal of Land Use, Mobility and Environment

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EIGHTH INTERNATIONAL CONFERENCE INPUT 2014

SMART CITY. PLANNING FOR ENERGY, TRANSPORTATION AND SUSTAINABILITY OF THE URBAN SYSTEM

This special issue of TeMA collects the papers presented at the Eighth International Conference INPUT, 2014, titled "Smart City. Planning for energy, transportation and sustainability of the urban system" that takes place in Naples from 4 to 6 of June 2014.

INPUT (Innovation in Urban Planning and Territorial) consists of an informal group/network of academic researchers Italians and foreigners working in several areas related to urban and territorial planning. Starting from the first conference, held in Venice in 1999, INPUT has represented an opportunity to reflect on the use of Information and Communication Technologies (ICTs) as key planning support tools. The theme of the eighth conference focuses on one of the most topical debate of urban studies that combines , in a new perspective, researches concerning the relationship between innovation (technological, methodological, of process etc..) and the management of the changes of the city. The Smart City is also currently the most investigated subject by TeMA that with this number is intended to provide a broad overview of the research activities currently in place in Italy and a number of European countries. Naples, with its tradition of studies in this particular research field, represents the best place to review progress on what is being done and try to identify some structural elements of a planning approach.

Furthermore the conference has represented the ideal space of mind comparison and ideas exchanging about a number of topics like: planning support systems, models to geo-design, qualitative cognitive models and formal ontologies, smart mobility and urban transport, Visualization and spatial perception in urban planning innovative processes for urban regeneration, smart city and smart citizen, the Smart Energy Master project, urban entropy and evaluation in urban planning, etc..

The conference INPUT Naples 2014 were sent 84 papers, through a computerized procedure using the website www.input2014.it . The papers were subjected to a series of monitoring and control operations. The first fundamental phase saw the submission of the papers to reviewers. To enable a blind procedure the papers have been checked in advance, in order to eliminate any reference to the authors. The review was carried out on a form set up by the local scientific committee. The review forms received were sent to the authors who have adapted the papers, in a more or less extensive way, on the base of the received comments. At this point (third stage), the new version of the paper was subjected to control for to standardize the content to the layout required for the publication within TeMA. In parallel, the Local Scientific Committee, along with the Editorial Board of the magazine, has provided to the technical operation on the site TeMA (insertion of data for the indexing and insertion of pdf version of the papers). In the light of the time's shortness and of the high number of contributions the Local Scientific Committee decided to publish the papers by applying some simplifies compared with the normal procedures used by TeMA. Specifically:

- Each paper was equipped with cover, TeMA Editorial Advisory Board, INPUT Scientific Committee, introductory page of INPUT 2014 and summary;
- Summary and sorting of the papers are in alphabetical order, based on the surname of the first author;
- Each paper is indexed with own DOI codex which can be found in the electronic version on TeMA website (www.tema.unina.it). The codex is not present on the pdf version of the papers.

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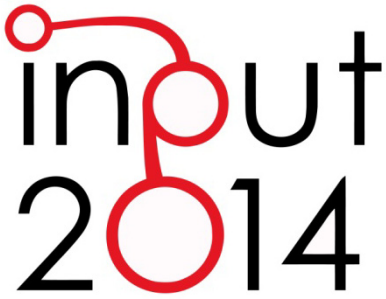
Naples, 4-6 June 2014



ACHIEVING SMART ENERGY PLANNING OBJECTIVES

THE APPROACH OF THE TRANSFORM PROJECT

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ABSTRACT
Cities play a dual role in the field of energy and integrated planning. They function as institutional planning and decision making bodies and interfere as actors, e.g. as project developers or launching customers. In the first case their attempts at integrated plans are often unsuccessful in integrating vision, goals and instruments of all stakeholders so that waste, water, energy cycles, urban planning and budgets proceed with no connection to each other.
TRANSFORM Project "Transformation Agenda for Low Carbon Cities" (FP7) tries to improve the integrated energy policy and decision making process of cities, both at a strategic and operational level, by providing the cities with a framework based on overall planning experiences and on-the-field projects and qualitative and quantitative analysis support models.
The project intends also to make a step further in the quality of research, by providing a replicable and tested framework for the production of a strategic Transformation Agenda for the city as a whole, combined with district Implementation Plans.

KEYWORDS
Smart municipal agenda, Urban energy planning

1 INTRODUCTION

Urban areas are worldwide responsible of almost 80% of the total GHG emissions; but, at the same time, municipalities can be considered as favourite areas that play a crucial role in the safeguard of the environment and in the setting out of more resilient.

Energy targets set by the European Union for 2050 overcome the 20-20-20 goals, aiming at an 80% - 90% reduction in greenhouse gas emissions and a near-zero carbon energy system. These targets are as ambitious as they are necessary and will require fundamental transformation of our society. Urban areas, currently responsible for three-quarters of the global energy demand, are the logical starting point for intervention to transform urban areas into resource efficient, low carbon places. Places that use their energy in an optimal way.

Such a fundamental transformation necessitates disruptive change in planning, development and decision making. That means a change towards real integration of planning and energy and more flexible decision making processes. Cities need to combine long term strategy and vision with practical, tangible and financially robust plans for implementation in surroundings which are open to new and integrated ways of working. The TRANSFORM project, this paper deals with, tries to support cities willing to take this leap.

With the launch of the "Smart Cities and Communities" industrial initiative the European Commission has expressed its wish to see cities taking their responsibilities in tackling the issues central to the SET-Plan (climate change and energy security) and in meeting its 20-20-20 targets.

By aiming both at the operational and strategic level, and focusing on replication both on a city level (district-to-district) as on a EU level (city-to-city) the project aims to have a maximum impact in reaching the 20-20-20 goals and beyond, while also staying practical and ensuring actual execution of energy efficiency projects. The cooperation in this consortium of commercial partners, research institutes, energy and grid companies and cities ensures both the dissemination and exploitation of the results.

As assumed in several recent documents, the approach carried on by the European Commission wishes to conjugate the environmental policy in a wider sense (struggle against pollution, re-forestation, waste treatment, sustainable mobility,..) with the topic of energy and climate changes, favouring synergic lines of actions, which permit to capitalize the interventions on the causes in parallel with the mitigation of the effects. In a general spirit of solidarity among Member States, the EU policy around the energy sector intends to guarantee the safety of the energy supply chain of the Union and the regular course of the market; this, promoting energy saving, efficiency and interconnection of energy networks, together with the development of the renewable sources. These could be considered as the first answer be implement in order to front the worst environmental challenges as the lasting carbon footprint and the reducing of greenhouse gas. This approach, consolidated as the years went by, was oriented to change radically the way Europe produces and consumes energy, setting up the basis of a new "industrial revolution", able to build up a high-level efficient and CO_2-low-emission economy.

European choices which characterized the economic and industrial policies in these first decades of this century are running straight along the Kyoto Protocol perspective (Hickman e Banister, 2007) which, as known, establishes that Industrialized and Transition Economy Countries must achieve different targets of atmospheric emissions' reducing. European Union wishes to pursue these objectives through the innovation in energy technologies and the proposal of market-and-finance instruments controlled at the EU level, also thanks to the involvement of the world of research.

Cities play a dual role in the field of energy and integrated planning. They function as institutional planning and decision making bodies and interfere as actors, e.g. as project developers or launching customers. In

the first case their attempts at integrated plans are often unsuccessful in integrating vision, goals and instruments of all stakeholders so that waste, water, energy cycles, urban planning and budgets proceed with no connection to each other. As actors they have difficulties at choosing cost effective, low carbon, financially feasible actions over business as usual scenarios. Implementation plans fail to choose life cycle approaches over short term payback periods, avoid high risk investments, and lever upfront costs over longer payback periods.

Furthermore, for most cities, making full use of the potential of analyzing the existing datasets of relevant stakeholders, combining them, and including possible new applications in search for better economics is a new step towards smart planning. We have some related examples in the pushing strategy towards the smart approach in governing cities and communities: energy efficiency and resilience are requirements new urban paradigms are centered on. Nevertheless, this innovative approach, more related to city's dynamics and shape than to the large-scale energy supply, needs tested experiences able to be capitalized, transferred and disseminated.

2 THE TRANSFORM PROJECT: AN APPROACH TO THE URBAN ENERGY PLANNING ISSUES

For decades, the attention paid to the urban recovery interventions is at the centre of the debate at the European scale: a certain similarity in the structuring of the urban and rural communities, a shared historical background and the overall objective of the communitarian cohesion helped, since the Nineties, a common cultural path which has been constituted by the outline of approaches, ways and instruments to face the matter. Starting from the insertion of the quality of life targets (requalification), as long as the following acknowledgement of lack of resources for the future generations (sustainability), it is clear that the town planning design has been widened in terms of contents and meanings.

Nowadays, going on along the path, the measure/assessment of the urban initiatives' effectiveness seems to be a further element of reflection. The soundness of these actions –realized in the metropolitan areas of the most of the European cities- would be showed thanks to their capacity to reach goals, improve standards of liveability and answering, in the meantime, to the above-cited principles.

It is the new paradigm that associates the requirements of *smartness* to the city, which aim to present itself as attractive towards the territories also distant, as competitive in terms of obtained investments, fast in the material and immaterial connections, able to exploit its potentials from the energy point of view and, therefore, maximizes results and benefits in the ecological perspective.

Evidently, such an urban organism shall shape physically and communication-ally in a efficient, effective, fast and intuitive way, *smart* in a word.

The Seventh Framework Program of Research addressed to the smartness in urban planning a call for projects in 2011, issued by the Energy General Direction, with the title "Smart planning".

This new openness towards urban themes linked with energy, if seen in a multi-decades overview, can ebe considered as the latest initiative of a overall strategy on the urban matters, faced during the years by the EU. This could be helpful in not seeing the smart planning field in terms of slogan, only.

This bore in continuity with what was accomplished in the last twenty years about the urban requalification debate in the European metropolitan contexts, enriched furthermore of new contents and of "other" subjects in respect of the original nucleus of architecture sciences.

The energy efficiency of plants and networks and the interoperability of data derived from different sources constitutes the surplus of a already well-spatially-organised city, which would like to improve its consumption

performances; moreover, with a contained effort of networking and coordination activity, it intends to set up its resources for upgrading the levels of offered services, thanks to the technological opportunities at disposal. In such organisation, spatial planning is not more than a card of the mosaic: nevertheless is fundamental, not only because it is the "mother" of the other initiatives to be settled down locally (land use planning and management), but also because it, differently from other technical approaches (typically of the engineering area), for its intrinsic nature, opens a dialogue with the social and political dynamics as long as building with them the real governance of the urban settlements.

Meaningful in this regard is the Transform Project- "Transformation Agenda for low carbon cities".

Within the project tasks, the 6 sample involved cities deal with the definition of a transformation path of their own contexts, by means of key performance indicators (KPIs) which permit a rigorous monitoring of the urban development, in terms of governance and the general outcomes in the sustainability field.

Key elements of the achieving goals are aligned with the 20-20-20 Directive and proposing something more, according to the recent targets reached by soome of the partners cities; moreover are crucial the participation of stakeholders and the use of ICT (Information Communication Technologies) as enabler factors of the incoming *smart communities.*

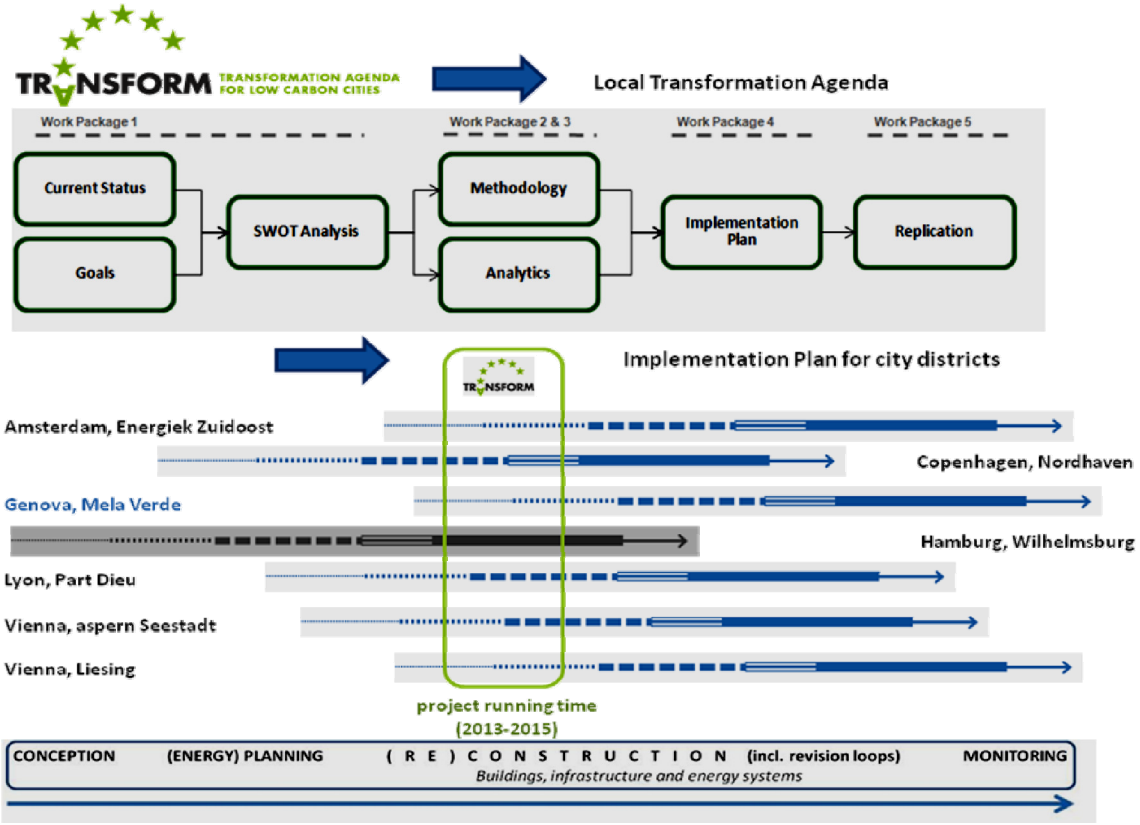

Fig. 1 Concept scheme of the phases of the Proiect TRANSFORM-8Transformation Agenda for Low Carbon Cities)

The project has the overall objective to draw up a transformation agenda which may be useful to address, firstly the partners and secondly the other interested urban contexts, in the process of transition towards a smarter way in planning, designing and living cities. The particular focus, in this case, regards the energy sector as a qualifier of the smart paradigm. The project starts form a very deepened analysis involved towns: this for two main reasons. On the first hand, because of the sharing of mutual knowledge and the building up of a computer science tool in support to the planning activity. On the other hand, the survey on

data had the scope of selecting those indicators which can take a picture of the city performance that is walking along an evolutionary scenario, from the "rough" level to a "smart" one.
This research activity was lead within the project not only for the partners cities but in benefit of all the network of European cities which will be interested in testing their own results, thanks to the make at disposal, most wide as possible, of a "handbook", a manual not exclusively technical, in support of urban realities that would like to set out on this process.

2.1 CONTENTS, METHODS: T.A., D.S.S. AND INDICATORS

TRANSFORM tries to improve the integrated energy policy and decision making process of cities, both at a strategic and operational level, by providing the cities with a framework based on overall planning experiences and on-the-field projects and qualitative and quantitative analysis support models. These models help local governments turn long term ambitions into tangible Implementation Plans within the context of metropolitan possibilities and conditions. The models should help stakeholders evaluate the economic feasibility of their plans by visualizing possibilities in terms of energy efficiency and production, rhythms of flows (energy, waste, water, etc), their interrelation and possible measures and costs, all of which will be based on quantitative and qualitative analysis.
The *main objectives* of TRANSFORM are:

- Support cities in their strive for integrated energy planning, through the combination of strategy and operations. By making Transformation Agenda's for the city as a whole, urban strategy is combined with the operational level of tangible implementation plans for city districts, embedded in urban planning and the local city specific context.
- Improve insight in successful stakeholder processes by innovating the way of working throughout the TRANSFORM project through design thinking methods, and bundling experiences for replication in other cities.
- Improve strategic financial strategies for low carbon cities, by bringing the current state of the art a step further and implement all insights in strategic Transformation Agenda's
- Improve insight in the generation and use of quantitative data, the role of analytics for scenario making, and the possibility to find better economics through the use of analytics.
- Ensure replication and dissemination of the TRANSFORM outcomes through a replication and exploitation campaign aiming at both the professional level as well as the political level of cities.

Cities differ in their context, e.g. their financial, juridical, regulatory and cultural contexts. That's why TRANSFORM focuses on outcomes both on the city level, ensuring impact in the participating cities and in their metropolitan surroundings, and on the European level, by distilling generic conclusions from local experience, and by pin pointing process interventions, ready for replication.
City *specific outcomes* of TRANSFORM are:

- *Local Transformation Agenda for each of the participating cities*
  To meet the 2020 and 2050 targets, a strategic Transformation Agenda is needed for the city as a whole. The Transformation Agenda should have the flexibility to look beyond the political borders of cities to the functional 'energy' borders, thus including the metropolitan hinterland of the core cities. The Transformation Agenda addresses the main components influencing the chain of energy production and consumption at city level: main infrastructure and sources of energy (thermal energy, electricity, gas) and efficiency potentials. It also addresses the possible energy efficiency in flows of water, waste, IT and mobility. It includes urban planning & regulation and the participation of end

users. It is based on qualitative and quantitative insights and contains a strategic financial strategy. Each city develops a Transformation Agenda, containing energy efficiency measures and actions that need to be taken by stakeholders, in order to make a city smart. The process concerns city regulators and decision makers, private companies, and other relevant stakeholders.

- *Implementation Plan for city districts*

  The Transformation Agenda will be brought to the operational level in the form of an Implementation Plan, which will be drawn up for specific city districts. These districts are selected for this project under the name of 'Smart Urban Labs'. Morphology, urban density, functional mix, demographic aspects, (energy-) infrastructures vary from district to district. This requires more specific Implementation Plans to take them into account to find an optimal mix in terms of production of energy, storage, reduction and exchange, supported by feasible business plans. This integration of all elements will create win-win business models for stakeholders with initially different interests.

  The districts where the Smart Urban Labs are located are transformation areas undergoing redevelopment at the moment. This means the Smart Urban Labs can provide direct impact in the ongoing development processes through the implementation plan.

  Thus, each Implementation Plan is a product made in a joint effort by all relevant local stakeholders and includes for example renovation of the building stock, heating and cooling possibilities, use of intelligence on both electric and thermal networks, the potentials of existing water systems, innovative (electrical) transportation possibilities and urban green. The Implementation Plans relate district scale with the city and metropolitan scale to scan for possibilities, relate local developments with strategic choices made on the (energy) infrastructures. And lastly, each Implementation Plan will be feasible, by building achievable business plans taking into account the costs, pay-back periods, regulatory issues, and market conditions.

Both the Transformation Agenda and the Implementation Plan are the result of an exhaustive, innovative stakeholder process, and will be economically feasible and validated by experts. All stakeholders, from the highest political level to technical staff will be committed to the completion of the Transformation Agenda.

The *generic outcomes*, derived from the city specific outcomes, will be the following:

- *Qualitative decision support models*

  These qualitative decision support models are concrete solutions and process interventions, including innovative business models, financial strategy, participation and governance models and adapting planning processes. These models support cities in their strive towards integrated energy planning. The synthesis brings together the state of the art of transition thinking, derived from existing scientific knowledge and from the practical experience.

- *Quantitative decision support models*

  The purpose of the quantitative decision support model is to make use of available data sets to produce information stakeholders can use for energy planning and the production of low carbon scenarios. The model assesses the quantitative impact (relative to key performance indicators) and cost of implementing measures that will improve the city's or district's performance in terms of carbon and energy targets. This information will support stakeholders in deciding which measures need to be part of the city's transformation agenda and where and when they will need to be implemented.

- Both models should help the stakeholders by generating scenarios of possible economics of their strategies by visualizing possibilities in terms of energy efficiency and production, rhythms of flows (energy, waste, water, etc), their interrelation and possible measures and costs, all of which will be based on quantitative and qualitative analysis. By this, stakeholders will gain a better insight in

economics of smart city plans, the interrelation of possible measures and costs. TRANSFORM delivers a prototype of a decision support tool, with recommendations for further development of the tool, or of components of the tool.

- Facilitate the decision makers with a Handbook for their journey towards implementation plans and a transformation agenda

  We create a thorough, lived through, process handbook that helps cities step by step with a strategic transformation agenda and related implementation plan. Cities and communities throughout Europe can use this handbook, in combination with the decision support models, to bring their visions or existing Strategic Energy Action Plans (SEAP) to tangible implementation plans. This handbook is both replicable and exploitable by consultancies.

- Political Memorandum of Understanding – the way towards implementation

  TRANSFORM will generate a strong political movement for the Smart City initiative, by the joined forces of the cities' politicians and through the networks the cities participate in. TRANSFORM will deliver a signed Memorandum of Understanding between participating cities, committed cities and relevant industries, knowledge institutes and commercial partners on the implementation of all TRANSFORM results.

  Stakeholders involvement at the city level will go from convincing the political level of the advantages and need for a commitment towards a smart city planning, to the introduction in municipalities and institutional staff of the concept, to integrating on-going labs and using feedbacks from the overall planning process directly on the field and, vice versa, using experiences to further improve the planning process. The involvement of companies and research institutions working together will consent practical and viable solutions to be found.

The TRANSFORM cities Amsterdam, Copenhagen, Genoa, Hamburg, Lyon and Vienna have a proven record of efforts to reduce energy consumption and increase sustainability. That includes ambitious targets and action plans, and political support for execution. They have experienced the limits of the current ways of planning and seen the need of integrative planning to tackle the challenge of the 20-20-20 targets.

Amsterdam formally endorsed its Energy Strategy 2040 in the year 2010. It is a formal part of the city's spatial structural vision, the political document that guides land use planning. The city's progressive policies on clean air and inner city traffic and parking, on electrical vehicles and waste/energy/water systems serve as successful examples. In 2011 the City was awarded the ISOCARP Award for Excellence 2011 for its Structural Vision 2040, mainly for the innovative stakeholder process and quality of the vision. Amsterdam's belief in the need for innovation in the field of energy provided the basis for the Amsterdam Smart City platform, a collaboration of KPN, grid operator Liander and the Amsterdam Innovation Motor and some 70 SME's. Amsterdam Smart city is the winner of the European "City Star Award 2011".

After the almost complete dismantling of the heavy industry, **Genoa** has started a transformation process moving towards technologies innovation and hosting several research institutions and companies, among them IIT. Genoa's SEAP, aiming to reach a 23,7% of CO2 reductions in 2020, the 1st to be approved by the EU, has been evaluated as an excellent tool, comprising more than 70 measures covering all city policy sectors such as buildings, transport, waste, RES plants, public lighting, CHP, district heating, domotics, smart grids, communication. Starting from the Covenant of Mayors initiative, Genoa set up a Smart City transformation process based on the strong involvement, through a specific Association of over sixty stakeholders, including small and big companies, research institutes, associations, public bodies and the energy company ENEL. Genoa's peculiar geographical position and shape, and its being at the same time an industrial, commercial, cultural city and the main Italian port, is promoting a new vision on urban, energy

and development planning by integrating different needs and tools, such as PUC (Urban Plan), SEAP, PEAP (Port Authority's energy plan) and others.

Hamburg was awarded as the European Green Capital 2011. This was an incentive to go beyond a sectoral policy to an integrative approach of a long-term vision by 2050: a strategic, process-orientated sustainable planning regarding socio-economic frames (cost-benefit), comprehensive urban planning, technical efficiency as well as research and applied sciences.

In this way Hamburg will be able to cut CO2 emissions by 40% till 2020 and 80% by 2050. Over the last decades Hamburg has switched its growth policy away from greenfield development which creates urban sprawl and destroys landscapes. Instead, the city is on the one hand regenerating brownfield urban areas and on the other hand planning new quarters with excellent climate protection and environmental standards.

Copenhagen has increasingly focused on Sustainable Urban Development over the last decade. Copenhagen has also adopted the vision of becoming the Eco-Metropolis of the world in 2015 and is therefore focusing on four themes. These are to become: 1)the world's best city for bicycles 2)a Climate Capital 3)a green and blue capital city and 4)a clean and healthy big city.

In 2010 the City Council adopted the vision to become a Carbon Neutral Capital by 2025. This ambitious goal led to Copenhagen being awarded the title of #1 Cleantech City for 2011 by the leading online cleantech destination CleanTechies.com. As parts of the means to achieve the goals, Copenhagen has adopted a Green Growth Strategy which will turn the city into a leading testbed for new green solutions. The purpose is to use the city as a living lab for new green solutions in collaboration with private partners and research institutions.

Vienna holds great potential for a far-sighted and spatially focused transformation to a "smart city": The high share of apartments owned by the city and well-organized public utility companies (transport services and energy supplier, 'WSTW') enable the City of Vienna to implement strategies to improve the energy efficiency directly. Proposed demonstration projects will apply thermal renovation, smart infrastructure and urban re-development strategies to selected, major, mixed-use projects (residential, office and services). For selected areas in the built-up city, rehabilitation and densification strategies, energy production and supply planning as well as future mobility concepts will be elaborated and implemented. In a Vienna perspective it is most important to obtain citizens´ and investors support from the very beginning of the transformation processes. This leads to the inclusion of socio-economic questions, such as acceptance and affordability, as seen from various socio-economic groups.

In 2007, **Grand Lyon** signed the Covenant of Mayors and committed itself to a climate change plan: 20x20x20 by 2020 and factor 4 by 2050.To reach the target, Grand Lyon launched in 2010 a partnership approach with local stakeholders, to design a shared climate change action plan: Industry, energy production, housing, offices, transports, institutions, communities, associations, public and private research. In total, about 250 stakeholders took part to the elaboration of the Action Plan. This collaborative work lead to pragmatic actions plan in 26 fields of intervention. For all actions, CO_2 saving potential, costs, allocation of budgets between involved stakeholders and timeline, have been identified. Climate Action Plan, for which final budget will be voted by February 2012, already succeeds in bringing together all main stakeholders and combining their investment agendas in a win-win approach. In parallel, many research and development activities on Smart grids and networks are carried out, making Grand Lyon one of the most advanced city in France in this field and paving the way to Smart City.

The work is divided into 6 work packages (5 of acitivity and 1 of management and coordination):

- WP1 Becoming a Smart Energy City, state of the Art and Ambition starts with a clear outline of each of the participating cities. The WP describes the context in terms of climate, energy assets, ambitions,

targets and main possibilities in terms of energy efficiency, flows, production. It describes at the same time the current status of city planning, energy planning tools, and existing energy data. The WP will draw largely on existing Strategic Energy Action Plans, Climate Action Plans and planning documents. After this first step, the WP focuses on the description of what a smart energy city is, what the main KPI's (Key Performance Indicators) are that should be met and how this relates to where the current cities and the living labs are. A SWOT analysis is used to create oversight on gaps and barriers before becoming a Smart Energy City both strategic and tactic level.

- WP2 Development of a Transformation Agenda will draw on the work of WP1, in terms of KPI's and definition of a smart energy city. This WP brings together existing methodologies, insights and governance issues to help decision makers with improved insight by generating models based on qualitative methodologies. It also draws on the city specific outlines for the drafting of a city specific Transformation Agenda, looking roughly at the main possibilities in terms of CO2 reduction, investments made by main stakeholders, an overall financial strategy and the recommendations for transforming both the internal city workings and the stakeholder processes.
- WP3 Development of a Quantitative Decision Support Model will draw on the definition of KPIs and inventory of existing datasets produced in WP1. WP3 recognizes the information required by stakeholders to make decisions and the format within which it needs to be provided (e.g. GIS maps, financial parameters). It consolidates existing datasets and then processes them to make this information available to decision makers. This is used in combination with the methodologies developed in WP2 to assist cities in producing a Transformation Agenda. It can provide the cities with the knowledge of how to set up smart city analytics. The use of data, the possibility to bring in end users for the generation of data and the use in practical applications and the use of analytics to search for better economies in scenario's are an innovative step towards smart city planning. It is also used by local partners to support them in developing their Implementation Plan; the Smart urban Labs of WP4 offer the opportunity to validate the model and tune it to the needs of the local stakeholders.
- WP4 Implementation in Smart Urban Labs ensures the coordination of six Smart Urban Labs, in each of the participating cities, where Implementation Plans are being made. Through the Smart Urban Labs, including condensed working sessions using design thinking methods, Implementation Plans are drafted. The Implementation Plans include all aspects like energy systems, mobility, water, waste, building stock, including timelines and payback periods. The Smart Urban Labs will be organized by the city and its local partners, but coordinated and facilitated by TRANSFORM. An intensive Lab period will be organized in each city, to accelerate the making of the Implementation Plan and add additional expertise.
- WP5 Replication, Dissemination, Exploitation ensures that the main outcomes will be replicable for other European cities. The work package ensures that other European cities are willing to replicate and go through the same process – e.g. through political commitment of other European cities. A strong political movement will be organized to ensure this commitment. The replication plan also means a clear action/ Implementation Plan per city – outcome of WP 4. WP 5 ensures also the correct dissemination of all products to relevant stakeholders in Europe. Exploitation makes sure that the results of the project will be commercialized by the industrial partners.
- WP6 Management, Coordination, Validation ensures the overall management, coordination, the communication between partners, with the Commission and the communication of the overall project. At the same time this WP ensures the validation of the results by an international advisory board.

3 CONCLUSIONS

The project intends also to make a step further in the quality of reasearch, by providing a replicable and tested framework for the production of a strategic Transformation Agenda for the city as a whole, combined with district Implementation Plans. Key Performance Indicators for Smart energy cities are part of the framework. This framework can be adopted by any other city in the European Union.

It will do so by uniting six frontrunner cities with ambition in targets and proven capacity to implement to meet the 20-20-20 targets (see 1.2.4), their local energy or grid companies, as well as commercial, industrial and scientific partners active in offering solutions to cities and a wide span of influence. TRANSFORM brings these partners together to ensure the coordination of applied research, the link between research and execution at city and district level, and the exploitation by industry of research and practical solutions. TRANSFORM will be able to do so through a process of mutual learning, and the distillation of these learning to the European level.

Innovation is key in this project: by bringing together the best cities in Europe, local specialists and international thought leaders TRANSFORM will contribute substantial to new ways of planning. In this new way of planning, data is being used to come to joint investment agenda's. This data is being generated by smart energy grids, buildings, mobile telephones and other technologies. The Smartness of the Cities will be used to analyze (analytics) the situation and decided on actions.

An innovative contribution to the integrated planning will be the application of an integrated approach in urban planning. The city is no longer considered as the object of un-coordinated city planning, mobility planning and energy, water and waste planning; but is rather recognized as an urban energy system whose flows from production to consumption can be made more efficient by measures from each of these fields. For example city planning can convince citizens to adopt public transport, while providing energy utilities with load profiles adapted to the integration of decentralized renewable energy production; waste and waste water can be seen as sources for biogas and heat respectively an their networks integrated as part of a broader energy network. This integration of the layers of a city will create win-win business models for stakeholders with initially different interests.

The gap between city level strategy and the local implementation requires a close study of the processes taking place, the stakeholders involved, data available and business models successful at the various levels of a city and how they impact or depend on processes, stakeholders, data and business models at higher and lower scales. Understanding which methods and tools are required at what scale in order to assure the implementation of an integrated Implementation Plan will be a significant contribution to providing other cities as well as commercial, industrial and academic actors with insight into this field.

The participation within this consortium of commercial, industrial and academic players already active in this field will warrant that the methods and tools developed will be further used and researched yet the requirement that these outcomes developed be freely available will ensure that they can be quickly adopted by other market players and research institutes.

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IMAGES SOURCES

Fig. 1: Transform Project "Transformation Agenda for Low Carbon Cities", Grant Application Form

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