D4.3 Synthesis report

Final version

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TRANSFORM

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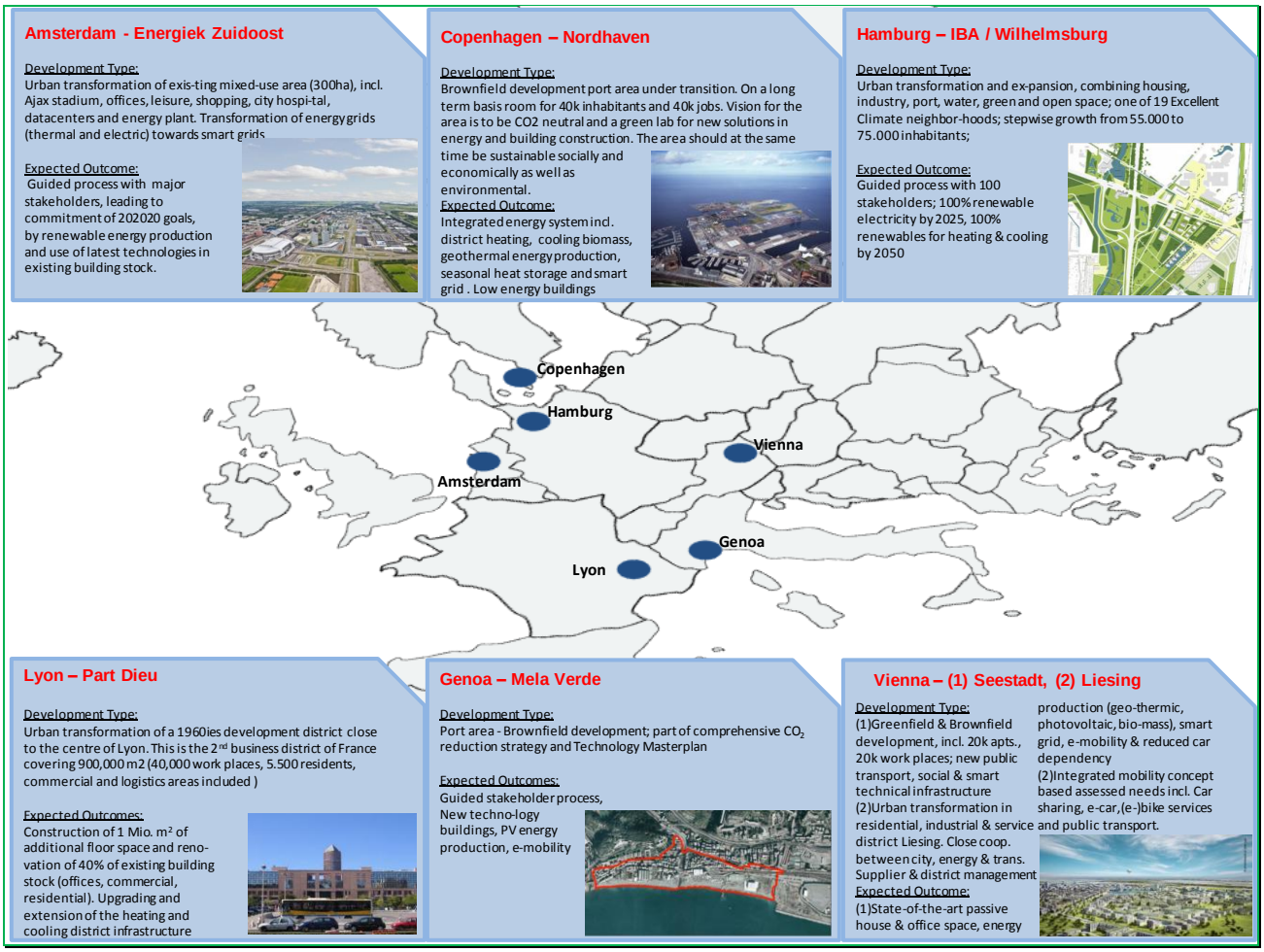
1. Preface

The TRANSFORM **WP4 Implementation in Smart Urban Labs** ensures the coordination of six Smart Urban Labs in each of the 6 participating cities. Through the working method "Smart Urban Labs" which included condensed working phases called **Intensive Lab Sessions (ILS)** using stakeholder involvement and design thinking methods, 5-10 year Implementation Plans have been drafted. The Implementation Plans are focusing on the conception of new energy systems, the quality and transformation of building stock, economic and legal prerequisites and – very importantly for making implementation happen – governance issues.

The selected Smart Urban Labs will provide an excellent variety of urban development phases, including the transformation of brownfield sites, former harbour areas, as well as re-development of fully built up and living districts. In this way, a realistic sample from European cities, also covering a wide range of geographic situations and different policy making traditions, is represented in this project and in workpackage 4.

The Smart Urban Labs in Copenhagen, Genoa and Vienna represent urban development districts which attempt to create a major innovative breakthrough in the integration of building technologies, smart infrastructure and in some cases, also sustainable mobility concepts.



The SUL approach in TRANSFORM has proven to be very successful, because it helped cities to start and intensify discussing energy planning within the administration and with stakeholders. By bringing stakeholders together with external advisors and experts from all over Europe, a new kind of discussion and collaboration started in our cities.

The SUL works as a platform and the method of ILS is a way to accelerate the collaboration between cities and key stakeholders in the area. By bringing together city planners and energy planners an new type of urban (re)development started. This is not only helpful for energy transition but also, in a broader sense, for the cooperation of different departments within cities' administrations: They need to work closer together to be able to involve citizens (Vienna), market players/building owners (Amsterdam, Lyon), housing corporations (Amsterdam), developers (Copenhagen and Vienna) and other stakeholders like distributors (Hamburg) and energy producers (Amsterdam, Hamburg).

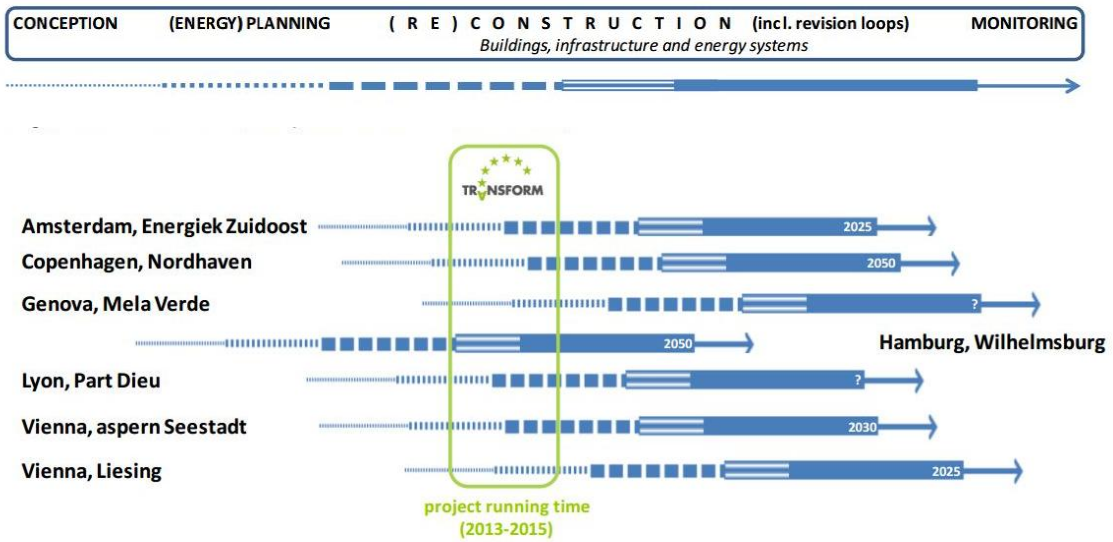
Without the TRANSFORM approach this new way of working, this new forging of alliances had not been not possible in a similar way. Through this intensive collaboration, a great number of insights on the various systems elements and their individual logic of operating and decision making could be won – the main findings and conclusions are summarized in the Synthesis Report D 4.3.

2. Summary

FP 7 project TRANSFORM has accompanied and supported the **urban and integrated energy system development process** in the 6 participating cities' **Smart Urban Labs (SULs)**, resulting in so-called **Implementation Plans** for each of these SULs with a 5 to 10-year perspective. The 6 SULs are of quite different character in terms of their development stage and challenges, representing the wide range from (slow) urban re-development to dynamic new (greenfield) development. This summary condenses the lessons learned from working with these SULs for two years.

SUL type: **G** = Greenfield **T** = Transformation	Area	Population today (2013/14)	Projected population	Jobs today (2013/14)	Projected jobs	Year of projection
Amsterdam, Energiek Zuidoost **T**	300 ha	18,000	20,000	18,000	18,500	2025
Copenhagen, Nordhavn **G**	250 ha/ 350 ha	0	40,000	5,100	40,000	2040
Genoa, Mela Verde **T**	280ha	12,758	12,800	n/a	n/a	n/a
Hamburg, Wilhelmsburg **T/G**	3,500 ha	55,000	69,160	n/a	n/a	2050
Lyon, Part-Dieu **T**	135 ha	5,000	7,100	45,000	80,000	2030
Vienna, aspern Seestadt **G**	223 ha	0	26,000	1,200	23,000	2030

The 6 SULs also are in different **stages of development**, ranging from early conceptualisation to project development with stakeholders in the area of construction of infrastructure and buildings, while the TRANSFORM project phase covers only a short period:



Source: OIR

Integration of urban development and energy transformation

Starting from the overall goal of bringing urban quarters onto the path of energy-efficient, climate friendly development, the approach has been to integrate urban development perspectives with the transformation of existing or with the design of new, future-oriented energy systems. Such **integration of urban development and energy planning** – aimed at transforming the cities' use of energy – requires

- overall objectives (on the city level, but broken down to quarter level),
- innovative strategy development (relating to energy, urban development and mobility) and
- defining measures which include both, framework conditions (legal, institutional, economic) and direct interventions (through projects and processes)

"Strategy development" in the context of transforming cities to "Smart Energy Cities" means

- defining priorities and the focus of measures, differentiating between
  – urban development type: new urbanization or renewal activities,
  – energy system development: efficiency, renewable production, networks, consumption
- creating legal and economic framework conditions which spur contributions to transformation from markets, stakeholders and individual households

Governance

In order to do this, cities need to redesign their governance systems. **Main governance factors** for a future integration of urban development and energy planning are:

- **Institution building:** goal-oriented, strategy-based close cooperation between municipal departments and key stakeholders (in the energy economy and the building sector)
- **Open knowledge and data provision** (energy atlas): as a basis for decision making, a high degree of transparency and open access to energy and building data are necessary
- **Smart/sustainable city guidelines and targets:** Needed as a basis for strategic decisions of individual actors in line with the overall strategy, e.g. breaking down overall targets to specific urban quarters
- **Framework conditions** related to the overall strategy: e.g. referring to competition rules, conditions to provide comprehensive energy services (including all potential carriers in energy systems per area), shift to the consideration of lifecycle-costs in business calculations etc.
- **Binding agreements** between public and private actors in urban (energy) development, relating to both, the overall strategic level and to the concrete urban development at local level (e.g. urban development contracts between city and developers)

Institutional re-arrangements and concrete cooperation designs, process designs and legal standard procedures need to be developed in the future, e.g. by initiating new cooperation formats between city departments, energy stakeholders and building developers.

Development processes and methods

Because every area is different and in a different phase of development, tailor-made solutions should be the norm. Still, the experience in six TRANSFORM cities, leads to the recommendation of two types of prototype procedures for area specific energy planning. One prototype is directed at green-field areas, while the other is directed at transformation areas.

The SUL experience shows that a sequence of well defined process-steps (as described below) will provide high quality development strategies and innovative technical and economically feasible solutions, setting the basis for successful binding agreements between partners in urban development.

Considering the high uncertainties about future energy costs and the fast changing technological options, it is necessary to create a development/planning process which is geared to provide innovative and sustainable systems for new urban developments, open for future, improved technical solutions.

It is recommended to use **power modelling** when starting a SUL, a quick scan of the legal situation and of the major stakeholders (including e.g. endusers, developers, grid operators, local production). This will deliver insight on a necessary mandate and on the willingness to collaborate of relevant stakeholders on the set vision.

Local, area-specific energy system planning

Concluding from the SULs experience, it is highly relevant to integrate the overall, city-wide perspective in the planning and decision-making on the energy strategy for individual urban quarters. Therefore, area-specific targets and implementation strategies are needed, because

- ★ they allow to focus on specific local conditions,
- ★ they are needed for activating local actors and stakeholders,
- ★ they give a close look at energy consumption, use and efficiency,
- ★ they provide for an integrating planning approach towards the different energy carriers (electricity, gas, heating networks etc.), which is essential for using all potential local resources and for reflecting local consumer demands.

A recommended **city-wide typology approach of urban quarters** could provide systematic information on the socio economic conditions, building structures and the existing energy supply system.

Prototype procedure for area-specific energy system planning: Greenfield

The following steps represent a **prototype procedure** for **integrated energy and urban development**, applicable for new urban quarters:

(1) City Planning department (or a development corporation) provides an urban development masterplan

(2) City Planning department (or a development corporation) in cooperation with Energy Planning department tenders an extended energy analysis/assessment to provide the necessary facts for decision making.
The assessment explores energy system options for the area based on the given, overall/city-wide targets and criteria and provides:
   - ★ Energy demand forecasts based on different building standards and densities, for the overall plan and per development phase
   - ★ Reachable CO_2 targets for alternative technical systems
   - ★ Cost estimates
   - ★ Different energy supply options for energy conversion and distribution to endusers
   - ★ Possible governance structures for developing and running the energy system
   - ★ And the systems are assessed by a social costs/benefit analysis.

(3) System selection:
City planning, energy planning, housing and other related departments decide the requirements for the future energy system, set CO_2 targets, define a financial strategy and other criteria (e.g. price ceilings etc.). A public hearing can be part of the selection process.
(4) Energy planning department leads a tender procedure for concession and selects a consortium of energy suppliers to give **a full service solution**, which means including the full scope of all energy carriers and needed supportive solutions like ICT and administrative necessities.
(5) City and energy planning define a connection area in accordance with the selected energy system (e.g. district heating and cooling) and obliges land owners/investors to link up to the grid via urban development contracts (or through a specific regulation in the Zoning Plan, if that is applicable)
(6) Implementation phase
(7) Monitoring and control: CO_2 limits, price levels, technical quality and security of the system (to be performed through cities or their agencies)

Experience with **these types of processes** – a stepwise development of options and targets, followed by a stringent tendering procedure – will **generate energy system solutions with best efficiency and CO_2 performance within given cost limits** and engages the public.

Prototype procedure for area-specific energy system planning: Transformation

For existing areas, the advised roadmap differs from the above, because energy systems and building stock are already in place. The legal framework to change this existing context is often very limited in power. In order to transform, the commitment of all the asset owners is needed. Therefore in existing areas the focus is much more of a circular process including:

- ★ stakeholder management with a focus on the whole chain of local prosumers, grids and building owners/inhabitants to create a joint vision and approach
- ★ test and develop business cases, feedback this to the jointly set development approach and adjust the approach where needed.
- ★ The institutional organization and cooperation on planning, implementation and maintenance for urban development, energy systems and possibly other relevant topics like waste and mobility.

The prototype of this approach can be defined as follows:

(1) Stakeholder and citizen engagement:
Inventarisation of visions and investment agendas in smart energy topics
(2) Parallel, analyse the area quantitatively on the physical part (building stock, energy system etc).
(3) Parallel, make a power (to implement) model of the joining parties. Add parties and/or develop strategies to redistribute power to implement strategies to redistribute power to implement.
(4) Define a joint vision, development process and related projects
(5) Test projects on feasibility and develop new value models if needed (e.g. local integration of waste and or e-mobility with energy)

(6) If needed and possible: improve framework conditions like financing models, legislation, open data, collaboration models. This an essential link to city's planning (TA) or governmental administrations on the national/EU level
(7) Replicate successful projects and erect a structural collaboration which facilitates the management of the steps above

TRANSFORM process intensification: The Intensive Lab Session (ILS) Method

Through the participation of TRANSFORM cities' experts in the course of the project, all 6 SULs experienced an intensification of their ongoing development processes, using the **TRANSFORM-method of Intensive Lab Sessions (ILS).** This three-day open-innovation-type setting, with participation of all relevant stakeholders and experts from the international group, has proven to create a helpful and continuous work process. It is particularly helpful in a situation, where major stakeholders for energy systems and urban development needs to be brought together in an early stage of planning. The ILS- format should be seen as a process-intervention to be set at a specific point in time, when a flow of communication and the creation of ideas about an area's future shall be generated and sped up (e.g. in steps 2 and 3 of the prototype process, above). The ILS method is further explained and evaluated in section 5.4.

Design criteria for smart local, integrated energy systems

Judging from the experience in 6 SULs, which are of quite different character (new urban quarters/urban redevelopment; fast growing or stable/shrinking population etc.), future "smart" energy systems need to feature **openness with respect to input sources and technological innovations as well as to changes in urban development.**

Sustainable, innovative and "smart" energy systems need to be designed

- in a "future-open" way with respect to (new) energy producers, technological innovations and efficiency gains
- to provide the potential for input from local (renewable) energy and other sources, like waste heat, in a stepwise mode, as the area evolves,
- to use local heating and cooling networks as backup systems for near-zero energy neighbourhoods, where hot water remains as the main heating energy consumption, (new areas only)
- to expect technological improvements, e.g. in PV and in storage systems, making future systems more independent from large grid power supply,
- to expect development in legal frameworks like for local energy exchange, new feed-in tariffs for electricity, and for energy performance for buildings.
- to cover different market conditions and price regimes, e.g. changes in prices for power and gas, as well as changes in the energy use on the consumer side.

One recommendation for cities is to bundle and integrate the systems designed not only in technological terms, but also in operational and economic terms. Long-term, holistic calculations for the business models seem to be a necessary precondition. A high degree of independence from short-term market conditions is needed to provide for more economic stability (see, for instance, the impact of current changes in energy prices on gas-powered CHP and heating systems).

Implementation Plans: Key strategies for local, integrated energy systems in the SULs

As indicated above, urban development perspectives in the 6 SULs differ widely, and so do the energy related strategies applied. A shortcut reads as:

- Amsterdam is applying an intensive process of stakeholder –based project development with respect to local energy production, waste heat use and building refurbishment for the area Amsterdam Southeast
- Genoa in a most difficult, stagnant economic and demographic situation, is focusing on urban redevelopment as precondition for energy optimization in the area of Mela Verde
- Hamburg, based on the 7 year IBA impulse, has already implemented a good deal of heating system infrastructure, using multiple energy sources and has developed a comprehensive plan for the area of Hamburg-Wilhelmsburg to become carbon neutral by 2050
- Lyon is planning to use major economic redevelopment schemes in the area of Part Dieu as the basis for a new energy system, including energy efficient buildings and the integration of energy carriers in the area, with the objective to double the areas' floor space at the current level of energy consumption
- Copenhagen, within the framework of the city's carbon neutral strategy 2025, is designing its new Nordhaven urban development project in near zero to plus-energy standards, using renewable energy production from the surrounding areas (mainly windpower)
- Vienna, within the new Smart City Framework Strategy, is designing the new urban development area aspern Seestadt with near zero building standards and flexible heat networks, using waste heat, biomass, groundwater and CHP sources.

These urban quarter represent good examples for characteristic situations currently to be experienced in European cities, while, of course, a great many more types exist.

Table 1: SUL Implementation Plans – main strategies for integrated urban and energy system development

existing areas *new areas*

	Amsterdam, Energiek Zuidoost	Genoa, Mela Verde	Hamburg, Wilhelmsburg	Lyon, Part-Dieu	Copenhagen, Nordhavn	Vienna, aspern Seestadt
Stakeholder involvement	Stimulation for action	Governance (main stakeholders)	Stakeholder participation	Club Part Dieu	Early dialogue	
Buildings			building standards	building standards	smart buildings	building standards
Renewable energy production	big scale solar projects (7 000-15 000m2)	seawater heatpumps	priority for local renewable energy (heat and power)		PV-use	priority for local renewable energy (heat and power)
Electricity (demand, smart grids)	demand supply management, storage and e-car charging	smart meter, smart grids		electricity consumption, design and management of grids	demand management	
District heating	use of local waste heat		open DH networks	design and management	DH in the first phase	flexible DH networks
Transport infrastructure and mobility	charging infra-structure: electricity and green gas	light rail, bicycle infrastructure			mobility, transp. infra.	mobility, transp. infra.
Public participation	key element of development approach		accomp. participation			participation, neighbourhood management

Establishing integrated, local energy systems for urban quarters

Integrated local energy systems offer the chance to most efficiently use energy and integrate locally produced, renewable energies. “Integrated” also means comprehensive planning and prioritizing the use of different energy carriers towards overall efficiency and service quality. Such integrated energy systems are, however, highly complex in design, maintenance and cost sharing issues and it is not easy to achieve economic efficiency.

As a prerequisite, it is necessary to create future legal framework conditions and economic incentive structures providing

- ★ attractive conditions for citizens to live in low energy, sustainable housing and to enjoy affordable energy services
- ★ opportunities to participate in local or city-wide efficiency programmes, and
- ★ reliable economic grounds for citizens and firms to actively participate in the production and use of local energy sources, such as renewable or waste energies.

New framework conditions for integrated, local energy systems

The local area approach which includes decentralized production, storage and feed-in, is partly contradictory to the traditional top-down approach provided for in the legal framework conditions of today. Necessary changes in the legal (and financial) frameworks are:

- Legal reforms, allowing the formation of (local) producer and consumer societies with respect to energy production, exchange and energy services (particularly important for electricity and heat)
- Legal reforms, allowing the integration of different energy carriers in production, distribution, storage and services for enterprises and (local) energy societies in order to make the approach of local area-focused energy service provision economically feasible and ecologically efficient
- Establishing a system of fair cost sharing between overall energy companies providing energy supply and grids on a supra-local level (city-wide, national or European level) and the local area system societies or companies.

Potential future model: Local Area-ESCOs for integrated energy systems

A future example would be the creation of Local Area ESCOs (energy service companies), servicing defined urban quarters in an integrated way, providing local renewable input, using efficiently "imports" from area-external energy markets, investing and operating in new supply systems and implementing retrofit programmes. For this purpose, city wide standards, tender procedures and concession processes will be needed.

Three-level energy systems: Cities and citizens are key

Concluding from the TRANSFORM-experience, European countries' future energy systems should develop towards interacting two or three-level systems, where the formation of local, integrated energy systems become established as new partners for the existing national or European carriers. Cities will play a key role in creating the framework conditions for initiating and establishing the local level Area-ESCOs, providing a procedural and legal framework with reduced risks for investors – be they from corporate background or from local citizens.

Winning the citizens' support for this new urban energy future is a main task for innovative politicians and the energy sector in the years to come – providing opportunities for citizens to invest in their own sustainable energy future could be a promising way.

Important issues for future research and development

Future research and development shall focus on both, technological and economic/legal issues with the objective to create efficient, integrated energy systems which can be handled and maintained at reasonable costs for the end users. **Main research and development issues** include:

- Design of a regulatory framework which allows for the build-up of the above sketched three-level energy system, with particular focus on the interaction between international/national carriers and networks and the local area service entities. The role and freedom of consumers/pro-sumers in such a three-level system should be elaborated with the objective to create stable, reliable and efficient system conditions relating to costs and environmental impact.
- Cities need support in the development of fast and effective transformation strategies for existing urban quarters, where the improvement of existing building stock and energy system stock is the main objective, while given infrastructure and contracts do not encour-

age such changes. The question is, if there are attractive incentive models which could be provided for market actors to spur investment in such transformation.

- A number of pilots projects for integrated local area energy services (performed through ESCOs) should be supported and monitored closely relating to their energy and environmental performance as well as relating to their economic viability. For such pilot projects, a minimum number of test years will be necessary, with analytical comparison of the necessary regulatory preconditions and the energy system outcomes. Based on such an experience, the general design of governance and regulatory settings could be improved, providing for a general roll out of the local area service approach in the cities.
- Existing financing schemes for research and development, including pilot projects and other high-level observatories should be adapted in order to make the funding accessible for the above purposes (Horizon 2020 and others).

In terms of **research policies** it seems important to

- continue to provide the possibilities for international learning and knowledge exchange on (smart energy) district development,
- stimulate the development of district organizations which have the mandate and capability to invest (or direct investments) in smart energy districts, e.g. through designated calls on this topic and by stimulating (comparative) research,
- test other support schemes than calling for research and/or demonstration proposals. In addition, calling for financial support of local finance schemes or (revolving) funds can prove to be successful too.

The role of EU institutions in the evolution of a European sustainable, and smart future energy system cannot be underestimated: Energy, climate change and environmental sustainability are key themes on the European agenda, ranging from climate protection to economic and political independence from fossil fuel production countries. Therefore, with such important objectives in mind, European partners from all levels should cooperate closely to create integrated, smart energy systems and transform existing urban structures in our cities.

3. Conclusions and recommendations

3.1 Conclusions

From the overall assessment of the transformation processes in the TRANSFORM SULs, main features of the governance, the transformation processes and of the IPs foreseen energy systems are summarized below. Main challenges as well as best practices are highlighted in order to draw the readers' attention to relevant questions for future energy transformation processes in other cities.

3.1.1 Governance for Integrated Energy Planning

How can Integrated Energy Planning be integrated in existing planning and urban development processes (including relevant stakeholders and actors?

Integrated energy planning requires an intensive cooperation between urban development related municipal departments on one hand and energy related administrative units and/or stakeholders on the other. Integrated Energy Planning as approach includes

- Overall objectives (city level, quarter level)
- strategy development
- defining related measures for both, framework conditions (legal, institutional, economic) direct interventions (projects and processes)
- projects and actions to engage citizens and/or the users of an area (e.g. intensive labs sessions)

The "strategy" level in this list relates to the main approaches to be taken in striving for a "Smart Energy City":

- Where shall the focus of policies and activities be positioned – new urban developments or renewing activities, substitution of fossil energy sources and reducing CO_2 by renewables, efficiency in use and/or in distribution systems etc.
- Where do framework conditions hinder the transformation most – is it legal barriers, high costs or the complexity of bringing a large number of actors together?
- Which party(s) are entitled to make integral decisions, often spanning more than one department and/or energy related enterprises.

Experience from 6 cities and 6 very diverse SULs indicate that a large number of barriers and uncertainties have to be considered and overcome. Beyond legal and financial restraints these mainly refer to knowledge gaps, the lack of co-operation between municipal departments (and other municipal institutions) and partly also to conflicting priorities or targets between actors (e.g. building homes versus protecting green space, renovation versus heritage issues).

Main supporting factors for future integrative energy planning can be identified as:

- Institution building: goal-oriented, strategy-based intensive cooperation between municipal departments (and key stakeholders in energy economy and the building sector)
- Open knowledge and data provision: as a basis for decision making, a high degree of transparency and open access to energy and building data are necessary

- City guidelines and targets: Needed as a basis for strategic decisions for individual actors in line with the overall strategy
- Framework conditions related to the overall strategy: e.g. referring to competition rules, separation vs. integration of energy carriers, shift to the consideration of lifecycle-costs in calculations etc.
- Binding agreements between public and private actors in urban (energy) development, relating to both, the overall strategic level and to the concrete urban development at local level (e.g. urban development contracts between city and developers)

As an example, current involvements in energy planning activities are shown in the table below for Vienna. Based on this analysis, institutional re-arrangements and concrete cooperation designs and processes will be developed in the future.

Best practice development approaches from the SUL experience

- Masterplan and Vision (CPH, FHH, LYO, VIE) are needed
- Smart City Framework Strategy(VIE) as umbrella approach integrating relevant sub-strategies
- Holistic view: Lifecycle, lifestyles
  Early dialogue with citizens (CPH) ⇨ continuous updating of vision & masterplan
- Bottom-up approach for transformation in existing, built up quarters to be transformed (AMS): on-site project development in city-guided interaction with main stakeholders
- "Early dialogue" with producers/grids/providers (AMS, LYO)
  based on existing relations, concessions etc.
- Guide for Investors (FHH, VIE, LYO, CPH)

Table 2: Example Vienna: Main activities related to integrative energy planning by spatial levels (status)

PESTLEGS categories (main aspects)	at the city level	at the level of districts or quarters	at the level of buildings or apartments
Political aspects	energy strategy, security of energy supply strategy Smart City Initiative	urban development projects	
Economic (and financing) aspects	funds for refurbishment and supporting higher building standards and for smarter energy systems	planning and financing of public infrastructure, energy systems infrastructure etc.	*handling of funding requests*
Social aspects	awareness raising and information funds to abate energy poverty	neighbourhood management, local initiatives	guidance and advice for refurbishment *handling of energy poverty requests*
Technical (planning) aspects	urban development plan (STEP), mobility concept/transport planning, renewable action plan (RAP), energy efficiency programme (SEP)	urban master plans *missing: holistic energy concepts for quarters (pilot projects are on the way)*	smart metering, apps, refurbishment of public (city owned) buildings infrastructure planning and provision (i.e. district heating network)
Legislative aspects	regulations on buildings for efficiency and energy standards	urban zoning (land use) and local construction plans building developer competitions, environmental impact assessments (in large urban projects)	Detailing and binding regulations or contracts for individual sites
Environmental aspects	climate relevant goals, environmental monitoring	only partly: environmental and climate targets for new districts	
Governance aspects	Smart City Framework Strategy, Climate Protection Programme (KliP) stakeholder management, monitoring	*missing: process of optimization/binding agreements for future energy systems of quarters as a basis for strategic decisions of various actors*	*missing: agreements for energy systems on quarter-level to be linked to individual investors/land owners (by regulations or contracts)*
Spatial approaches	Land mobilization and acquisition strategy (esp. for public housing) *missing: (public) atlas of energy demand and total RES potential*	target zones for refurbishment of building blocks ("Blocksanierung"), partial knowledge on local RES potential	Implementation of land acquisition strategy

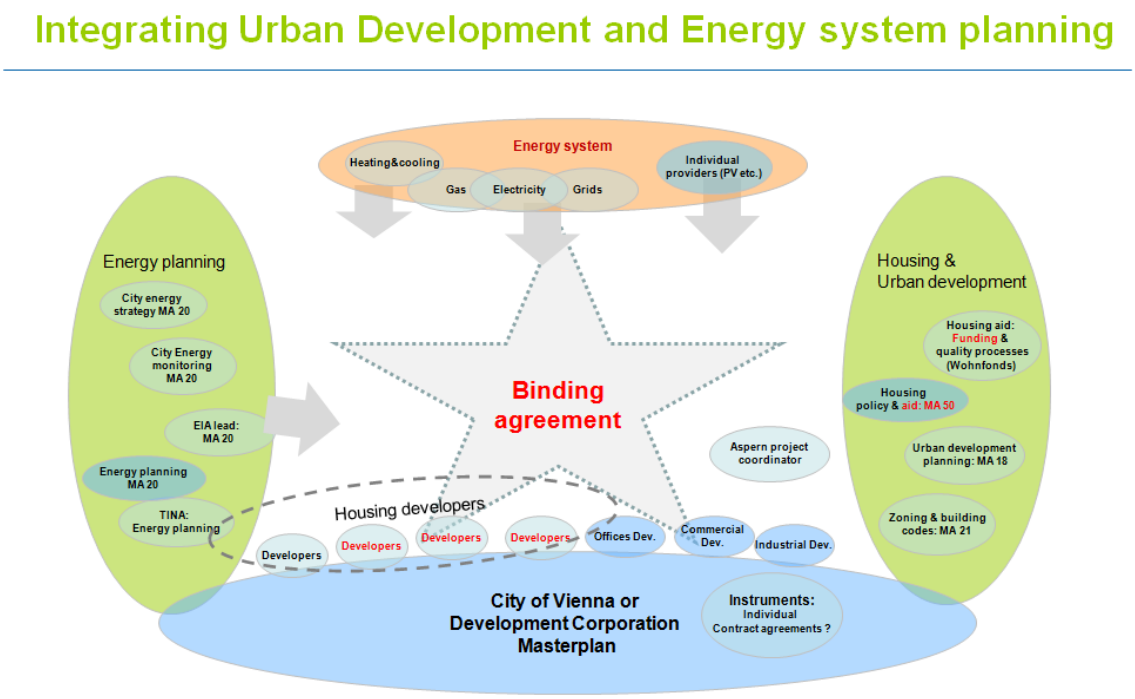
3.1.2 Institutional and organisational requirements for the integration of urban development and energy planning

Existing approaches of urban development and energy supply, characterized by separate activities of city planning, refurbishment of buildings, setting technical standards for new developments and the supply-side energy planning from energy utilities needs to be transformed substantially. There needs to be an area-focused integrated approach,

- ★ setting targets for energy consumption and the composition of energy supply,
- ★ binding for all development activities to be set by the municipality,
- ★ binding also for (public or private) developers and energy utilities in the area.

This integrated development framework for individual urban quarters shall be linked in targets and strategies to the overall city-wide energy and climate-protection strategies. The breakdown to individual quarters is needed, further specification and adaptation to the local conditions also will be necessary. As the example from the Vienna SUL shows (below), the complexity of these arrangements is extremely high, relating to the number of relevant actors as well as to the legal and economic constraints which are to be observed when negotiating a binding agreement between development actors.

Figure 1: Example SUL aspern Lakeside (Vienna): Municipal departments, energy system providers and local development actors involved in integrative energy planning and urban development (status)



Source: ÖIR, Vienna

While the urban development plans so far have defined the background for building development, public spaces and the transport system, the options to define and implement a future

"smart energy system" remain quite limited – vis á vis energy system providers, building developers and new corporations to be settled in.

Future "smart" urban development requires instruments directly dealing with the energy systems to be installed, defining the contributions from the individual parties in a binding way: City, energy system providers, building developers, tenants and homeowners in their roles as energy consumers and producers need to be involved and included in the binding arrangements: A commitment to invest and operate a system designed with respect to reducing fossil fuel inputs and CO_2 emissions, allowing for the feed-in from individual producers and flexible enough to make future adaptations possible.

Best practice institutional prerequisites for integrated urban and energy system development

- ★ Development Agency as landowner (CPH, VIE)
- ★ Development Agency as promoter (FHH, LYO)
- ★ IBA approach (incentives for investors, pilot projects, milestones, research, landmarks/icons … with city as partner and partial landowner)
  Tailored, neighbourhood-specific transformation strategies and technical solutions (FHH-IBA)
- ★ IBA+ = replication in other urban districts
- ★ Mission Part Dieu⇨ Development Agency (as public law legal entity, using ZAC development empowerment) in close cooperation with
  Grand Lyon Energy planning agency (city-wide Energy Masterplan)

Within all the Smart Urban labs (SULs) a district related development organization is in place or is developed. As explained before, all the SULs are in differ in development stage and take place in both new to develop districts and existing/transformation districts.

In the new to develop districts a strong development organization is in place. These organizations are, in the case of the TRANSFORM cities, very much municipal driven. In Hamburg's case, there is IBA Wilhelmsburg, in the Copenhagen's Nordhavn it is CCPD and in Vienna there is Wien 3420 for Aspern. All these entities are similar municipal development companies. Also for the Part Dieu district in (Grand) Lyon a local public company is in place. This is not so much a development company it is rather a program office for the development of an existing district with large numbers of new to build building (double the existing building stock).

In the existing districts the organizations have different forms and are much more depending on the collaboration of sitting parties. Genoa's Mela Verde is highly depending on the national railway company and on the national port authority. In this (early) stage of development the municipality in close collaboration with the electricity grid company Enel is providing the platform to induce the collaboration with more asset holders. In Amsterdam South East a cooperative between building owners, grid owners, local energy producers and municipality is erected. The mandate on setting the vision and investments across the energy and urban planning chain is brought together.

On a more specific level, these are the findings of the SULs:

- In almost all districts a broad the stakeholder management is in place but **the financial sector** or financial instruments are in most cases not in place. Amsterdam and Hamburg do have city wide funds with a specific focus on climate and energy and excepting a high level of risk of innovative solutions, but this instrument is related to projects and not to the development of a district/district related organization.
- In most SULs, the mandate on the electricity grid belongs to regional -or bigger scale- organizations. Wished for transitions or investment on district level are mostly beyond the mandate of the district organizations and political level of the city. This is also the case for privately owned heating and cooling grids.
- Local energy exchange needs a regulatory and administrative framework. Although the feed in tariff and legal frame may cause constrains on this topic, none of the district oriented organizations provide the instruments to enable energy exchange and/or trade. Projects in the scope of demand respond, energy storage and energy conversion in some of the SULs point out that this might be developed in near future.
- Up until now, the district organizations have limited involvement in the management of assets after realization. Therefore, bridging investments and operational costs/benefits is not part the activities (yet). This activity is shifted to parties being part of the collaboration, like energy or grid companies.
- Hamburg municipality has erected three mechanisms to strengthen the implementation of smart energy measures: IBA, a municipal development organization with a strong focus on smart energy topics, a city wide fund for climate and energy projects and a municipal sustainable energy company (also investing in local district heating grids and cooling solutions). This way a logical sequence of planning and realization is organized.
- Grand Lyon has been authorized to release the **concessions on energy grids**. Since the same organization is involved in energy planning on district level, a strong mandate on energy planning and implementation is accomplished.

3.1.3 Energy system transformation: Prototype process

Experience from some TRANSFORM cities – like Copenhagen and Hamburg – show, that a sequence of well defined process-steps will provide high quality development strategies and technical solutions, setting the basis for successful binding agreements between partners in urban development.

The following list is presenting a **prototype procedure** for the **integrated energy and urban development**, applicable to existing and new urban quarters:

(1) City planning (or a Development Corporation) provides an urban development masterplan
(2) City planning (or a Development Corporation) in corporation with municipal Energy Planning tenders an extended energy analysis – options for the area relating to:
- Energy demand/building standards/densities
- CO_2 targets, realistic for alternative technical systems

- ★ Cost estimates
- ★ Energy system design (alternative scenarios): District Heating, temperature levels, waste heat, solar/PV use etc.

(3) System selection:
City planning, energy planning, housing and other related departments decide the requirements for the future energy system, set CO_2 targets and define other criteria (e.g. price ceilings etc.)

(4) Energy planning department leads a tender procedure for concession and selects a consortium of energy suppliers to give a full service concession

(5) City and energy planning define a connection area in accordance with the selected energy system (e.g. district heating and cooling) and obliges land owners/investors to link up to the grid via urban development contracts (or through a specific regulation in the Zoning Plan, if that is applicable)

(6) Implementation phase

(7) Monitoring and control: CO_2 limits, price levels, technical quality and security of the system

Resulting from the current situation in the energy markets, with high uncertainties about cost factors and with fast changing technological options, however, it seems necessary to create a process which is geared to provide innovative and sustainable systems for new urban developments – with an openness to future, improved technical solutions.

Experience with **these types of processes** – a stepwise development of options and targets, followed by a stringent tendering procedure – will **generate energy system solutions with best efficiency and CO_2 performance within given cost limits**.

3.1.4 Integrated, local energy systems

Developing a quantitative framework by use of scenario techniques

It is essential to establish a clear quantitative framework for the development of an urban quarter (or SUL). Starting from a comprehensive database – an Energy Atlas – covering energy consumption and energy production and also existing distribution networks as well as future potentials for the production of renewable energies and the use of waste heat, alternative scenarios for the transformation (or: new design) of the area's energy system can be developed.

The use of a scenario technique is of particular importance in relation to the complex interaction between land use, building typology and energy services needed in the area. Therefore, a detailed urban masterplan for the area's development or transformation is an main prerequisite for the drafting of alternative scenarios for the energy supply and distribution. Floor space, user types and building types are essential input data for the energy scenarios.

Using different framework settings and objectives, scenarios can cover a wide range of best case to bad/worst case development in terms of energy supply and CO_2 emissions. Comparing the scenarios in terms of costs, maintenace and security of supply as well as emissions can form the basis for **developing a vision and a set of KPI-related quantitative targets**. That vi-

sion and set of targets then will form the basis for concrete implementation measures, such as a tendering procedure (as described in 3.1.3, above). Relevant examples for such an approach are Lyon, Hamburg, Vienna, Copenhagen.

Best practice on energy planning and database

- Energy Atlas as method and data base (FHH-IBA, AMS – OpenData approach)
- Quantitative framework (indicators, targets) with commitment (LYO, FHH-IBA, also CPH, VIE)
- Monitoring of energy demand (yearly, per carrier) and performance (LYO, FHH-IBA, pt. also VIE)
- Project impact calculation for transformation of existing quarters (AMS)
- Holistic calculation of energy infrastructure investments (including society, consumers, environment – CPH)

Providing a **clear vision** and setting **quantitative target**s are a crucial success factor in designning and implementing the energy system in line with urban development. A clear vision or message can help greatly in communicating to all actors in urban development, what is planned, why and how the system is supposed to function. It also provides a the basis for implementing an effective monitoring system, which is needed to analyse and understand the real performance in the urban quarter and will give essential information for the continuous adaptation and improvement in the urban development/implementation process.

Local energy system planning versus comprehensive, city wide energy strategy

Within a city-wide framework of objectives and energy strategies it is important to set specific targets and strategies for specific areas, because

- this helps to focus on sustainable development for specific local conditions,
- it supports a close look at the energy consumption side (energy use and energy efficiency) in the area,
- it can help to change from the “single energy carrier viewpoint” to an integrated consideration and planning of all energy sources and energy consumers,
- it supports to activate local actors and local population using local potentials by raising awareness and bringing together local citizens and actors.
- It indicates the contribution of a district to the overall city goals.

The focus on a specific area is helpful in order to make provisions and planning for implementation more concrete and to relate better to the actors in an urban quarter.

Nevertheless, it is necessary to consider the overall systems linkages and energy flows in a city. Including an overall system logic, however, may lead to different strategies and results of optimization: Energy systems considered optimal within the boundaries of a SUL may not look so ideal when considering the entire energy system of the city or even beyond.

Concluding from the SULs experience, it is highly relevant to integrate the overall, city-wide perspective in the planning and decision-making on the energy strategy for individual urban quarters. While the area-focused planning approach is recommended, it is necessary to include

city-wide system information and framework conditions in the local area's planning processes. This relates e.g. to the energy mix (energy carriers) and thus to "indirect" emissions outside of the area, or to overall development of capacities in the system of district heating networks, etc.

Open district heating networks – low temperature grids

With respect to the potential use of waste heat or surplus heat from various local sources, it has become evident that low-temperature grids offer a higher degree of flexibility than traditional high-temperature heating grids. Since it is a general objective to realize a high share of local energy and step up energy efficiency, it seems relevant to include the concept of local low temperature heat grids in the planning of local energy systems. While the technology of such grids is stable and affordable, it is however more demanding to establish a grid management providing the efficient and continuous flow of energy input and demand balance. They also need a special consideration of hygienic issues, especially with respect to producing hot water – this can lead to a separate, decentralized infrastructure of heat-pump driven hot water supply.

Such systems have been installed in Hamburg and are currently discussed in Vienna and also for future DH-systems in Copenhagen and in Amsterdam.

Cost factors for the implementation of advanced energy systems

Experiences from Hamburg put the cost arguments into perspective: Accordingly, architects, investors and developers have accepted high buildings standards (nearly zero energy standards) as relatively unproblematic and virtually cost-neutral, when required from the beginning in the planning process. Practice shows that the criticized higher construction costs very often are at least partly caused by deficiencies in the design and construction management or by employing un-experienced, supposedly cheaper planners and firms. Higher material and labour costs account only for a minor increase in construction costs (5-10% are being discussed as realistic).

Changing legal frameworks triggers continuous rethinking of concepts and decisions

Planning and optimizing energy systems is under great influence of current or anticipated legal framework conditions. Changing such legal prerequisites will cause reassessments of energy systems with respect to costs and market conditions, organisational solutions, compatibility with competition laws etc. It is therefore crucial to anticipate the energy providers' and end-users' reactions to changes in legal frameworks or in the design of aid schemes.

Best practice on Urban development/energy system development approach and guiding instruments

- ★ Sustainable Urban Development (functional mix, lively quarters ...) linked with energy planning, focusing on long-term, life-cycle related solutions (CPH, VIE)
- ★ Mobility Fund as instrument to develop soft mobility projects (VIE)
- ★ Interest free eco-loans for energy-efficiency related refurbishments (national aid instrument in France, LYO)

- Low temperature heat grids – policy changes to encourage the use of waste heat and other (local) energy sources, and decentralized hot water systems (AMS, LYO, VIE, CPH)
- Local demand-supply management on electricity (AMS, VIE, COP)

Integrated, local energy systems and framework conditions

Of particular importance are legal provisions relating to

- who is entitled to act as energy producer and provider,
- what is the system of feeding-in locally produced energy or waste heat (legal conditions, feed-in tariffs),
- how can integrated local production and consumption systems be established in a situation, where national and local carriers are competing(power, gas, heat and local renewable are being treated quite differently)?

In the current situation for most countries, it seems virtually impossible to establish a locally driven, integrated energy system with a bottom-up approach. In order to create such integrated systems, however, it would be essential to integrate local production of renewables and the use of waste heat/waste energy in a coherent, systematic way. Incentives and organisational provisions are needed for individual actors in urban quarters in order to participate actively in the interaction of setting up integrated energy systems.

Integrated local energy systems are highly complex in design, maintenance and especially related to cost sharing and economic efficiency. Future legal framework conditions and economic incentive structures should be designed in such a way that

- it is attractive for citizens to live in low energy, sustainable housing,
- to participate in local or city-wide efficiency programme, and
- it is attractive for citizens and firms to participate actively in the production and use of local energy sources, such as renewable or waste energies.

Framework conditions needed for such a change in could be:

- Legal reforms, allowing the formation of (local) producer and consumer societies with respect to energy and energy services
- Legal reforms, allowing the integration of different energy carriers in production, distribution and services for enterprises and (local) energy societies
- Establishing a system of fair cost sharing between overall energy companies providing energy supply and grids on a supra-local level (city-wide, national or European level) and the local system societies or companies.

It seems clear that in the current situation, where energy markets and regulations are in critical phase, with changing global conditions and political unrest, setting up such a fundamental system transformation seems difficult. Nevertheless, it is essential to develop a vision giving directions for the development and transformation of the future energy systems: Concluding from the TRANSFORM-experience, the future energy system should develop towards a two or three-level system, where the formation of local, integrated energy systems should be established as a new partner for the existing national or European carriers.

3.1.5 Links and open questions

Linkage between city-wide strategies and urban quarter development strategies:

One question of most relevance to a city-wide roll out is the linkage between the top-down strategies and the area-specific strategy development and implementation. The SUL experience suggests that while it is necessary to have some bottom-up input for city wide strategy development, a comprehensive approach at city level is essential for elaborating area transformation strategies.

Best practice on linking city-wide strategies with quarter-specific energy system development approaches

- ★ Energy Masterplan as a city-wide planning and decision-making instrument and process, linked to the SUL level (LYO, Part Dieu)
- ★ Smart City umbrella strategy approach (AMS, VIE)
- ★ Visions for improvements and positive impulses in areas with little development dynamic (static or declining) (GOA)

Reasons for this essential top-down strategic input as prerequisite for area-specific development include:

- ★ Data and governance structures need to be provided in a city-wide, inclusive way (e.g. energy atlas or other open data provisions)
- ★ Energy production and grids have to be considered in a larger context, probably reaching beyond city boundaries
- ★ Energy system development strategies are shaped at city-wide or even national and European levels; utilities and energy companies operating at those levels therefore will influence the parameters for development in local contexts, relating to infrastructure investment, costs and tariffs etc.
- ★ City governance can be formed in a way to coordinate with utilities and energy companies, but such cooperation formats cannot be formed and sustained at a sub-city, local level except for specific projects. Cities also need generally applicable approaches and methods in order to provide effective roll-out of innovative strategies.

The specific content for city-wide strategies and governance provisions, however, will need the specific experience and input from a variety of quarters, representing the variation of urban quarters in the city. When developing comprehensive, overall strategies and measures for energy transformation, this variety of different urban quarters and their specific requirements will have to be taken into account.

The **linkage between city and quarter-levels** can be provided by the following approaches:

- ★ A city-wide, but high-resolution representation of the existing energy system on both, production and consumption sides (including building structures and existing heating systems in buildings, e.g. as so called **"Energy Atlas"** and open data access)
- ★ A **typology of urban quarters** formed in a way relevant to apply generic transformation strategies and to define **appropriate objectives and benchmarks** for different types of ur-

ban quarters (e.g. for new developments, historic areas, residential post war areas, office hubs etc.)

- A **process design** for the roll out of the city-wide energy transformation strategy and to develop quarter-specific strategies, a process integrating urban development, energy system planning and legal framework development, a process which is applicable to all different kinds of urban quarters.
- A **monitoring system**, compatible with the high resolution energy atlas, which in addition to the energy consumption and production features includes also a documentation of measures and actions taken in the area

It is essential to develop a **city-wide transformation strategy which differentiates between types of urban areas** in terms of both, objectives and measures to be implemented. A city-wide, data driven representation of the energy system is also necessary as a basis for setting priorities, meaning where to invest, where to focus incentives and man power resources, in order to achieve good impact results for the money invested.

Data requirements and planning/implementing integrated local energy systems:

While it is debated whether "smart meter" data on energy consumption will have a direct effect on consumer behaviour, data requirements for providers and energy system designers are high. A differentiation of energy consumption by

- energy carrier,
- given continuously per hour
- in reasonable aggregation

is mandatory for the design and calculation of complex energy systems as well as for innovative, flexible pricing and trade mechanisms.

The systems designed and planned for the SULs in TRANSFORM include all types of energy production and distribution (ranging from local renewable energies like PV to national/international power and gas grids) and are characterized by a highly complex interaction between carriers. Such complex systems, in order to be designed and operated economically, need to be based on a good and detailed knowledge regarding the consumption and production of different carriers in a seasonal and daily time line. Therefore, a high spatial and temporal resolution of data is necessary. This may, however, be in conflict with citizens' rights concerning the privacy of data. The best way for balancing the two objectives seems the legal provision to require aggregates of 5 end-users for any data representation, given in several participating countries (a benchmark of 20 units, however, seems to be too large for realistic applications).

If **carrier-integrating energy service areas** are formed and operated, it will be necessary, however, to include a data provision statement in the service contracts, where end-users grant the provider/system operator full access to individual data under the provision of secrecy vis á vis all external parties.

Best practice on data provision and on integrating urban development/energy system development approaches with guiding instruments

- ★ Relevance of Smart Meters for consumer behaviour and for energy planning by cities/providers ? (e.g. GOA, FHH, VIE)
- ★ Restrictions for data provision (privacy issues, detailing of data: from annual to monthly and hourly) versus energy planning needs (AMS city wide, LYO, HAM, VIE, GOA, district)
- ★ Standard agreement on KPIs for Energy Masterplans and IPs (which indicators, definitions etc.) (HAM, LYO)
- ★ Buildings standards, energy saving requirements, certificates for new office buildings ⇨ civil law contracts between landowners, developers and cities (example Urban Development Agreements in FHH, HAM, VIE) versus "convincing" of developers (LYO, COP)

Another **open question** remains with making energy planning or the **participation in a (integrated) local energy system** mandatory to all actors in an urban quarter. In order to make specific energy systems economically feasible in urban quarters, the participation of a high rate of end-users is necessary. This usually can be provided only if there are some legally binding agreements between the city, energy system providers and end-users (see also section 3.1.2, above). This relates to Zoning Plans, Energy Masterplans (or IPs), also in combination with specific civil law contracts, which may contain regulations concerning building standards and the participation in energy consumption/production entities (eg. as in Hamburg and Lyon).

3.2 Recommendations for cities

3.2.1 Recommendations for cities on governance and processes (at SUL level)

Framework and toolbox

Because every area is different, there is no such thing as the golden roadmap to come to an Implementation Plan. Tailor-made solutions have to be the norm. In chapter 4 a framework is presented that can serve as a map, which a city can use to draw its own roadmap tor the sustainable development of an area. In annex 1 the roadmaps are presented that the six TRANSFORM cities undertook, together with the products they made on their way towards their destination. These products are integrated in the framework (paragraph 4.2) and can be seen as tools. Together the framework and the tools make up a toolbox to come to an Implementation plan. In chapter 5 the process, the function of the IP, and the different approaches are evaluated.

Getting started: Process in Smart Urban Labs (SULs)

Essential for the successful area transformation is to create context and framework conditions at city level: The quality of urban governance is the crucial factor. Can the urban political and administrative system create processes and framework conditions favourable for actors to invest in the transformation of building stock and energy systems?

Recommendations on work processes at SUL level

- ★ Energy Atlas – analysis of the area as start in the planning process
- ★ Stakeholder involvement (energy producers, experts, developers, citizens ...) in a continuous work process to promote a bottom-up approach
- ★ Set up a Vision with qualitative and quantitative objectives (quality of life related etc.), relating to the identity of the area
- ★ Define requirements for each stakeholder group, property owners, developers etc.
- ★ Promote vision and development process of the area

It seems reasonable to **start with specific areas (named here SULs)** and to gain experience from the attempts to develop a transformation strategy, e.g. by elaborating an Implementation Plan. When doing so, a number of issues and problems will soon come to surface, which cannot easily be overcome in by local action alone. Still, it is recommended to get started in such a way and gain knowledge and ideas on SUL-level for what has to be changed in the framework conditions at city level.

Starting point and elementary for further processes in a SUL is to elaborate the relevant **database (Energy Atlas) and to involve key stakeholders** in a transformation planning process. Inserting expertise and experience from outside (e.g. on legal, economic, engineering matters) may be necessary and helpful.

A continuous work and communication process between the city's key promoters and the stakeholders in the SUL should be set up in order to establish a joint vision for the area development. That vision should be concrete and also include some key quantitative targets in order to make it tangible and possible to judge, if the area's development follows the vision path. The vision should also be more comprehensive and inclusive, relating to general urban development issues such as quality of life, area specific identity and socio-economic issues. Some of these elements in the vision will be possible to describe in qualitative terms only, making it even more important to have a continuous communication process on the vision and its implications, so that it is well understood by the population and stakeholders in the area.

SUL findings: How to enlarge influence for implementation?

Collaboration. This is the simple answer to a complicated topic. Although cross sectorial and cross planning-implementation collaboration is very hard to accomplish, this is the way in which a lot of solutions could be realized within existing legal framework conditions. But, reality shows different. The enormous change which the energy transition is, it makes sense that not all parties (including governments) change at the same time and envision the same goal. Therefore instruments and procedures to support change are very much needed.

Innovation and research laboratories. In two of the six SULs, an innovation and research laboratory is installed to look at new solutions in the field of smart electricity grids and (related) home solutions. The switch of mandate between the grid and the building plus the often the missing mandate to change the grid locally is covered by this laboratories. New solutions are proposed and possibly new (consumer) demand is induced.

Legal shift. Can mandate be shifted if sitting parties are not able to collaborate? In some occasions it is. A special purpose vehicle (SPV) can be erected in which (new) parties legally commit to collaborate. This way a new "playing field" is organized for other parties than the usual parties involved and "local energy solutions" can be developed. Also, investments can be done by this SPV. Of course, the activities of the SPV take place within the ruling legal framework.

Lobby for mandate. If mandate is not officially in place, the power of the political level can be used too. Also shifting between the city-wide "Transformation Agenda level" and the "SUL level" can be very effective, but very much depends on local relations between politicians and between politicians and private (energy) sector.

Legal framework. For new to develop districts in some cases new legal frameworks, which can be specified per district, enable reaching (specific) the targets at district level. In both Amsterdam and Vienna SUL frameworks are (partly) in place. For Aspern first development phase an Environmental Impact Analyses was used to ensure sustainable heating and cooling solutions. In Amsterdam the application of a new law, which allows to ensure sustainable heating and cooling solutions without presubscribing the technology nor a party which delivers the solution, is tested.

Good governance: The secret to success

Judging from the TRANSFORM cities' experience, by starting such a development process governance issues will immediately com to the fore: Integrating energy planning, urban development, housing und economic development as well as infrastructure planning in an innovative way is a highly demanding task, which goes far beyond business as usual on both levels, political and administrative. As mentioned above, starting in one area is useful to spur a learning process, but many issues will have to be dealt with at city level. This relates to political decision making, setting priorities and creating a legal and economic environment making area transformation possible and attractive.

Recommendations on governance at SUL level

- ★ Set up a task force for the area development (or a specific agency), working across administrative "silos"
- ★ Establish a strong communication flow with citizens in the process, provide open data platform
- ★ Develop business models and improve business framework conditions to make development and investments possible

The recommendation to start with a kind of **"task force"** relates to the experience that a number of sector-specific, administrative or political "silos" have to be brought into a mode of intensive cooperation. Such a format usually is exceptional to the ordinary, top-down work process within each of the administrative units. In terms of integrating innovative energy and urban development, however, it means that **technical, economic and legal procedures and standards have to be reframed – in a coordinated way**. This needs contributions from energy stakeholders, housing and infrastructure as well as from economic and financial departments, needs continuous exchange of information and joint setting of priorities.

Process-wise it is recommended to use **power modeling** while starting a SUL: A quick scan of the legal situation and of the major stakeholders (on the chain of enduser/developer, grid operators, local production) shall be performed. This will deliver the insight of a necessary mandate and on the willingness to collaborate on the set vision.

Such a process involves to overcome conflicting interests and finding a joint way for developing quarters, e.g. conflicts between low construction cost for housing and higher energy standards for both, the building and the energy supply system. This relates to another area of conflict, from the level of ambition in terms of CO_2 reduction, usage of renewable energy etc. which also is connected to the question of price levels and the social composition of urban quarters (in the case of residential areas, e.g.). As of now, it seems easier to develop a new urban quarter with high building standards and sophisticated energy supply systems for middle to higher income residents than for low income groups. Likewise this seems much easier to promote in modern, high-class business environment than in a workshop area with low skilled jobs. Therefore, the level of ambition and sophistication for integrated urban and energy development may have to be differentiated as well as development strategies and instruments to be applied.

The last point relates to the economic feasibility: Framework conditions must be found to make investments in the building and energy systems economically feasible, at best to provide the ground for integrated development. Energy service provision seems to be the key for the development of efficient business models for both, economic and legal grounds. **Integrated energy service providers**, using all energy carriers, sources and technologies in the future will make it possible to have the same plug-in quality for end users as in today's energy provision. It seems wrong to expect form end users, residents or businesses, to become sophisticated energy managers and optimizers of their energy consumption and costs. Therefore, future systems need to be as easy to use and as reliable as today, even if they are far more complex to build and operate. It is essential to create legal and economic framework conditions to make such integrated energy service provision possible and attractive in economic terms – there is the need for **smart, integrated energy service business models, inclusive of all energy carriers, energy sources and service components** (see also "Area ESCOmanagement", below in section 3.2.3).

In a mid-term **general implementation perspective**, it is necessary to **integrate climate and energy goals in the tasks of existing district organizations** and to provide these organizations with extra knowledge capacity to act in this relatively new field of work..Framework agreements with sitting energy (grid) companies to locally deviate from standard procedures and to support innovation may pave the way for future improvements.

Essential is to **commit on governmental support** of district organizations in such tasks, dealing for at least 2.5 -- 5 years to ensure continuity in the development process for smart (energy) districts.

3.2.2 Recommendations for cities on energy systems and technical issues

Judging from the experience in 6 SULs, which are of quite different character (new urban quarters/urban redevelopment; fast growing or stable/shrinking population etc.), a number of specifications for future "smart" energy systems can be summarized. Some of the main fea-

tures relate to the **future openness of the energy systems** planned or introduced into existing quarters. This required openness and flexibility for future adaptations relates to both, technical innovations and changes in the legal or economic framework conditions. Therefore, it seems to be an essential feature of "smart" energy systems to be planned in such a way that later additions or adaptations can be achieved easily, with as little cost as possible. Such changes can be anticipated only rudimentary, but as can be seen from recent developments, changes include important framework conditions in the various energy sub-markets.

Sustainable, innovative and "smart" energy systems need to be designed

- to provide the potential for input from waste heat and other local (renewable) energy sources in a stepwise mode, as the area evolves,
- to use heating and cooling systems as a backup systems for near zero energy neighbourhoods, where hot water remains as the main energy consumption,
- to expect technological improvements, e.g. in PV and in storage systems, making future systems more independent from large grid power supply,
- to cover different market conditions and price regimes, e.g. changes in prices for power and gas.

One recommendation is to bundle and integrate the systems designed not only in technological terms, but also in operational and economic terms. Long-term, holistic calculations for the business models seem to be necessary on one hand, while a high degree of independence from short term market conditions could provide for more economic stability.

Recommendations on the design of "smart" energy systems

- Start with holistic calculations
- Develop a system which can integrate waste heat and other local energy sources
- See heating and cooling systems as a backup system for near zero energy neighbourhoods
- Expect and calculate with innovation (improved building standards, improvements in efficiency, electricity as source for heating)
- Develop an energy atlas as founding data/information instrument
- Design an energy system which has the potential to evolve with innovation and changing framework conditions (in the energy markets, legal frameworks, technologies/services, etc.)

3.2.3 Open questions for future SULs: local area, integrated energy systems

One of the main open questions resulting from the various attempts to develop "smart energy city" adequate energy supply and distribution systems relates to organisation and legal framework conditions:

- Is it possible to **tender (and how) area–specific contracts to develop and operate integrated energy systems** (as opposed to separate tenders for energy carriers or have a free play of individual providers)?

Open questions for future SUL area development

- How to tender and contract (or give concessions to) integrated energy systems for development areas (as opposed to separate tenders for energy carriers)?
- Idea: Energy supply for end users as an integrated service – with as little energy usage as possible
  "Area-ESCO-management"
- Which organisation platform to use ?
  Consortium of end-users – ESCOs – building firms – governmental agencies – "communities"
- Legal framework needed (e.g. Lyon, Nordhavn, aspern Seestadt…)?
- Requirements – open system, flexibility of energy sources and producers, provide a freedom of choice for consumers within the energy system framework
- "COMMUNITY" as an overarching idea for area development

The questions arises out of the necessity to provide complex, integrated energy systems which rely on a large number of decentralized, local energy suppliers (renewable energies, waste heat etc.) and try to balance (mainly local) energy demands with a combination of locally produced and grid-based supplies. Such integrated energy systems are composed of e.g. a district heating and cooling system, a hot water supply system, electricity production/consumption/ storage, heat pumps, PV and/or solar-thermal inputs and storage. All such elements being deployed in urban quarters, with end-users who are also participating in the production and distribution of energy.

In a complex, integrated system like described: Does it make sense to have separate subsystem providers competing and developing parallel infrastructures – just in order to keep up the illusion of a free market and choices for individual end-users? The idea of competition would be best used to provide creativity and efficiency in designing and operation a local energy system. If this needs to be as complex as described above, the various components have to be planned and operated in a complementary way. This can be guaranteed only if there is

- a comprehensive design and operation mode,
- the full participation of end-users and local producers in the local system in order to avoid parallel infrastructure investments and operational costs.

The (market) competition, in this case, should be placed in the design and calculation of alternative (integrated) energy systems, offered by different consortia of providers. It should be the city's choice, maybe including representatives from the area's population, work force and enterprises in the selection process.

The organisational notion for providing integrated local energy systems is that of a **"Area-ESCO-management"**, with the city – in a legally founded process – selecting and controlling consortia who are able to invest, install and operate those systems. For residents and firms in the area, this area-specific ESCO would act as full service provider, offering a variety of contractual options.

For the end-users in such an area, which is then being operated by the selected consortium, a set of options within an overall service contract could be provided, e.g. the option to select

from a variety of service contracts or modes for in-feeding energy to the system. It will be necessary, however, to balance the power of the selected consortium by establishing **a city-run control body**, where end users or potential individual energy producers will be guaranteed the service contracts and within these, as much freedom of choice as possible.

Another key question in the context of integrated energy systems relates to **competencies and legal status of potential consortia**: They have to be equipped with licences to provide all relevant carriers (e.g. electricity, gas, biomass, ground water ...) and need to have sufficient competencies to operate the local grids and the links to overriding, city-wide or national grids. Since some of the actors in integrated energy systems will be in the role of producers, e.g. feeding-in electricity from individually owned PV panels, it needs to be clarified, what their tasks and responsibilities are: Provide input always to the maximum potential or within the given constraints of the local area operator? What happens, if local input providers for some reason cannot deliver – who is responsible for operational losses, for repair and replacement of deficient components – at any given time?

Behind these questions rests the notion of an **urban quarter or neighbourhood to act as "Community"**, responsible for organizing and guaranteeing sustainable energy supply to its members, with the option for some members of the community to become partners in the provision of energy, e.g. as local producers of renewable energy. The Area ESCO Management would function as the main organisational and operational body to provide the community with such services in a comprehensive way.

Another element in guaranteeing the area ESCO's future performance and development could be the role of owners or overseers: Residents and local firms could become owners of the area ESCO if this is provided through a clause in the city's concession, or they could be guaranteed a role in the city-organized control mechanisms, minding the local residents' interests, especially with respect to performance and freedom of choices for individual end users.

Relating to the long-term development perspective of integrated, area-specific energy systems (and area ESCOs) it seems necessary for the **city to maintain an governing and innovative role**: Area concessions probably will need incentives for innovation and system adaptation, in order to maintain competitive standards with other, newer and more modern areas. In a field where technological and organisational innovation and improvements are key, such provisions to spur innovation in the areas under concessions seem to be necessary: Strategic guidance is needed for local area ESCOS, and the role of cities to guarantee such an innovative transformation path will have to be clarified and elaborated.

3.3 Recommendations on policy frameworks (national, EU)

3.3.1 Recommendations on energy related framework conditions/regulations (legal, economic, political)

New framework conditions are needed to allow for integrated, local energy systems

The local area approach which includes decentralized production, storage and feed-in, is partly contradictory to the traditional top-down approach provided for in the legal framework conditions of today. Necessary changes in the legal (and financial) frameworks are:

- Legal reforms, allowing the formation of (local) producer and consumer societies and their exploitation of energy production and energy services
- Legal reforms, allowing the integration of different energy carriers in production, distribution and services for enterprises and (local) energy societies
- Establishing a system of fair cost sharing between overall energy companies providing energy supply and grids on a supra-local level (city-wide, national or European level) on one hand and the local area system societies or companies on the other.

In order to spur innovation and investment activities it should be considered to

- provide freedom in legislation and regulatory framework for local deviations and to
- provide low interest innovation (revolving) funds for high(er) risk activities also for private organizations.

Cities (or city-regions, agglomerations) should be entitled to plan and tender for delineated urban areas, where specific measures of energy transformation shall be implemented. Necessary measures include:

- Integrated urban and energy system development planning and guidance
- Tender and concessions for integrated energy system providers (local Area-ESCOS)
- Building and network refurbishment, incentives and technical standards
- Area-specific obligations to hook up to heating and cooling networks (for new and existing quarters)

Depending on EU and specific national regulations, one or the other of the above measures cannot be taken by the cities until now. A specific barrier is the right to choose energy carriers and providers individually, by developers or end-users in a general way. While this may seem as producing low energy costs, it does not necessarily lead to efficient energy systems for urban quarters in a comprehensive view: Parallel provision of carrier systems with low market coverage leads to high costs for the providers, which in turn are handed over to customers.

Therefore, in **new urban developments**, the competition between carriers and providers shall be placed at the beginning, when competing for the best energy system solution for the area. If an area-ESCO the is being entitled to set up its new energy system, all end users will be linked to the most efficient system, providing for low investment costs. As a potent buyer, the ESCO in turn will be able to tender for best market prices among energy providers and also guarantee the most efficient use of locally produced energy.

In **already built-up urban quarters**, the situation is much more complex, since a number of individually provided networks are existing, often in parallel. Only a percentage of end-users, then, is linked to one or the other network or is relying on individual heating/cooling provisions. Such a mix of historically developed energy systems in existing quarters is far from efficient in both dimensions, economic and ecologic. Cities, therefore, need the right to intervene and provide for more efficient energy systems in **area-specific approaches, quarter by quarter**:

- Designing transformation strategies and designating "Transformation Areas", where a specific mix of measures can be applied
- Use of activating and supportive approaches for integrated urban and energy development (pro-active project development, stakeholder involvement etc.)
- Give clear incentives for a switch to a preferred energy system (e.g. local heating and cooling network) and for the in-feed of locally produced energy or for the use of waste heat
- Use urban contracts for more efficient, innovative energy systems for new or redeveloped projects within the area (e.g. in linkage with zoning procedures) in order to provide for a stepwise increase of the share of the preferred energy system in the quarter

As in new urban quarters, it is the objective to improve the area-specific levels of energy consumption and to make the overall system more efficient (less parallel investment in networks and individual end-user investments). But in order to reach energy and CO_2 targets, it will be necessary to entitle cities to intervene on behalf of climate and environmental objecttives:

Based on city-wide and area-specific, integrated urban development and energy strategies, cities shall have the right to **set clear incentives or binding rules to shift** from existing, fossil-driven systems **to new, "smart" energy systems** – within a given time horizon, end-users shall be required to replace existing heating and cooling systems and switch to an new system offer to be provided through the cities' initiatives. (CHP heat strategy)

3.3.2 Recommendations to national and EU-level policies and governance

Three-level energy systems: Cities and citizens are key

Concluding from the TRANSFORM-experience, European countries' future energy systems should develop towards interacting two or three-level systems, where the formation of local, integrated energy systems become established as new partners for the existing national or European carriers. Cities will play a key role in creating the framework conditions for initiating and establishing the local level Area-ESCOs, providing a procedural and legal framework with reduced risks for investors – be they from corporate background or from local citizens.

Future, three-level energy systems reflect this re-orientation towards area-specific, local development approaches:

- EU-level: General framework regulations, multi-national energy carriers (production, distribution networks) and energy markets ⇨ governance of international distribution networks
- National level: Country-specific framework regulations, influencing national and sub-national energy carriers ⇨ governance of national production conditions and of distribution networks

- Cities (and also regions): Implementation of integrated urban and energy development strategies, providing for quarter-specific energy system transformation and new area energy system design, as well as for local area-ESCOs ⇨ governance of local production and of linkage between local and national distribution networks

Winning the citizens' support for this new urban energy future is a main task for innovative politicians and parties in the energy sector in the years to come – providing opportunities for citizens to invest in their own sustainable energy future could be a promising way.

Potential future model: Local Area-ESCOs for integrated energy systems

A future example for how to organize integrated energy systems on the local level would be the creation of Local Area ESCOs (energy service companies): Such Local Area ESCOs would be servicing defined urban quarters in an integrated way, providing local renewable input, using efficiently "imports" from area-external energy markets, investing and operating in new supply systems and implementing retrofit programmes. For this purpose, city wide standards, tender procedures and concession processes will be needed. As a new and bigger consumer in the energy market, such ESCOs would have more market power, operating and bargaining professionally and efficiently to the advantage of the individual end-users.

The cities' future role in this model would be the creation of service areas, setting of standards and targets for these areas and governing the tendering and monitoring processes needed to implement this new organizational vision, a process where local area service concessions are awarded to ESCOs. Over time, with growing experience, changing market conditions and technological evolution, redrafting and adapting of the ESCOs energy strategies may be needed – therefore a governance process should be provided, where a revision of the conditions for area service concessions can be handled in an ordinary way.

Important issues for future research and development

Future research and development shall focus on both, technological and economic/legal issues with the objective to create efficient, integrated energy systems which can be handled and maintained at reasonable costs for the end users. **Main research and development issues** include:

- Design of a regulatory framework which allows for the build-up of the above sketched three-level energy system, with particular focus on the interaction between international/national carriers and networks and the local area service entities. The role and freedom of consumers/pro-sumers in such a three-level system should be elaborated with the objective to create stable, reliable and efficient system conditions relating to costs and environmental impact.
- Cities need support in the development of fast and effective transformation strategies for existing urban quarters, where the improvement of existing building stock and energy system stock is the main objective, while given infrastructure and contracts o not encourage such changes. The question is, if there are attractive incentive models which could be provided for market actors to spur investment in such transformation.
- A number of pilots projects for integrated local area energy services (performed through ESCOs) should be supported and monitored closely relating to their energy and environmental performance as well as relating to their economic viability. For such pilot projects,

a minimum number of test years will be necessary, with analytical comparison of the necessary regulatory preconditions and the energy system outcomes. Based on such an experience, the general design of governance and regulatory settings could be improved, providing for a general roll out of the local area service approach in the cities.

- Existing financing schemes for research and development, including pilot projects and other high-level observatories should be adapted in order to make the funding accessible for the above purposes (Horizon 2020 and others).

In terms of research policies it seems important to

- continue to provide the possibilities for international learning and knowledge exchange on (smart energy) district development,
- stimulate the development of district organizations which have the mandate and capability to invest (or direct investments) in smart energy districts, e.g. through designated calls on this topic and by stimulating (comparative) research,
- test other support schemes than calling for research and/or demonstration proposals. In addition, calling for financial support of local finance schemes or (revolving) funds can prove to be successful too.

The role of EU institutions in the evolution of a European sustainable, and smart future energy system cannot be underestimated: Energy, climate change and environmental sustainability are key themes on the European agenda, ranging from climate protection to economic and political independence from fossil fuel production countries. Therefore, with such important objectives in mind, European partners from all levels should cooperate closely to create integrated, smart energy systems and transform existing urban structures in our cities.

Part B
Process evaluation and main contents of the IPs

4. Framework for making Implementation plans

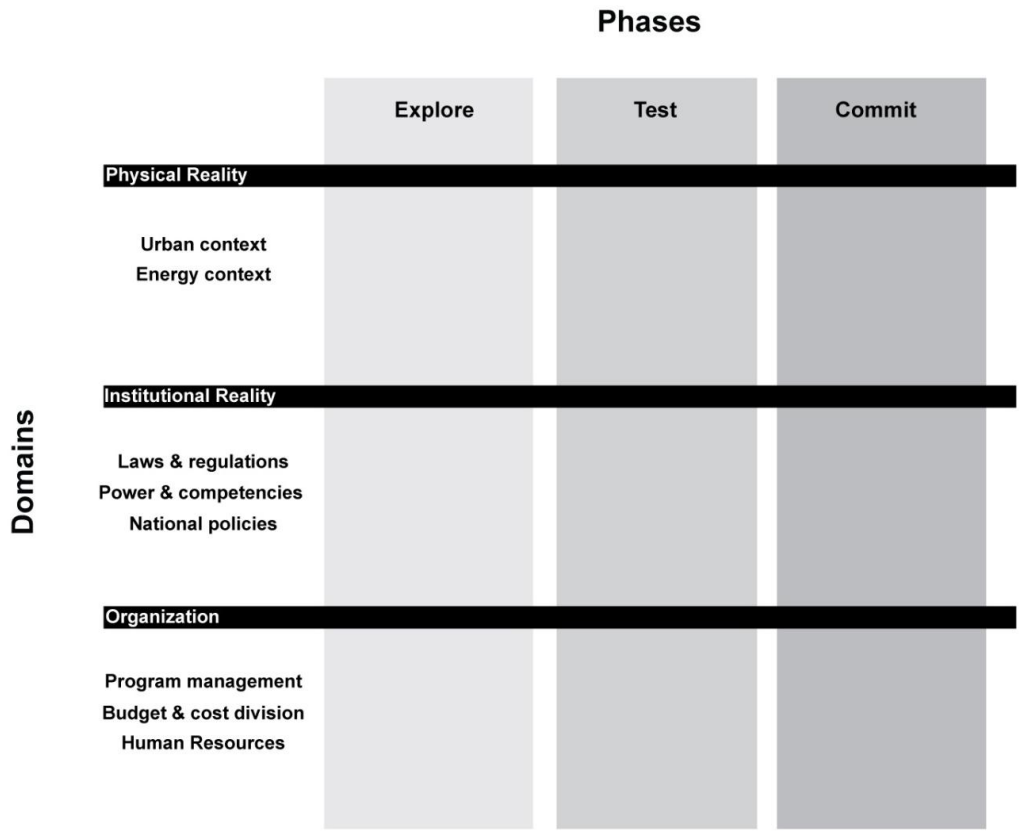
The central question in this chapter is: How to make an Implementation Plan?

Because every area is different in physical details, in the phase of development and because the institutional context differs, there is no such thing as the golden roadmap that suits every city. Tailor-made solutions are the norm. The general roadmap towards an IP that is made is therefore a framework (4.1), instead of a set of steps. In this framework the products have been integrated that were made by the cities in making the implementation plans. Together the products (annex 1) and the framework make up a toolbox for making an implementation plan (4.2). In 4.3 the different phases are explained in a more practical sense.

4.1 Framework

The framework focuses the attention in making an Implementation Plan. It consists of three phases and three domains, that make up a matrix of nine fields.

Figure 2: Framework to make an IP as a matrix of nine fields: phases and domains



Depending on the area to be developed, some fields will need more attention than others. Moments should be organized to link the different domains together, prioritize and discuss the next steps.

4.1.1 Sequence of phases

The making of the IP can be regarded as a sequence of phases. In dark are the phases in the period of making the IP: explore, test and commit. Lighter are the period of preparation in advance and the implementation period afterwards. Before the TRANSFORM project started, there was a period of preparation. In the call towards the European Commission each city selected an area as Smart Urban Lab, set up a local team to work on the Implementation Plan (IP) and arranged local resources to (co)finance the making of the IP. Keep in mind that the phases are in practice not as linear as presented here.

Figure 3: Phases in the making of the IP

For these phases questions are formulated, and interesting products and working methods have been gathered. These products and working methods can be seen as tools that come along with the general framework. The phases are elaborated on in paragraph 4.3.

IP timeframe

The experiences of making the IPs within TRANSFORM concerned a period of two years. Starting from different stages of development (planning and implementation phases) in the TRANSFORM cities, the presented implementation plans were made in two years time from the start of the TRANSFORM project in January 2013, until the end in December 2014. The implementation period that will follow, has a scope of about 5(-10) years. Depending on the task and the specific situation of an urban area, the length of these periods might differ.

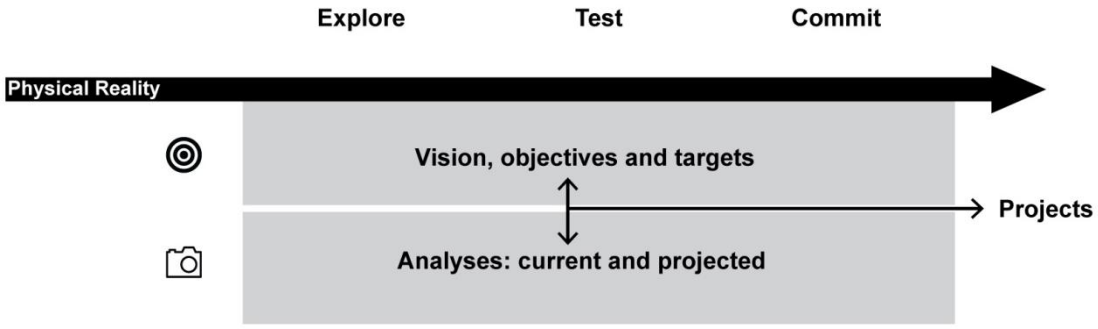
Figure 4: Three periods concerning the IP

4.1.2 Domains

An IP is not merely a document. The making of the IP is a process that might be of more value than the document itself. Besides focusing on the integral planning of urban development and energy for a specific district, the making of the IP can be used to change the institutional context. And by making the IP together with other stakeholders a new way of working and program management can grow. In short, when making an IP, it is useful to understand three different domains: (1) the physical reality (2) the institutional reality and (3) the organization and management of the overall process.

The first domain is the physical reality. It is about the urban context and the energy context. In this track the task is to set a vision, confront this with analyses of current and projected situations. This should lead to a solid vision with specific targets and the formulation of **implementation projects** to change the current situation into the desired one. In this track technical, financial and spatial aspects play a major role. Also economic, environmental and social issues will be addressed in this track.

Figure 5: Physical reality subdivision: vision versus analyses



The second track is about the institutional reality. Institutions are real, but not tangible. Laws, regulations, rules, programs, the division of powers and authorities, the procedures, and subsidies are examples of institutions. Also organizations itself and etiquettes can be understood as institutions. Institutions are important because they influence behaviour. In a new field of development – integrative energy planning – the institutional context must be understood. This makes it possible to understand the roles of stakeholders, their behaviour and to find out how this behaviour can or cannot be changed. In some cases there will be a need to change institutions to foster a low carbon development. In other cases developments in the institutional context are creating new possibilities. Within this track typically political, governance and legal aspects are at stake.

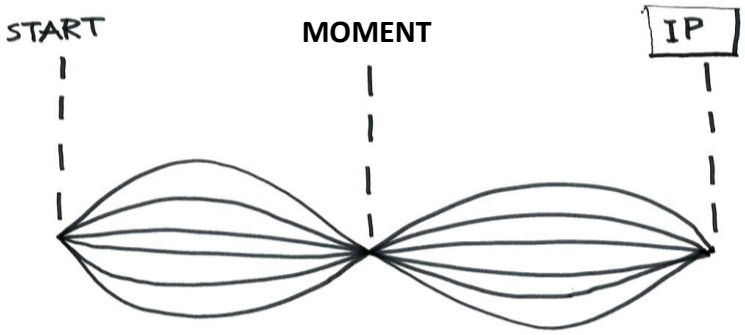
The third track is about organizing and managing the making of the Implementation Plan. It is about organizing the process to decide what products to make, what interventions to place and who to invite for what. The process in the implementation phase must also be organized and managed. The organization of the making of the IP has therefore two goals: to come up with projects (implementation projects or projects directed at the institutional context) and to organize involvement and commitment of stakeholders that are needed for a good implementation. Besides budget, time and staffing issues, there is a strong link with the governance aspect.

4.1.3 Moments

By organizing collective moments during the making of an IP, the different domains can be related and adjusted to each other. These moments foster collective learning during the process. The moments can also serve as milestones and deadlines. They contribute to an integrative approach, prioritization and to commitment. To be successful a moment is used to create

a **momentum** in the process. Typically this means a product is made to record and communicate the findings and to manage the expectations on the next steps in the process.

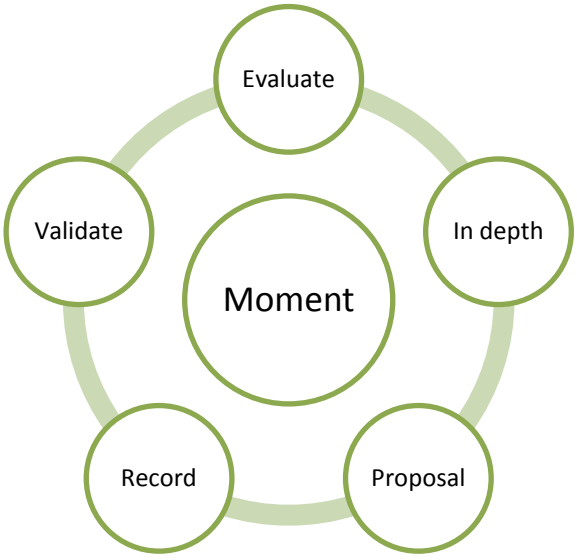
Figure 6: Integrative moments in the process



Within the TRANSFORM project the cities all organized an intensive Lab Session as a moment between the start of the project and the delivering of the IP. This is a 3-day workshop with local stakeholders, international partners and expertise from the TRANSFORM network and relevant knowledge and market organisations (chapter 5). The moments of the ILS within the making period differed per city (annex 1).

Another moment, before the ILS was held, was the making of the document "Roadmap to make an Implementation Plan" per city, part of Deliverable D4.1. In comparison with the ILS this moment was less an integrative moment together with the stakeholders. But, this document marked the end between the first phase of exploration and the phase of testing. At that moment, the main themes were chosen, new research projects, and the relation between the institutional context and the next steps in the process was made explicit.

Figure 7: Activities around moments

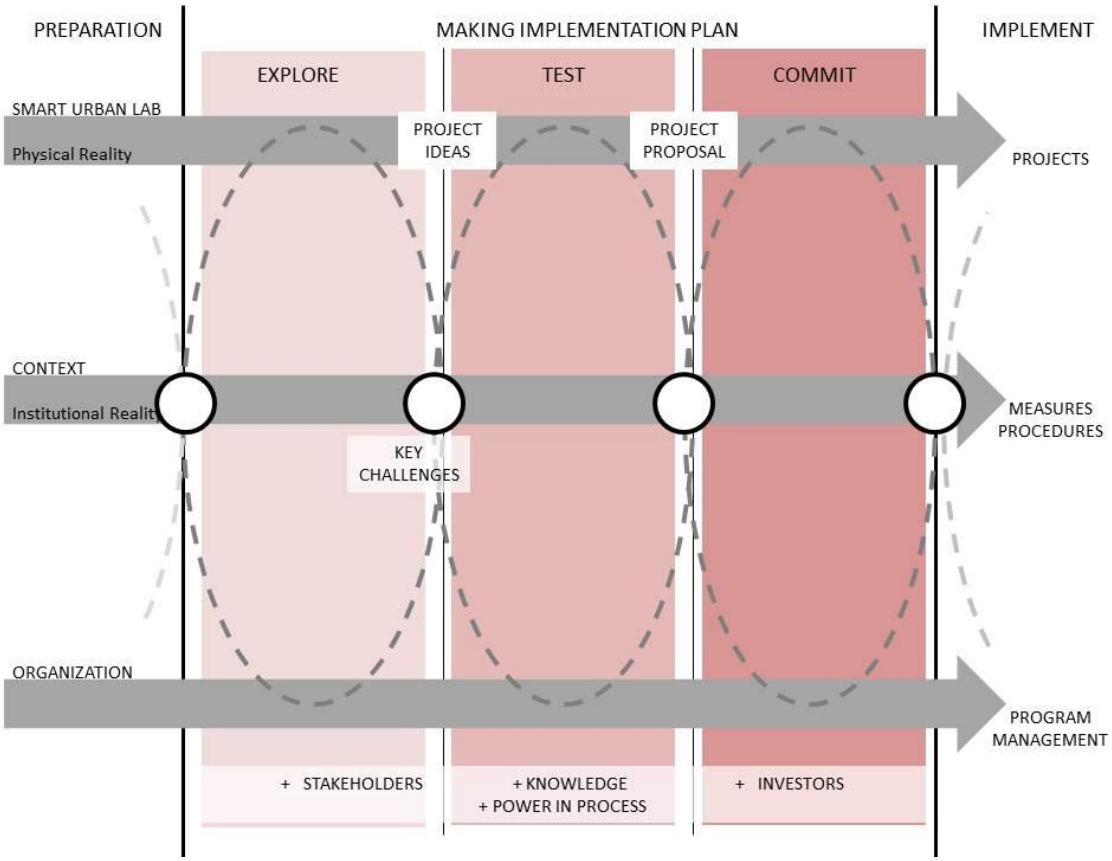


A moment is a point in time to reflect. To use the moment well it is important that (1) evaluation of the ongoing processes takes place, (2) there is time for in depth dialogue that fosters exchanging knowledge on specific topics, (3) this results in a proposal for next actions and working methods (4) these results are recorded and made into a product, and that (5) this product is validated by the actors needed. These actors can be local politicians, but also development agencies, developers or grid operators. It depends on the local context.

4.1.4 Overview

In the next figure the phases are combined, with the domains and the moments. The integrative moments symbolize the progress that is made. It is the ending of a phase and a beginning of a new phase. In every new round the tracks should become more clear and focused. In the physical reality this means that project ideas develop into project proposals and finally end up in projects.

Figure 8: The Framework for the roadmap to make an IP



In reality the phases will also run through each other. In TRANSFORM there are also projects with a explorative research character in the final implementation plan. And the other way around: In the cities where the urban development already started before TRANSFORM, there were implementation projects already at the start. These existing projects can also become part of the implementation plan for the next phase.

4.2 Toolbox

You need to know your desired destination to choose the right roadmap (IP as final product, chapter 6). You also need to know how to drive in order to arrive at the destination (products and their methods, annex 1). Products made in TRANSFORM are placed in this paragraph within the general framework and form a toolbox for making an IP. The products and methods make up the tools for inspiration and reality checking. There is more information on these tools in annex 1.

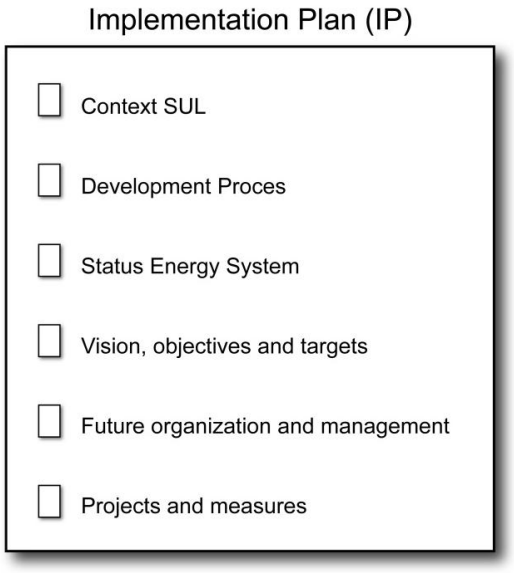
Work towards a product

To set up a process it helps to know what the result of the process should be. Deliverable 4.1 contains a format of a general Implementation Plan for a SUL, with different chapters and tables. The cities in TRANSFORM used this format to make the IPs. Of course the cities tailored the format to their own situation (deliverable 4.2 and chapter 6 in this document). Sometimes chapters were combined, tables were added or only partly used. In general the cities used the format and thought it useful and user-friendly. During the making of the IP the format helped in structuring, communicating and raising the awareness of all the different aspects that are concerned.

The point is that having a clear idea of what an IP is, helps in drawing the roadmap. The IP as a product is the destination for the roadmap. This makes the process easier manageable.

Each chapter of the Implementation Plan can be considered as a product of its own. The figure below shows the products that make up the Implementation Plan. In comparison with the format in deliverable 4.1 there is one change made here. The chapter “vision, objectives and targets; future organization and management” has been split into two separate chapters. The reason is that these are different and important parts of the IP, that have had different approaches in the TRANSFORM cities.

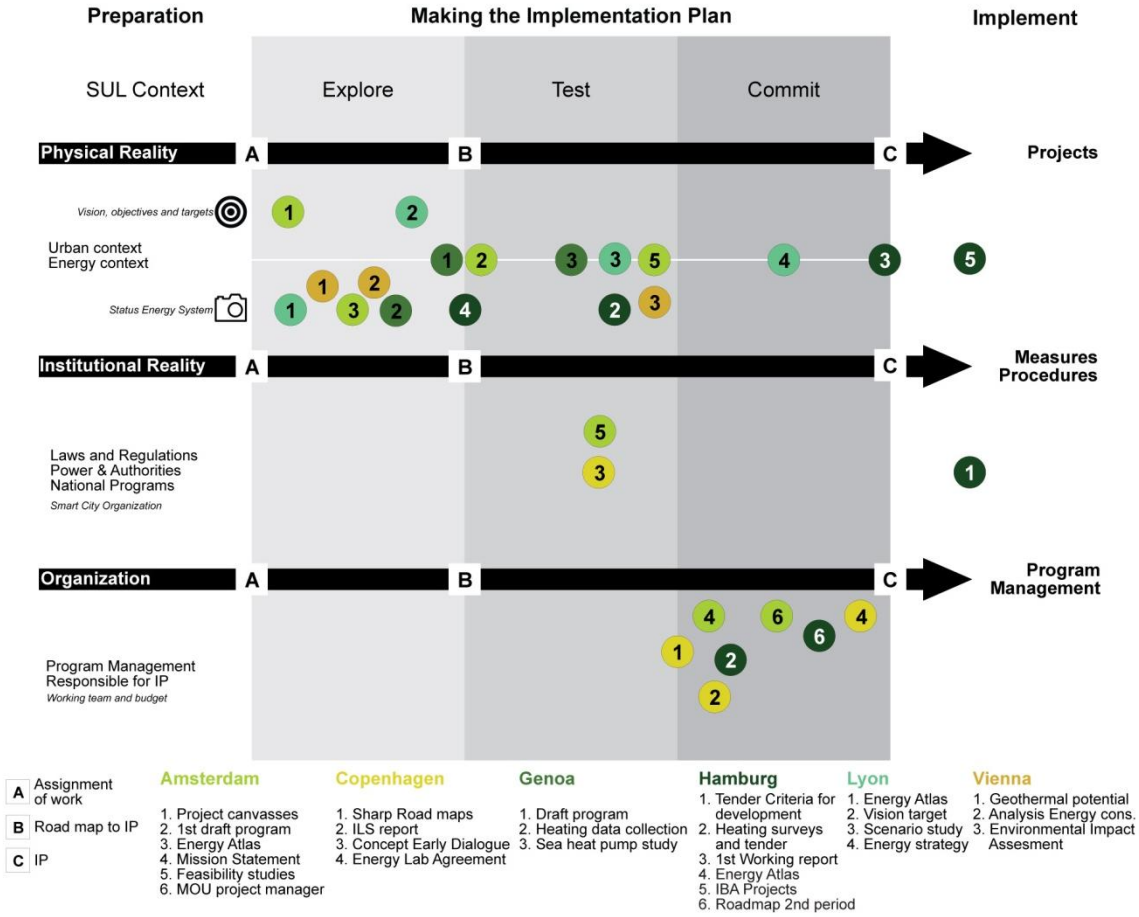
Figure 9: Sub products of the Implementation Plan



To arrive at the final destination and to draw the roadmap, it makes it easier if you already know where you want to stop in between. In other words, the final IP will rely on products that were made during the process. In TRANSFORM the cities have been producing different kind of products. A common example is the making of an energy atlas. These products are placed within the framework.

In annex 1 the general process that the cities undertook is represented. The overview of the products that were made are in the following figure.

Figure 10: The Toolbox: Overview of the products made within the framework



4.3 Phase by phase

For each phase a question is formulated, and interesting products and working methods have been gathered. These products and working methods can be seen as tools that come along with the general framework.

4.3.1 Preparation

Preliminary to the start of the TRANSFORM project, a proposal was made in the application for the European subsidy. **This is the assignment to work on.** In this preparation phase each city **did:**

- ★ select an area as Smart Urban Lab
- ★ set up a local team to work on the Implementation Plan (IP)
- ★ arrange local resources to (co)finance the making of the IP.
- ★ make a decision to make an IP for the integration of energy planning and urban development.

Guiding question

In this phase the guiding question is: Where are you?

The following topics should be addressed:

- ★ Phase of development within a longer time frame
- ★ Check on current network and relations with stakeholders
- ★ Argumentation for the selection of the area

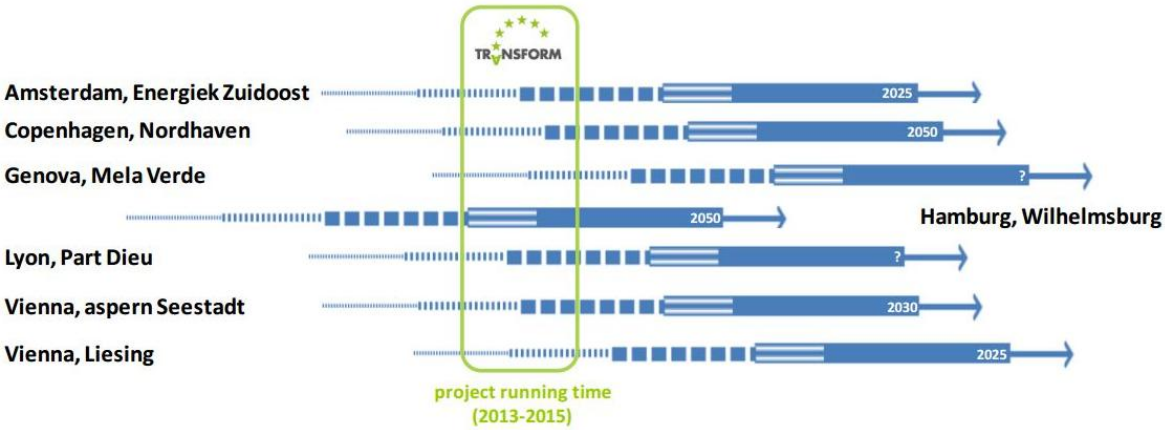
Phase of development within a longer timeframe

The Implementation Plan differs per SUL according to the phase of development of the SUL seen in a longer timeframe. The total period of development of the SUL is longer than the implementation period of the IP. In Copenhagen the estimated development period is about 60 years. In the Deliverable 4.1 “Roadmap to make an Implementation Plan” the following schemes of phases is incorporated.

Figure 11: Scheme of SUL realization phases

Source: OIR

Figure 12: Realization phases of TRANSFORM SULs

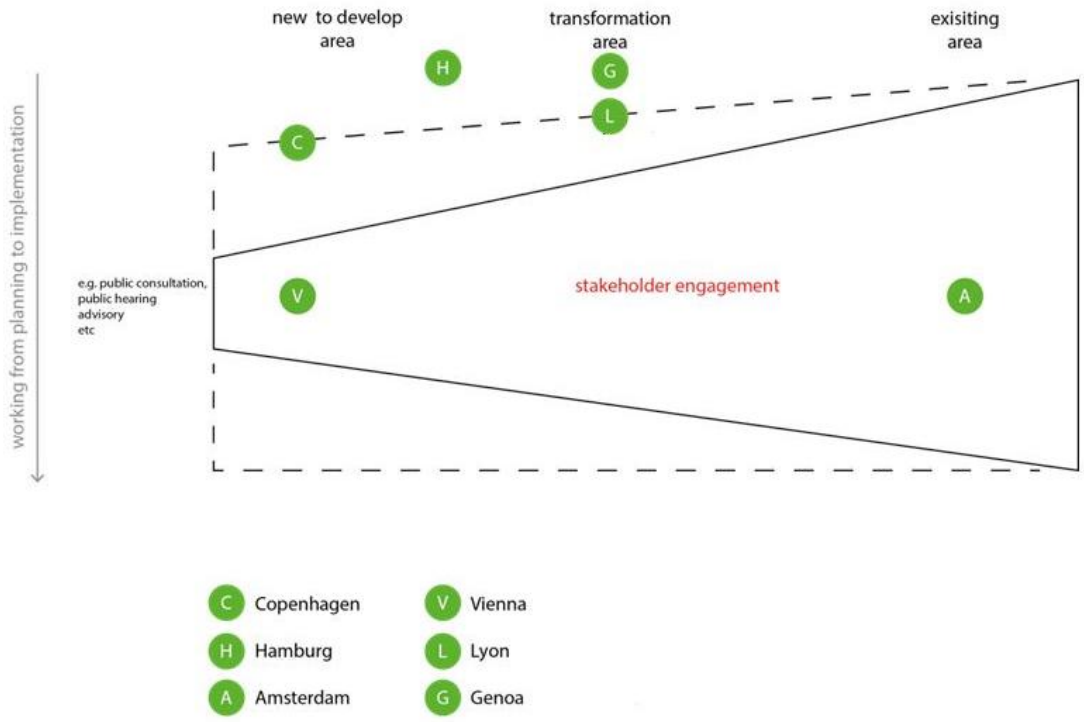


Source: OIR

Be aware that this scheme does not incorporate the difference between a greenfield development (Copenhagen, Vienna Aspern), the transformation of an urban area (Genoa, Hamburg, Lyon, Vienna Liesing) or without a big urban development (Amsterdam). The realization phases are about the current and planned changes in the area and do not say anything about the maturity of the urban area.

For the making of the IP this does make a difference. The topic of sustainable and integral energy planning is relatively new. In built environments there are already energy systems functioning, that were originally not aimed at sustainability. It is easier to incorporate new technology, insights and systems within an area that is unbuilt, than to "repair" it in an already built environment. Moreover, in existing built areas there are more stakeholders with a position in the area. In built areas, the involvement of the stakeholders will be more important during the whole process of making and implementing the IP.

Figure 13: Type of urban development in the TRANSFORM SULs



Check on current network and relations with stakeholders

Because different internal and external stakeholders are needed in the implementation phase, a good relation with them is crucial. If it is possible to build on existing relations and partnerships, this will enhance their understanding, the trust and their contribution to the process. A quick scan should be done.

Major stakeholders in the area can be development agencies, owners, special functions. Major stakeholders in the field can be municipal departments, grid operators and energy providers. There might also be networks with goals related to the goals of the IP. A Smart City organization can be a valuable network as entrance to approach the stakeholders.

Argumentation for the selection of the area

There should be an argumentation to use a specific development area as a Smart Urban Lab. The argumentation in the beginning can be a guide to get back to during the process.

4.3.2 Exploration phase

The exploration phase is like an encounter. During this phase you will get to know and to understand the area, the topics, the possibilities, the barriers and the stakeholders. This phase is a diverging phase looking for all kinds of possibilities and new connections. In this phase there is a search for a vision, an understanding of reality and a first confrontation between both. This will result in project ideas, and will make the vision more focused. On the end of the exploration phase a first selection will be made.

Guiding question

What are the options?

Result

The main result will be a specified roadmap for the making of the IP (see D4.1 for elaboration). This roadmap contains:

- Characterization of the SUL
- Vision and general objectives
- Steps to be taken towards IP
- Responsibility per actor in the process
- Description of themes
- Governance structure
- Key challenges
- Project ideas

There should be a link between the key challenges, the steps and the involved actors. To overcome key challenges cooperation is necessary.

Methods

In the phase of exploring, typical methods are:

- Brainstorming
- Gathering data
- Workshop or working groups with stakeholders
- Interviews
- Policy research
- SWOT on policy domain (mostly energy) on PESTLEGS

Toolbox: Product examples

Products made in this phase were project canvasses, draft programs and roadmaps.

On the institutional domain there were less products made. The reason is that the institutional context has been mostly regarded on the city-level (WP2) instead of on the SUL-level. If there

is no separate track on the citylevel, then more attention has to be paid on these aspects on the level of the SUL. A powermodel can be made of one organization, but it can also be a total for a partnership. Here are examples of a graphic representation of a powermodel and a way to map stakeholders.

Figure 14: Graphic representation of power on the city level

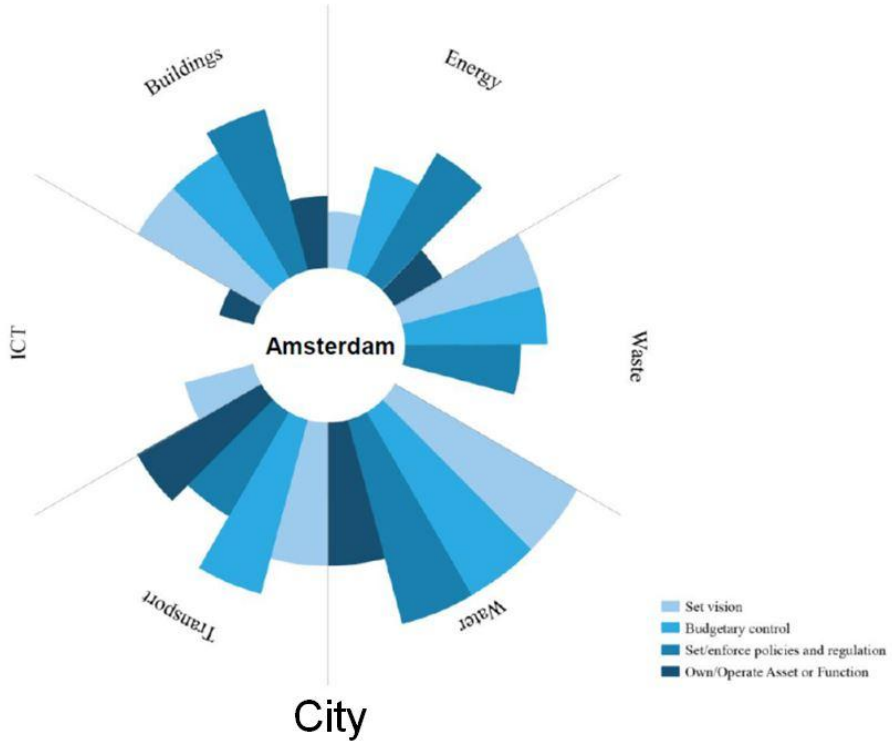


Figure 15: Example Powermodel of collaboration on SUL level

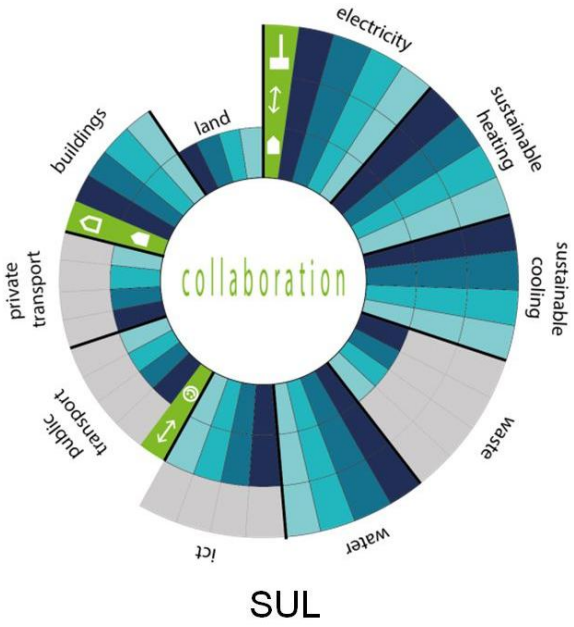
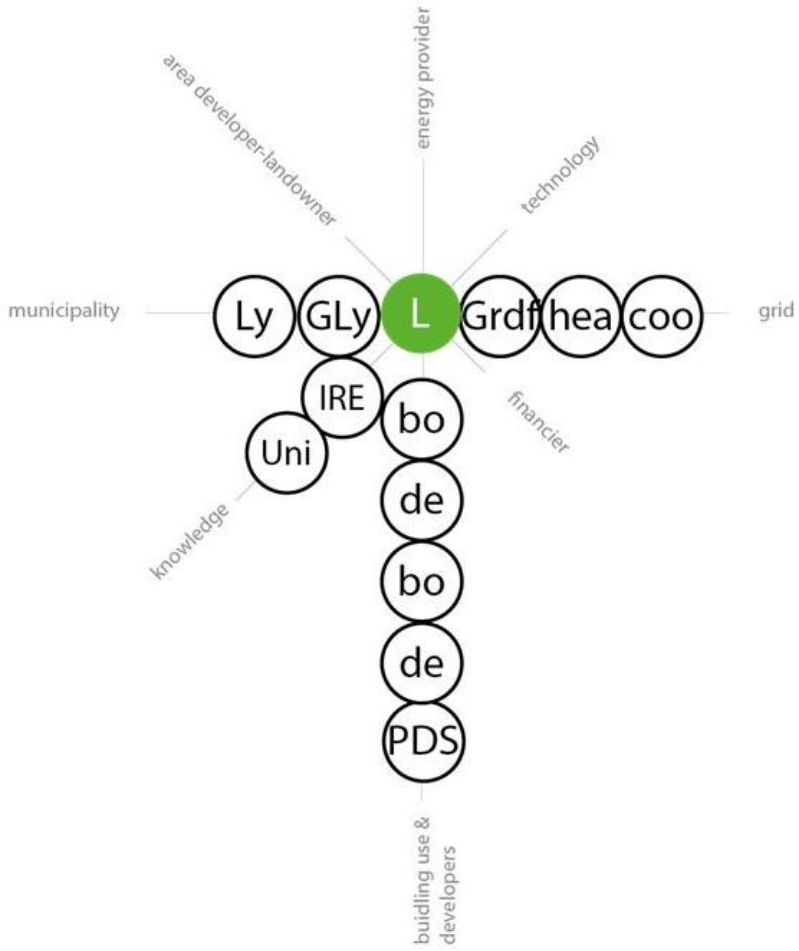


Figure 16: Mapping of stakeholders



4.3.3 Testing phase

In the testing phase it is about finding out if the goals and the concept projects are possible to implement. It is about checking whether the goals are realistic, what different scenario's will deliver for output and what kind of barriers there are in the institutional and organizational context.

Guiding question

What is the value of concepts in practice?

Result

This phase did in the TRANSFORM project not lead to an all-encompassing product, although there should be a moment for prioritization. The phase is ideally delivering more specific studies on legal aspects, technical aspects, business cases, stakeholder commitment. The big moment within this phase should be the ILS on more specific themes and with some existing studies done.

Methods

- Expert research
- Workshops
- Working groups
- Interviews

Toolbox: product examples

- Scenario reports
- Expert studies
- Feasibility study

4.3.4 Phase of commitment

In the final phase it is about the decision of the major stakeholders to agree and invest on the implementation program and on separate projects. This phase is all about making choices. Who is willing to commit and invest in what?

Guiding question

Are we going to do it?

Result

The result of this phase is the implementation plan itself. This consists of products made during the whole period. Ideally the following topics are addressed:

- Context SUL
- Status energy system
- Vision, objectives and targets
- Evaluation development process
- Future organization and management
- Projects and measures

Methods

- Involve the decision nmakers
- Negotiate
- Specify necessary budgets

Toolbox: product examples

- Contracts
- Agreements
- Energy strategy document
- Validated criteria
- Signed mission statement
- Specified roadmap

5. Process evaluation: The making of Implementation Plans

5.1 Function IP and TRANSFORM-process: Evaluation per city

Table 3: Summary: Comparison of the IPs' function as expected (ex ante) and in practice (ex post)

City	Function of the IP within the city development – ex ante (source D4.1)	Experiences – ex post
Amsterdam	The IP is a visionary framework to speed up a multiplicity of existing and planned transformative projects, and thereby link local needs with key themes and considerations of the city's transformation agenda. The products of the implementation plan should have added value for (a) implementation speed-up, (b) creation of buzz in South East to attract new initiatives, (c) learning factor for other areas in Amsterdam and (d) learning factor for other cities.	The making of the IP resulted in (1) a knowledge base regarding energy (2) the creation and testing of project ideas (3) creation of a buzz in the area (4) The application of a programme manager that will work on behalf of the city, ArenA stadium and other main stakeholders in the area.
Copenhagen	The IP shall help to develop a strategy to facilitate dialogue among stakeholders and to foster existing development ambitions for the area.	The IP has been most helpful in fostering the cooperation between the city-departments. A method has been developed to facilitate dialogue among stakeholders where sustainability has come better on the agenda.
Genoa	Transform and the Implementation plan should be part of the process promoting and supporting the actual realization of the Green Apple.	The report represent an advanced step into the study of the area and a roadmap to make it go ahead. When requested, it could provide the adequate synthesis for who wants to approach (and invest) to this area. The added value to make an IP is to integrate aspects to come to a complete framework of the situation and further development. Some are technical aspects on which there is now a better understanding on the realistic possibilities. The IP functions as a result of a validated approach, which can be delivered to politicians directly.
Hamburg	The IP will have the function to deepen and speed up processes started during IBA and more generally organize the period post-IBA until 2020 or 2025. It will do so by (1) continuing ongoing	The IP is directed towards the next development period after the IBA as exhibition. The making of the IP resulted in a better stakeholder involvement, a better understanding of what is possible and the inspiration of people

City	Function of the IP within the city development – ex ante (source D4.1)	Experiences – ex post
	IBA projects, (2) realization of already planned projects (3) transfer existing IBA structures, concepts and networks into a "post IBA period", (4) develop new projects and (5) attend the general German and Hamburg development.	by making a vision and setting clear targets. It helped to have a special local development agency with a clear target connected to the already started development of the area.
Lyon	The IP functions as the strategy to organize for the transition of Part Dieu "from of a simple urban project to a project aiming at an energy transition".	The IP functions as the strategy to organize for the transition of Part Dieu "from of a simple urban project to a project aiming at an energy transition". It helped to define common objectives, to let stakeholders work together, share wishes and speak about the content, to check if and how objectives can be realized and it helped in the sharing of data by the grid operators.
Vienna – aspern Seestadt	The function of the IP will be to sharpen, deepen and enhance existing energy strategies for the next development phase of the area.	The IP process resulted in the connection of social, economic and energy issues. It brought stakeholders together on the same table to exchange their perspectives. The ideas for implementing the existing masterplan went a step forward. Guiding principles were formulated.
Vienna – Liesing Groß Erlaa	The IP will help to structure the dialog between most important stakeholders and to develop a comprehensive strategy for the area.	Because of the lacking of a masterplan and of a special development organisation, because of the fragmentation in ownership and because of the lack of political ownership, it proved hard to develop a comprehensive strategy for the area.

5.2 Cities' reflections on the experience of making IPs

From the first reflection of the cities (in a step of self-analysis) there are some experiences to be highlighted due to their special importance also for other SULs.

The Amsterdam case of building intensively on **motivation and empowerment of stakeholders** to engage in the urban development process shows that

- using data and information may considerably support the willingness of actors to engage;
- lacking knowledge of stakeholders on available technologies and how they can act in the field of smart urban development is a major barrier to implementation;

Since smart urban development and the transition towards a smart district is not a part of the daily work of major local stakeholders (like companies, building developers and administrators, offices, etc.) support for implementation is needed. It takes a lot of persuading, personal resources and time to innovate and knowledge how to come from an idea to an investment decision.

Setting up a dedicated **development agency** to hand over the responsibility for the development of a whole area is a promising wax to meet challenges associated with smart city development. Such a solution was identified and is thus in place in most cities (with different specifications) in order to support local stakeholders and their collaboration, passing over information and contacts and bringing forward new ideas. The positive and stimulating impact was experienced from IBA in Hamburg with the conclusion, that it is necessary to have someone in charge as a contact point coordinating different projects and stakeholders in an area. Also in Vienna, the fact that the development agency Wien 3420 has the mandate as well as sufficient influence and human resources facilitates a comprehensive planning approach, focussing not only on economic but also on ecological and social aspects in planning, preparation and contracting. In Copenhagen, Byhavn is in place to develop the area holistically. Actually, Genoa considers to assign a development agency as an operative agent. The "Agenzia Smart Sviluppo Voltri (ASSVO)" shall be equipped with manpower and resources to facilitate and steer the process and it shall act as the main player to bargain the framework agreement between the city, the port authority and the national railways (including the achievment of a "one concession" idea). This agency will be guided and supported by local political representatives and citizens of Voltri.

Meanwhile, the new concept of an **early dialogue with stakeholders** about sustainable development has accelerated in Copenhagen. Its use in an urban lab has made the process easier and due to its success the approach of an early dialogue will be further elaborated. This is an approach, which bases on the fact, that the development agency Byhavn owns the land and thus has the opportunity to put requirements on property developers. With similar background, IBA Hamburg agreed "Quality Assurance Contracts" for developers, investing in land previously owned by the municipality and finally also the development agency in Vienna in such a situation put requirements on developers as guidance for investors.

For Copenhagen, additionally the **collaboration of the city departments with industry and research institutions** is a key of the development strategy, allowing for new ideas and innovative implementation. In addition, the importance of **lighthouse projects** is being highlighted from the TRANSFORM-cities. Examples for such projects can be found in all cities, as e.g. Hamburg realized the energy bunker and the energy hill, in Vienna the IQ building stands for a passive house office building and with Aspern Smart City Research (ASCR) the combination of industrial and municipal actors provides resources for innovative and challenging research tasks together with access to relevant stakeholders, finally the Ajax stadium ArenA in Amsterdam as a major stakeholder in the area aims high in terms of energy targets. These innovative pilot projects shall give a clear signal to public and private partners and to the residents in the area as well as in the city. Furthermore, collaboration of city, industry and research secures a more likely later implementation of successful research results.

In developing smart urban districts, special attention is needed on aspects of **demographic structures and social cohesion**. This is true for both, existing and new quarters. Whereas gentrification by smart urban development is the major topic for existing areas, new urban development projects struggle to offer housing and living places for all residents:

- During the IBA, Hamburg evaluated the social structure of its SUL. Measures were set carefully, trying not to change the character of the district too much. Nevertheless, the local civil society is dealing also critically with this new development.

- Age structures may also interfere with transformation strategies, as e.g. in the case of renovation and retrofitting. Property owners which are advanced in years are reluctant in terms of spending larger amounts of money for measures, which pay off only in a long term perspective (if at all).
- There are major efforts needed in new development areas to provide with a fair social mix. According to its tradition, Vienna has dedicated a large part of the area to subsidized housing projects, offering residential living space to a large part of the population in Vienna. Copenhagen, in contrast, struggles to offer social housing due to the obligation of financing the metro line. Thus housing prices are quite high, making a rather high level income population expectable.
- Neighbourhood management, as started in Vienna, seems a promising approach to support participation and a lively development in the new urban areas. At the same time, this successful instrument is also central for planning institutions for the co-operation between and with smart citizens in the area.

For **business areas**, this situation is different. A shown in Lyon, in such an area the transformation process may also increase the real-estate values of tertiary buildings and thus improve the functional value and increase the positive perception of the district. At the same time, the development may provide with both, higher quality of life for neighbouring urban areas by additional offers for leisure and green space as well as more populated, livelier environments even outside business hours.

A major limitation to most of the implementation plans and according energy atlas projects is the focus on energy use in residential and office/service buildings, renewable energy potential and energy networks, leading to considerably **less consideration of energy use by transport, industry and life style**. This is especially true for objective setting and the assessment of current energy uses. Since the share of these energy users is quite high overall, future efforts should be concentrated also on such issues in order to obtain a holistic impression of the total energy use of an area.

A specific difficulty for defining medium to long term implementation plans is the time line of 10-20 years from initial planning to last constructions. It demands in some cases **decisions now with unknown framework conditions**, technological changes and innovative opportunities relating to energy supply and renewable energy production years later. This is for example the case for the development of the energy concept of aspern Seestadt North in Vienna and for the later phases of the development of Nordhavn in Copenhagen. This challenge has also to be tackled together with another key issue for the transformation of our cities, namely **financing**, especially in times of a difficult economic situation and common budget restrictions. Often it is not clear, if investments will pay off, but even if it is obvious and common understanding that decisions for some investments today will lower future costs, they are often not taken. Main reasons are short term financial calculation and pay-off periods instead of life-cycle cost accounting and the uncertainty of the future development of the energy markets.

5.3 Comparison of IP approaches

The cities have had their own approaches towards the making of the IP. There are some similarities and differences to be mentioned.

Similarities and differences

The labs of Hamburg, Vienna Aspern and Copenhagen are most alike. Before the start there was already an urban plan and a special development agency with ownership in the area and with a goal for sustainable development. In all three cases the market was good. All three SULs have been setting high standards and have been calculating on scenario's. There was also attention for contact with end-users. Challenges were mostly to keep the relationships between the city departments and the agency.

Lyon also had a clear urban plan, and a special development agency. Different is that this is a situation of only transformation, and there was less information available in the beginning. Moreover, integral energy planning was not a special goal for the development agency. The strategy has been to organize the making of the IP from the beginning within the institutional framework and to strengthen the knowledge position.

Genoa had a different approach. Genoa has an urban plan, but the market is down and the demand for development is nog high enough. The strategy has been to connect the attention to the area strongly to the smart city movement on the level of the total city. A lot of attention has been given to the involvement of decision makers, mostly politicians and national companies.

Amsterdam directed its attention mostly on the existing network and the stakeholders within the area. There was no clear plan or organization on urban development. The gathering of data and knowledge was to contribute to this stakeholder process.

To sum up, the different approaches are:

- Quantitative target-oriented approach with clear (political) mandate and a special development agency with a special goal on sustainable development directed at practical implementation (Hamburg, Lyon, Copenhagen: new urban developments)
- Institutional approach with a clear position within the existing organisations, directed at building a knowledge position, changes regulation and authorities (Lyon; transformation)
- Political and city wide approach form within the city, directed at creating urgency for development (Genoa, existing urban plan in a economic bad market)
- stakeholder-management approach on the basis of strengthening existing relations with semipublic stakeholders in the area and on city level with the organising of knowledge and expertise to foster progress (Amsterdam, existing city)

5.4 Intensive Lab Sessions (ILS) as Transform process method

5.4.1 Introduction – description of the methodology

In the final internal meeting on WP 4 the question was raised by Copenhagen: “How can you organise an Intensive Lab Session without a European project like TRANSFORM?” In daily practice it seems impossible to gather local stakeholders, governments, grid operators, companies and national and international experts all together in the SUL area. Even for half a day it would be too much to ask. “Can you imagine them willing to spend three full days workshopping?”

The ILS

The intensive Lab Session is a 3 day workshop with a core of about 30 participants, who join the whole programme. The core of participants consists of a mix of public, private and knowledge partners. All the essential stakeholders in the development of the SUL should be there, like the local government, area development corporation, grid operator, a representation of (potential) users and owners. Knowledge partners can be companies, universities, international experts. A representative of each TRANSFORM partner city also joins. This fosters the learning between the cities. For parts of the programme extra stakeholders are invited, mostly local.

In an active way the participants focus in groups on realistic recommendations for about 3 specific problem statements. These statements were given as task to the group from the relevant city officials.

Goals

The goals of an ILS are:

- Connect area development with sustainable energy planning Bring stakeholders together in an open, friendly and informed setting and use the short time for discussion in a very intensive way
- In depth treatment of current specific problem statements
- Include knowledge from international partners, external perspective
- Making roadmaps

The programme

The three days of the ILS have their own function. Day one is about understanding, day two is working in groups and on day three the groups present their findings.

- Day 1: understanding the context

The participants visit all together the SUL-area. There is an official opening, an introductory presentation and the themes and problem statements are shortly explained. An assignment is given by local politicians on different themes. In subgroups the participant explore their problem statements with the help of local experts and stakeholders.

- Day 2: working in groups

On day two the subgroups work on the problem statements. This activity can range from expert calculations, group discussions, dialogue with stakeholder, drawing or visiting a specific place within the area.

On day two there is also an exchange between the groups. There should be also the possibility to ask further questions to local experts and stakeholders. They are invited for a parts of the programme.

- Day 3: present

The groups finalize their discussions and translate their findings into a presentation. Part of the result is a roadmap on how to go on. For the presentation city officials are invited and everybody else who participated in a part of the programme. There is room for discussion and reaction by the officials.

Organization

A local team working on the SUL organizes the ILS. The team prepares the event and documents the results. During the ILS the team facilitates the groups and the overall programme.

5.4.2 Evaluation of the ILS as a method

Topics of the ILS

The topics of the ILS per city are summarized in the table. The specific topics concentrate in three overall categories:

- Heating and cooling
- Governance and planning
- Behaviour and participation

In two cities there was a topic about technological and smart solutions. In Hamburg this focussed on the building level, while in Genoa this focussed on the grid level and also contained the topic of heating by seawater. Other topics were about Mobility (Genoa) and Energy Scenarios (Vienna).

Table 4: Topics of the ILSes

	Heating and cooling	**Governance and planning**	**Behaviour and participation**	**Technology & smart**	**Other**
Amsterdam	Heating and cooling	Role private sector in retro-fitting	Public action		
Copenhagen	Energy systems and networks	Early dialogue with developers	Sharing Copenhagen		
Genoa		Governance		Smart energy: technologies and smart grids	Mobility: voltri gateway and intermodality
Hamburg	District heating			architecture	

	Heating and cooling	Governance and planning	Behaviour and participation	Technology & smart	Other
Lyon	Heating and cooling network	Integrated energy planning	Operation and maintenance and users behaviour		
Vienna		Framework conditions	Living and participation		Energy scenarios (demand, RES production, energy systems)

Involvement: stakeholder/political

The involvement of stakeholders in the ILS was an enormous success. In every city there was participation of stakeholders within the area, stakeholders on the city level, energy and other companies, experts, and representatives from the TRANSFORM partner cities. In some cities there were also officials of the national government or semi-governmental companies. In the SULs with a brown field development there were relatively more representatives from the area itself.

In all cities city officials were present and at least one politician joined. They gave a problem statement in the beginning and received the final results. The ILS of Genoa was exceptional in the presence of political leaders. The president of the SUL area was present during all the workshop. The relevant city alderman gave a starting presentation, attended the evening programme and the final meeting. And also the mayor of Genoa was involved. He opened the second day and was present at the final presentations.

In two ILS-es an important stakeholder was missing: in Copenhagen this was the development organisation and landowner of the SUL area (CCPD) and in Vienna this was Wien Energie.

Results: usability, follow up and product.

Each ILS resulted in a powerpoint presentation per topic with an oral explanation. In four cities a professional drawer was hired, who summarized what happened in the ILS. This was a reflection on the content, the process and captured the results in storytelling drawings.

The products that were made after, as a result of the ILS, differed per city. In general the most important product was a roadmap, agenda or programme. This roadmap structured the following local process and ensured the continued participation of the ILS-participants in the period after the ILS. In the case of Amsterdam a booklet was made. It contains a general introduction to the SUL area, the assignments for the ILS, the findings of the ILS, a concept programme with projects to test in the following period, and an evaluation of the ILS event. Drawings, pictures and presentations made during the ILS were integrated in the booklet.

5.4.3 Conclusions and Recommendations

The cities of TRANSFORM are very enthusiastic about the method of the ILS. They would even like to do it again themselves. In the ILS an atmosphere of open dialogue was created between organisations that sometimes forgot that they were striving for the same goals. In an active and joyful way the participants focussed on realistic recommendations for 3 -4 specific problem statements.

The ILS has in potential the following merits:

- ★ Working together instead of back to back
- ★ Content driven
- ★ Open dialogue
- ★ Result oriented
- ★ Creates partnership
- ★ Clear base for further process
- ★ Specific, actual and main problems
- ★ International setting brings surprising discussions, insights and results
- ★ Include social programme & visit the area
- ★ Agenda setting => integral energy planning & urban development
- ★ creating urgency
- ★ Visibility
- ★ Invites others

Points for methodological improvement

There is always room for improvement. With the experience of TRANSFORM we suggest to pay extra attention to:

- ★ Presence of important actors
  One of the main goals of the ILS is to connect area development with sustainable energy planning. Therefore it is in all cases essential that the area development corporation and the institution with authority on energy investments are both present.
- ★ Media attention
  During the ILS-es there was not much media attention. The attention of the media can bring more urgency to the table.
- ★ Take care when combining an ILS with a bigger event
  In Hamburg the ILS was combined with the closure conference of the IBA. This brings in opportunities, like political presence, efficiency in organizing and more exposure. The downside is that the risk exists that the ILS does not get the focus and attention it deserves. Therefore a careful planning and relation between the ILS and the conference is important.
- ★ Main and actual problems
  Because of the international setting, the dialogue will be very open. Everything can be discussed and compared with less burden of local history and stakeholder positions. Therefore it is absolutely valuable to put the main problems on the table. It is a chance to discuss the content in an informative and inspirational way and find new common perspectives.

6. Comparative analysis of the content of Implementation Plans

Smart urban Labs in comparison

The presented smart urban labs considerably vary in their expansion and today's as well as projected population and jobs (due to existing built up quarters or new development areas). When comparing the cities' visions, strategies and measures which are stated in the implementation plans, these conditions are an important background for assessing the specific situations and drawing conclusions.

Table 5: A rough characterization of the cities' SULS

	Area	Population today (2013/14)	Projected population	Jobs today (2013/14)	Projected jobs	Year of projection
Amsterdam, Energiek Zuidoost	300 ha	18,000	20,000	18,000	18,500	2025
Copenhagen, Nordhavn	250 ha/ 350 ha*	0	40,000	5,100	40,000	2040
Genoa, Mela Verde	280ha	12,758	12,800	n/a	n/a	n/a
Hamburg, Wilhelmsburg	3,500 ha	55,000	69,160	n/a	n/a	2050
Lyon, Part-Dieu	135 ha	5,000	7,100 **	45,000	80,000	2030
Vienna, aspern Seestadt	223 ha	0	26,000	1,200	23,000	2030

Notes: * Enlargement of the area by landfill, ** 1,500 new apartments (equal to 5,000 persons in 3,000 existing apartments)

The implementation plans have been written according to a shared format. Nevertheless, because the SULs are different, the structure of the documents has been tailored to the individual SULs.

Main contents, however, are included in all IPs: Background information on the area, vision and goals for the area development, information on the energy system planned, specific projects and an outlook on implementation.

6.1 Political commitment

In general, there is a great variation of SUL cases and specific situation to be stated in terms of their respective transformation processes and the associated challenges against the background of different legal and financial regulations.

Overall, commitment of municipal politicians to a "smart" development of the analysed urban quarters as pilot or lighthouse projects for the cities is widely given. But official political support is also depending on a number of contextual issues. Nevertheless, there is no major refusal of objectives and measures which have been defined in the IPs to be expected in any of the cities.

The implementation plans, written in the course of the TRANSFORM project, are a product within an ongoing urban development process and show varying importance as planning documents itself.

For the present, politicians in three cities already have given officially political commitment to the implementation plans (Amsterdam, Copenhagen and Lyon), in two cities commitment is expected (Genoa, Vienna). After the IBA-process in Hamburg with high political commitment, the further line of action for the development area is not agreed yet (besides intervention in some parts of the area). Thus commitment to the IP (before the end of the TRANSFORM-project) is not yet finally decided.

6.2 Basis of decisions – information from available data and open knowledge

Knowledge on development plans and energy flows as well as renewable potential in the city on spatially disaggregated level are an important basis for developing new, innovative solutions. Information on specific parts of the city (quarters, streets, building blocks) is also essential for stimulating interest in order to achieve stakeholder involvement and for enforcing public participation.

Main findings on available data and open knowledge in the TRANSFORM cities are:

- all cities provide with plans and concepts for urban development, which are usually officially published (printed documents, pdf-formats);
- mobility and transport planning is partly published, but plans and data are at least available for municipal departments;
- three cities provide with an energy atlas for the entire city including data on buildings and energy – Amsterdam, Hamburg and Lyon; public access is only given in Amsterdam, in both other cities mainly municipal departments have access to the data;

The cases of Amsterdam, Hamburg and Lyon show best, that **availability of energy data** (at least for municipal urban and energy planning departments) is one of the keys for steering innovation and developing integrated solutions. Data provided new insights and defined the specific challenges for the analysed areas.

In the cases of Amsterdam and Hamburg, the combination of data on energy and buildings with socio-economic data about residents helps to get a better idea for the implementation of reasonable measures.

Together with its Smart City partner Liander, only Amsterdam managed to provide open access to a broad variety of energy data via an online platform so far1. It contains data on actual energy demand, possibilities for energy demand reduction and production of renewable energy at the level of blocks (at least five users). Giving access to the data helps in defining goals of the implementation and enables all kinds of parties to get active in the area, amongst others consultancy, foreign experts, business partners and students.

Projections on future energy demand have been assessed mainly during the TRANSFORM project or previously (Hamburg) in all cities except Genoa (for the reason of its early planning status).

Challenges referring to the availability of detailed actual energy data

The reason for the rather scarce availability of energy data actually for municipal departments (and even more for other stakeholders and citizens) is based on several difficulties:

- Even though the municipal energy utilities often are willing to contribute, the need for considering trade secrets and maintaining competitive advantages as well as uncertainties concerning privacy protection remain.
- In Lyon for instance, only the TRANSFORM project made it possible to obtain actual consumption data and compare it to estimated consumption data for the buildings of the SUL. Usually, this is no possible, because (1) there is no global agreement with network managers at national level for the provision of data at building level to local authorities and because (2) the enormous necessary efforts for data collection and processing to be done by network managers to obtain actual consumption data
- In terms of the efforts to obtain actual consumption data, the situation seems quite similar to Vienna, where the municipal utility company struggles to recall spatially allocated information. Mainly this is due to the fact, that the utilities' data bases are configured for selling energy rather than for gathering spatially disaggregated information (rather client based than localized geographically).
- Genoa even more struggles, to get data on energy consumption (due to privacy issues at all) in order to elaborate an energy atlas as a mapping tool and as a basis of further working steps.

[1] http://maps.amsterdam.nl/energie_gaselektra/?LANG=nl

Table 6: Available spatially disaggregated data for integrated urban and energy planning by unicipal actors

	Amster-dam	Copen-hagen	Genoa	Hamburg	Lyon	Vienna
Urban development, masterplan, land use plans, population and jobs, urban densities, gross floor space	plans, concepts	plans, concepts	plans, concepts	plans, concepts	plans, concepts	plans, concepts
Mobility and transport planning and projections	plans, concepts	plans, concepts	plans, concepts	plans, concepts	plans, concepts	plans, concepts
Building typology, building standards and renovation options	energy atlas	studies, experts	studies, experts	energy atlas HAM	urban atlas	studies, experts
Location of existing energy infrastructure, pipelines, networks	energy atlas	plans	plans	plans	plans	plans
Capacities of existing energy infrastructure (pipelines, networks)	utility	utility	utility	utility	utility	utility
Actual electricity consumption	energy atlas	utility	n/a	energy atlas HAM	urban atlas	TSO
Actual heat (cold) consumption	energy atlas	utility	n/a	energy atlas HAM	urban atlas	utility
Projected energy demand for electricity and heat (cold)	TRANS-FORM	TRANS-FORM	Municipal dep.	energy atlas IBA	TRANS-FORM	TRANS-FORM
Solar use	energy atlas	TSO	n/a	energy atlas IBA	urban atlas	TSO
Solar potential	energy atlas	Online open data	n/a	energy atlas IBA	TRANS-FORM	online atlas*, TRANSF
Use of waste heat	energy atlas	utility	n/a	energy atlas IBA	urban atlas	utility
Waste heat potential	energy atlas	utility/City	n/a	energy atlas IBA	n/a	n/a
Use of other renewable sources (geothermal, wind, sea, ...)	energy atlas **	green accounts	n/a	energy atlas IBA	urban atlas	n/a
Other renewable potential (geothermal, wind, sea, ...)	energy atlas **	studies, experts	n/a	energy atlas IBA	n/a	studies, experts

Notes: TSO ... transmission system operator, DH/DC... district heating/cooling,
* ... online atlas on potential for existing buildings
** ... use of groundwater, geothermal energy and wind

open data, public domain, publication	partly open data, available for municipal departments	restricted data, available for selected municipal departments	not available or only available under certain circumstances (selective)

6.3 Legal frameworks

Funding schemes are in place in all TRANSFORM cities, mostly supporting EU 202020 targets and requirements (e.g. implementation of EPBD directive) and usually these are regulations at national level. Funding or tax deductions mainly refer to the energy performance of buildings and the production of renewable energy (funding or feed-in tariffs).

Some examples for such initiatives are:

- Amsterdam provides with city-wide funding schemes: Amsterdam investment funds, subsidy for retrofitting social housing, Energy-loan
- Copenhagen makes use of the national financing institution Kommunekredit ("the municipal credit system"). The actual loan conditions of Kommunekredit are 3% for a 25 years loan (covering 100% of the investment) due to a municipal guarantee.
- In Genoa national incentive schemes and tax deductions for energy performance of buildings and investments in renewable energy production are offered (e.g. for small biomass boilers and energy saving measures from private households, energy efficiency measures from public entities, feed-in tariff for renewable energy, etc.)
- Hamburg respectively Germany has installed feed-in tariffs with priority for renewable energy sources (EEG) and requirements on the energy performance of buildings (EnEV).
- In Lyon, interest free eco-loans are available providing financing for energy saving initiatives together with incentive-based financial instruments for thermal renovation as the sustainable development tax credit or the sustainable development passbook account.
- Also Vienna offers subsidies for retrofitting and installations for the use of renewable energy. Additionally, there are national feed-in tariffs for renewable energy production in place (complementary).

Table 7: Specifics of legal frameworks with high relevance for Smart City development in TRANSFORM cities' SULs

	Energy network aspects	Specific regulations for RES-production	Specific aspects relating to housing	Other aspects
Amsterdam, Energiek Zuidoost	City heating is obligatory for new buildings	Possible: energy production by small users on property of others*	Restrictions to the height of rent for social housing	Big energy users: Obligation for environmental investments which pay off in less than 5 years
Copenhagen, Nordhavn	National Heat Supply Act: district heating in Denmark must be operated on a non-profit basis			
Genoa, Mela Verde	Large transformation areas: obligatory proof of the possibility for CHP plants by developers	Large transformation areas: projects must be eco-efficient and provide renewable energy production		
Hamburg, Wilhelmsburg	Climate protection law, possibility for mandatory DH-connection; tender offer for concession for installation and supply of a local DH-grid		Concept tender offers for housing developers buying municipal land (not social housing); rental law: Price of heating costs may not be risen due to the change of a heating system (investment costs not considered)	
Lyon, Part-Dieu	MAPAM law reorganized the legal system in metropolises: Lyon metropolis is assigned to provide DH (and cooling) networks and to give concession to electricity and gas distribution		Eco-renovation grant for social landlords (experiment); special subsidy for eco-renovation of owner-occupied dwellings	
Vienna, aspern Seestadt	Regulated heat price for the municipal district heating network.	Building codes in Vienna require a minimum share of local RES production for new buildings		Obligatory environmental impact assessment for urban development areas requiring an energy concept; reduction of compulsory parking space in residential buildings

Notes: * ... new national tax regulation will hinder such initiatives

6.4 Visions and quantitative targets

Visions

The comparison of quotations about the vision of the SULs (following list of most important aspects) shows the overall objectives of the analysed quarters:

- Amsterdam, Energiek Zuidoost: The SUL is an area for experimentation, learning and becoming more sustainable. A public-private partnership forms the basis of transformation. Stakeholders support the transition towards new economic concepts like the circular and smart economy. They are aware that collaboration is the way to success and govern (and pay for) the local development.
- Copenhagen, Nordhavn: Creating a new sustainable and vibrant city district for everyone which will be a state of the art district and a testing ground for new solutions.
- Genoa, Mela Verde: Green Apple aims at planning a sustainable Mediterranean district in Voltri, adopting solutions by use of innovative technologies while respecting lifestyle, environment, local identity and promoting economic development.
- Hamburg, Wilhelmsburg: The "Leep across the Elbe" process2 (title of the IBA) shall support the urban growth of Hamburg in its centre. Under the third key theme, the overall aim of IBA was to provide exemplary urban responses to the challenges of climate change and to set new standards for the "Metropolis of the future".
- Lyon, Part-Dieu: Development of a more lively and dynamic district, gathering a bigger diversity of functions and practices including culture and leisure activities by doubling the net floor area without increasing the overall energy consumption (PE).
- Vienna, aspern Seestadt: Development of an ecological, resource-friendly and climate neutral city. Urbanity and high quality of life shall form a new, multifunctional city quarter, which is to offer attractive housing options, jobs, a modern range of shopping and service facilities as well as an innovative science and education campus of supra-regional importance.

Quantitative targets

- Amsterdam, Energiek Zuidoost
  - As a target for electricity and gas consumption -20% until 2025 is defined
  - CO_2 emissions shall decrease by -40% until 2025
  - Additionally: individual targets of participating stakeholders
- Copenhagen, Nordhavn
  - No specific quantitative targets for the SUL. "*In the SUL there are no specific goals for renewable energy or energy efficiency. To avoid "island thinking" and the risk of sub-optimizing vis*-à-vis the energy system, the SUL is subject to the overall goals as defined in the city-wide Copenhagen 2025 Climate Plan, CPH 2025." (IP Copenhagen)

[2] An impulse for this process was the white paper on the future vision for Wilhelmsburg (2002) written by residents from the area in the course of a conference. In this paper, residents demanded to improve schools and public transport, to build new high quality and family friendly new residential areas within the area of Wilhelmsburg.

- Nevertheless, the heat demand of the SUL in 2065 (after full implementation) is expected to be covered by 100% renewable energy with a large share of energy generated outside the area3.
- Mobility: “5-minutes-city”, car traffic shall make no more than one third of all traffic in the area

- Genoa, Mela Verde
  - None (for the time being)
- Hamburg, Wilhelmsburg
  - IBA projects (in total) shall not add to the total CO_2-emissions of the island (compensation by renewable energy projects);
  - 100% renewable and local electricity for buildings until 2025;
  - Long term: Almost 100% renewable energy provision for the Elbe island (electricity and heat) until 2050.
  - Use of scenarios for analysing the feasibility of the targets.
- Lyon, Part-Dieu
  - Maintain overall energy consumption (for primary energy), despite the planned increase in area in the order of a doubling of the floor space.
  - Different scenarios of future energy consumption (not defined as targets), including analyses of different energy uses, energy efficiency measures, mix of imported energy – resulting in scenarios of RES share, CO_2 equivalent and nuclear waste.
- Vienna, aspern Seestadt
  - Different scenarios of future energy consumption with a potential for reduction of energy demand by -41% in the Smart City scenario and a reduction of CO_2 emissions by -46%.
  - Modal split targets: 40% public transport, 20% walking and cycling, 20% car traffic

6.5 Energy system strategy, implementation of actions and projects in the IPs

Focus of strategic approaches

The overall strategic approach of the TRANSFORM cities for transforming energy use, production and systems of the selected SULs differs considerably.

Roughly, there is the strategy in Amsterdam Energiek Zuidoost, which works as an innovation motor. The city supports projects coming through the stakeholder process, accompanying reflections to the city strategy are made.

[3] The first part of Nordhavn (Århusgadekvarteret) will be connected to the municipal district heating network and thus most of the heat will be produced from biomass combined heat and power plants, waste incineration plants, and possibly heat pumps outside of the area.

In Copenhagen (Nordhavn), Hamburg (Wilhelmsburg), Lyon (Part-Dieu) and Vienna (aspern Seestadt) an energy development process takes place in existing transformation areas or new quarters, which is integrated in an overall urban development process. These processes are accompanied by a number of research oriented projects.

Due to the early state of implementation in Genoa, the city is supporting promotion of projects and gathering a sufficient consensus für the realization of Mela Verde. Up to now, the elaboration of energy related measures has been limited.

In more detail, the following main thematic strategies for transformation have been set in place in the TRANSFORM cities:

- Amsterdam, Energiek Zuidoost
  - The development strategy is based on facilitating and positive stimulation – institutionalizing a learning process: creating a knowledge base, informing, bringing possible partners together, connecting, organizing, helping to formulate projects and testing them, possibly supporting by funding;
  - This approach has been already successive – some important local stakeholders have joined forces in a new organization (Southeast/ZO Circular), other partners are invited to join the initiative and take part in projects.
  - Agreed themes in general: energy, mobility, waste (projects are run by organizations in the area)
- Copenhagen, Nordhavn
  - Smart buildings providing with highest building standards and demand side management options.
  - Early dialogue with developers and involvement of citizens with the aim of a more open dialogue between the city and developers as well as between developers. This shall have positive effects on energy supply and use of open space (between buildings). The city facilitates a process in which it gets in contact with developers and – at the same time – developers inspire each other.
  - Energy: Heat supply partly covered by district heating (first phase), supply for later phases is not decided yet, management of electricity demand by demand side management (households) and load management between sectors (supported by PV-use on roofs in the SUL). The overall aim is to develop innovative solutions for the future key challenges (flexibility).
  - Carbon low transport giving priority to pedestrians, bicycles and collective transport. The “5-minutes-city” shall provide with a well organised transport infrastructure (including subway) with car parking facilities primarily located inside buildings in order to keep public and private urban space free of cars.
- Genoa, Mela Verde
  - Governance activities: Cat Med project and urban empathy, AGSC – Genoa Smart City Association and other ways to promote process
  - Smart Energy projects: Smart grid, seawater heat pumps
  - Mobility projects: Railway metro gate, intermodal public transport

- Hamburg, Wilhelmsburg
  - Renovation of the building stock and ambitious new building standards including exemplary innovative buildings
  - Open district heating networks: Installation of decentralized heating grids based on renewable heat and combined with a heat storage (e.g. energy bunker, integrated energy network Wilhelmsburg)
  - Prioritized use/production of local renewable energy for heat and power, including innovative projects (e.g. power to heat, power to gas)
  - Accompanying process for participation and involvement of local stakeholders and residents
- Lyon, Part-Dieu
  - High energy efficiency of new buildings and buildings to be renovated (work with stakeholders, real-estate investors and building owners/occupiers/managers)
  - Decrease specific electricity consumption (non building related electricity, due to high share of offices)
  - Rolling out energy networks in the district (decision on future energy carriers, considering the energy mix in the overall energy system)
  - Design of energy networks: dimensioning of networks (capacities) and grid management (smart grids) in order to optimise scheduling of investments, planning infrastructures, increase RES and local energy integration
  - Operation of energy networks (demand side management, smoothing out peak demand)
- Vienna, aspern Seestadt
  - High building standards (efficiency and quality of the buildings)
  - Sustainable transport infrastructure provision (public transport/subway, cycling, walking) with subordinated private car traffic
  - Neighbourhood management and public participation
  - Priority for the use of local energy potential (solar, geothermal, waste heat)
  - Low temperature heat networks in order to allow high flexibility of the system for different (partly still unknown) local energy sources.

Table 8: Main strategies of the cities' SULs (according to IPs)

existing areas *new areas*

	Amsterdam, Energiek Zuidoost	**Genoa, Mela Verde**	**Hamburg, Wilhelms-burg**	**Lyon, Part-Dieu**	**Copenhagen, Nord-havn**	**Vienna, aspern Seestadt**
Stakeholder involvement	Stimulation for action	Governance (main stakeholders)	Stakeholder participa-tion	Club Part Dieu	Early dialogue	
Buildings			building standards	building standards	smart buildings	building standards
Renewable energy pro-duction	**big scale solar pro-jects (7000-15,000 m^2)**	seawater heatpumps	priority for local re-newable energy (heat and power)		PV-use	priority for local re-newable energy (heat and power)
Electricity (demand, smart grids)	demand supply man-agement, storage and e-car charging	smart meter, smart grids		electricity consump-tion, design and management of grids	demand manage-ment	
District heating	use of local waste heat		open DH networks	design and man-agement	DH in the first phase	flexible DH networks
Transport infrastructure and mobility	charging infrastruc-ture: electricity and green gas	light rail, bicycle infrastructure			mobility, transp. infra.	mobility, transp. infra.
Public participation	key element of devel-opment approach		accomp. participation			participation, neighbourhood man-agement

Project implementation in the course of IPs

As main strategies also the implemented and planned measures and projects are differing in terms of topic and size. The IPs of the TRANSFORM cities contain a more detailed description of various concrete measures and projects (following table) within the topics of

- energy systems and networks
- buildings, industry and services – energy demand and energy efficiency
- local renewable energy sources
- mobility
- use of ict and smart grids
- other issues, e.g. life quality, water, waste, etc

According to the phase of implementation in the SUL-process, these measures range from studies and visions to business model developments, from vague first steps of implementation to pilot projects and demonstration projects and even broader implementation.

Table 9: Concrete implementation measures and projects in the cities' SULs (according to IPs)

	Amsterdam, Energiek Zuidoost	**Copenhagen, Nordhavn**	**Genoa, Mela Verde**	**Hamburg, Wilhelmsburg**	**Lyon, Part-Dieu**	**Vienna, aspern Seestadt**
Energy systems and networks	Energy plan medical business park	Heating infrastructure Electricity infrastructure – sectorally integrated		District heating grids – extensions and new grids: "energy bunker", "Wilhelmsburg central", "Kirchdorf Süd, Veddel and Harburg"	Scenarios on primary energy consumption and renewable energy coverage	Smart grid demo
Buildings, industry and services – energy demand and energy efficiency	SMART living Gaasperdam – retrofit and saving BREEAM for offices monitor Retrofit market research	Intelligent services for buildings Energy labelling of buildings Early dialogue with developers about DGNB	Public lightning	Future vision for Georgswerder and Wilhelmsburg central Efficiency of new buildings and sustainable construction Reduction of electricity demand in private households	Global energy approach on the basis of data provision on energy demand	Minimum thermal standards beyond building code
Local renewable energy sources	Waste heat (hospital) ArenA solar testbed ArenA, solar parking business case	Heat pumps (sea water)	Sea-water coupled heat pumps system	Deep geothermal district heating grid Wind turbines in the Harbour area Storage of renewable power by "Power-to-heat" and "Power-to-gas"	Reflection on energy mix changes of the urban heating and cooling networks	Use of groundwater potential – cold water network Obligatory solar use

Table 9: Concrete implementation measures and projects in the cities' SULs (according to IPs) [continued]

	Amsterdam, Energiek Zuidoost	Copenhagen, Nordhavn	Genoa, Mela Verde	Hamburg, Wilhelmsburg	Lyon, Part-Dieu	Vienna, aspern Seestadt
Mobility	Mobility portal south east, product development Smart charging hubs Orange gas station		Metropolitanization of the railway system Intermodal hub Electric mobility	Strengthening of cycling, bike sharing scheme "StadtRAD" Extension of public transport Integration of e-mobility in urban development E-mobility infrastructure Car sharing services Intermodal mobility points "Switchh"	Electric vehicles deployment	Mobility fund aspern seestadt
Use of ict and smart grids	AMC ArenA, electricity demand supply management	Smart network technologies Smart buildings	Smart grid – active demand and smart info	Demand side management research project "Smart power Hamburg" Hybrid grids project INFRA PLAN	Optimisation of demand and management of electricity demand peaks Various studies on demand and flexibility potential	Smart building and smart ICT demo Pilot project smart citizen assistant
Other issues, e.g. life quality, water, waste, knowledge building, legal frameworks etc	Waste to energy Action research and education programme Summerschool 4 kids, adding sustainability	Visibility and stakeholder engagement			Mixed development zones and possession of land Reference document "Sustainable Part-Dieu guide" Club "Part Dieu"	Neighbourhood management as an intermediate institution Management agency for the public retail streets

6.6 Stakeholder involvement during implementation phase

Only in Amsterdam, a clear bottom up process was initiated from municipal actors with the aim to put local stakeholders in the lead for the development.

In contrast to this approach, the other TRANSFORM cities combine a top down approach with bottom up activities, but developments are rather started and governed by municipal departments or institutional actors introduced for management and implementation. Nevertheless, also in these planning processes local stakeholders play an important role for decision making. In the case of Genoa, they are decisive for any development in the area.

	Stakeholder involvement
Amsterdam, Energiek Zuidoost	During the "Captains Dinner" the main stakeholders in the area committed themselves to continue cooperation for a sustainable area. Stakeholders are leading the development by providing personal resources and money for a public private partnership (ZO Circular).
Copenhagen, Nordhavn	Stakeholders: Dialog with developers shall improve the quality of development; Energylab Nordhavn supports energy planning by cooperation of important stakeholders and research institutions in the area. Citizens: Participation as a basis for the international urban design competition for the development of Nordhavn (masterplan).
Genoa, Mela Verde	Stakeholders: Contact to two decisive stakeholders (Port Authority, National Railways) is established, planned: working group of local stakeholders Citizens: Participation is planned
Hamburg, Wilhelmsburg	Stakeholders: Cooperation agreements, Quality Assurance Contracts Citizens: Participation Panel, IBA Forum/Citizen Chat, IBA laboratories
Lyon, Part-Dieu	Stakeholders: Energy and urban planning workshop, Club Part-Dieu
Vienna, aspern Seestadt	Stakeholders: Agreements on building quality standards referring to SEA and requirements of the developer, bilateral cooperation if relevant Citizens: citylabs, Ombudsmann, neighbourhood management

Amsterdam, Energiek Zuidoost

As the SUL Energiek Zuidoost is an existing, built up area, cooperation with the local stakeholders is of highest importance. Users and owners in the area can make the difference. Since the beginning of TRANSFORM the partners in the area started working together and created ideas and researched project proposals. During the **"Captains Dinner"** in fall 2014 the main stakeholders in the area committed themselves to continue effort making together for a sustainable area. Thus in Amsterdam, the stakeholders will be responsible for the final outcome. The Amsterdam Energy and Climate Office started as the accelerator of the process, and also took the initiative. The office is part of the urban planning department, to make sure energy and planning are combined.

The status on the end of 2014 is that the Amsterdam ArenA, NUON (producer of heat and cold and also distributer) and AMC hospital have actively been taking the role of leadership together with the city of Amsterdam and the city district of South East. Thus in Amsterdam the new **public private partnership** (**ZO Circular**), formed by local stakeholders will be in the lead.

Major institutions in the SUL area – even commercial companies – committed themselves to the spirit of TRANSFORM and signed to contribute to these goals in the coming years.

After the setting up of the network the leadership role in the coming period will be less clear. With partners who have a strong position within the area, less urgency might be felt for new and innovative solutions. Therefore it will be the role of the city and the knowledge partners to stay alert and to foster openness, learning and experiments

Copenhagen, Nordhavn

In Nordhavn, Copenhagen is testing how to improve **dialogue with developers** and landowners on sustainable urban development. Voluntary "city development agreements" ("Byudvikling-saftaler") shall help to implement high quality buildings and resource efficient development between the city and the development agency CCPD, certain requirements will be put on developers. The first meeting with developers in Nordhavn will take place in January 2015 with the topic of DGNB-certification.

Citizen Partizipation was started before the international urban design competition for the development of Nordhavn. The City of Copenhagen and the development agency CCPD hosted a workshop for citizens and other stakeholders to discuss ideas for the new part of the city. More than 800 people participated in the 3 workshops, and their ideas were transformed into guiding objectives that formed the building stones in the winning project.

By **EnergyLab Nordhavn**, a new energy research project starting 2015, the partners DTU (lead), HOFOR, DONG, CCPD, ABB, CLEAN and the City of Copenhagen aim at supporting the transformation of the energy system to a reliable, cost-effective and sustainable system based on renewable energy. The overall objective of the project is to develop new methods and tools for design and dimensioning of the future cost-effective multi-carrier energy system (electricity/heat/cooling/transport) based on Nordhavn as an energy lab. It includes development of novel business models, and experiments with smart energy technologies and new intelligent operational solutions.

Genoa, Mela Verde

Major stakeholders relate to the Mayor and Alderpeople; local stakeholders are partly contacted by the Municipio, partly by the Municipality. People's involvement is mainly managed by the Municipio. Genoa Smart City Association will help in the process.

The **two main stakeholders** (RFI and Port Authority) are very powerful and connected to the urban system in a number of issues. Italian ports are independent legal entity answering directly to the national Port Authority. Amongst other things the port has to coordinate and plan its own structural and physical development together with the city in a Port Development Plan. RFI is the national railway infrastructure owner, in charge of developing and maintaining all railway infrastructures. It is a major player owning large share of the Mela Verde area. Thus its commitment to the project will be decisive but a complex negotiation process is expected. With these two main players meetings are already being organized at political level in order to work towards a commitment for the realization of the Green Apple District.

The further process is planned in a way, that a common discussion will be started with all stakeholders after a first analysis of resources, costs and possible funding. At the same time the **citizens' involvement** will be continued.

Once the high level political agreements are made and translated into formal documents, the municipality will organize a dedicated **working group** including offices working in Transform. To this working group following stakeholders will be invited: municipality, National Railway Company RFI owning the station and surrounding areas, necessary for the conversion of the area, Port Authority in charge of all matters concerning port activities and areas near the sea or dedicated to maritime activities, Capitaneria di Porto (which is the national Army Department in charge of controlling legal, safety, security, proprietary issues of land included in the State owned coasts), Local Fishermen's Associations having their boats and buildings in the area, Local Sports Associations, Local Naval Repairing Companies, Commercial activities, Cultural Associations, owners of Villas

Hamburg, Wilhelmsburg

The main task of the IBA was to acquire, coordinate and steer the implementation of private investment or in some cases public funding. The IBA rarely acted as an investor or building sponsor. Each of the projects had to pass through a process of application and approval before being recognised as an IBA project. More commitment to the objectives of the IBA was achieved through the following: **Cooperation agreements** were signed with all key partners, stakeholders, institutions, private and public companies, which formed the basis for the IBA' collaborative work. The approximately 140 different partners agreed to the following articles of the "IBA partnership": To support the aims of the IBA Hamburg, to develop common Public-Private-Partnership models, to support the exhibition- and presentation activities of the IBA Hamburg.

The partners participated in a network, the "Expert Forum", to develop synergy effects and were obliged to work as a multiplier for the future themes and projects of the IBA Hamburg and to support the planning and participation culture as an integrated part of the IBA process in order to assure the quality and innovation of the IBA projects.

"Quality Assurance Contracts" between the IBA and the single investors were the basis for the purchase agreement of the former city owned properties. In these contracts several aspects were fixed:

- Concept, design and quality of the buildings and projects,
- Energy standard "IBA Minimum Standard" of 30% better than the national regulation (EnEV 2009)
- Participation at monitoring concept
- Consideration of social and educational aspects like internship and training positions
- Consideration of local companies by a special registration concept
- Publication and accessibility during the exhibition
- Grants (mainly for especially innovative buildings) and penalties, deadlines.

IBA Hamburg involved local politicians and local residents in the planning process to a great extent. The citizens on the island were involved in different ways, depending on the target group and tailored to the individual projects. For all IBA project consultations were held with representatives of the local residents and those directly affected by the measures. The in-

volvement of residents is in particular of high importance when trying to increase the energy efficiency through e.g. retrofitting. Experience showed that people have to be convinced on an emotional level:

- One way was the **"Participation Panel"** that consisted of 24 residents, who were advising on the projects but had no power of decision. However, its opinion was seen as vital.
- Another way was the **"IBA Forum/Citizen Chat",** which was regularly held in order to get citizens involved in an open dialogue. In spite of special efforts to get representatives involved immigrants were underrepresented in participation events.
- Moreover, so called **"IBA laboratories"** were hosted with different topics to ensure expert preparation and support on the one side and to debate with citizens on the other. For example, the climate protection concept was critically analyzed by international experts.

Additionally, a great focus was on the publicity of the projects. Numerous project publications with different target groups were published and an IBA newspaper ("IBA Blick") with current developments, events etc. was published every four months. Furthermore, it was possible to explore the projects on the Elbe island with guided tours on bike or by bus. Each IBA project was equipped with a column that informed about the project. Several small exhibitions for example on the Energy Hill also informed residents and visitors about the development. Additionally, the permanent exhibition "IBA at work" on the IBA Dock was a major contact point for all visitors, expert groups and residents.

Lyon, Part-Dieu

The involvement of the stakeholders in the Transform project is managed in the context of a working group called the **"energy and urban planning workshop".** All the urban planning stakeholders are present: the urban development agency, the study and programming syndicate of the conurbation of Lyon (SEPAL) responsible for the SCOT, the Urban Planning Department of Greater Lyon and the institutional stakeholders for energy (ERDF the operator of the heating and cooling network, GRDF the operator responsible for the gas distribution network, the City of Lyon, and the local energy agency).

In addition to the institutional stakeholders (departments of Greater Lyon and the City of Lyon and energy stakeholders) and the partners of the Transform project (ERDF, Hespul), the stakeholders of the implementation plan are:

- the developers and builders,
- the owners/managers of property,
- the Part-Dieu shopping centre and more generally all the companies based in the buildings in need of rehabilitation,
- Lyon Part-Dieu station.

This very institutional governance of stakeholders is supplemented by the involvement of the district's economic stakeholders, since the Transform project team worked with an existing group called the **"Club Part-Dieu",** made up of the 60 largest businesses present in the Part-Dieu district.

Vienna, aspern Seestadt

Besides the development agency Wien 3420 and the coordination unit aspern Seestadt (coordinating municipal departments) further important partners are: wohnfonds_wien (subsidized

housing), Wiener Stadtwerke Group (infrastructure service provider of Vienna) as a holding of municipal energy service company, energy infrastructure utility and public transport provider and Aspern Smart City Research ASPR (research institution).

Accompanying these processes a number of participation events called **"citylabs"** have been conducted, in order to involve citizens and experts into development and planning processes. Citylabs covered topics in all main fields of activities, providing valuable input to further development process steps.

Since 2013, aspern Seestadt has an **Ombudsmann** that is a first contact point for residents of neighboring areas and the district concerning all questions related to building activities and other inquires related to the development of the site.

The **neighbourhood management** (Stadtteilmanagement) for aspern Seestadt started with beginning of 2014. It constitutes a contact point and meeting place for residents of aspern Seestadt, but also for residents of peripheral communities. The focus of this enterprise is the development of neighbourhood and community oriented networks as well as the linking of old and new urban spaces.

6.7 Future management and monitoring of the SULs

Future management

Plans and decisions about the future management of the SULS vary considerably.

Only Lyon and Amsterdam have decided upon the future management of their SULs. In Lyon Part-Dieu this has been done by founding a local public company which is formed by local authorities. It is in charge of determining the strategy, conducting studies, coordinating and carrying out the activities. In contrast, in Amsterdam Energiek Zuidoost import stakeholders founded a new organization (Southeast/ZO Circular) in which local partners are in majority, the city is only one of the partners. This organization is taking over ongoing strategic planning, implementation and monitoring.

In the two new development areas of Copenhagen and Vienna development agencies are in place for the realization of the SULs. Both agencies also own the land to be developed and sold off. Up to now, it is assumed that there will be no management in the period after project finalization. After the end of IBA Hamburg (in the end of 2014) the further management of Hamburg Wilhelmsburg is unclear (besides a short prolongation for three years). Due to the early planning phase in Genoa, no decisions have been taken upon the future management of the SUL.

Table 10: Future management of IP implementation in SULs

	Management plans
Amsterdam, Energiek Zuidoost	ZO Circular as new organization in charge of ongoing strategic planning, implementation and monitoring.
Copenhagen, Nordhavn	Byhavn is responsible for realization of the SUL, no specific management after realization.
Genoa, Mela Verde	Not yet decided
Hamburg, Wilhelmsburg	Prolongation of IBA for another three years, no concrete plans for a coordinating actor after this period.
Lyon, Part-Dieu	Part-Dieu mission works as a Local Public Company, to implement delegation procedures of project management (concession-type) or development operations.
Vienna, aspern Seestadt	Wien 3420 is responsible for realization of the SUL, no decision about specific management after realization

Amsterdam, Energiek Zuidoost

The new organization (Southeast/ZO Circular) founded of import stakeholders in the area (AmsterdamArena, NUON, the hospital AMC, city of Amsterdam, the district of Southeast) is in charge of the ongoing strategic planning, implementation and monitoring. A steering group will consist of end-users, the municipality and a knowledge institution.

The partners will invest in the cooperation with human resources and with a financial contribution. These resources will be used for programme management: setting up new initiatives, monitoring current projects, financing and marketing. Overall, the local partners of ZO Circular are in majority, the city is only one of the partners (but not leading the development).

Copenhagen, Nordhavn

There are no explicit decisions taken on future management of the SUL. The area will be managed by municipal departments and services according to the total area of Copenhagen.

Genoa, Mela Verde

Too early to be discussed in the present phase of planning.

Hamburg, Wilhelmsburg

After the timeframe of IBA Hamburg 2006-2013 a follow up of IBA has been decided in order to prolong activities for another three years. This work has to be focussed on selected areas within the SUL (some not finished projects, some new ones).

There are no plans for a coordinating actor for the continuation of the climate protection concept, who is facilitating individual projects and also initiates new ones at the moment. The outstanding trait of this concept is that it involves many different projects, which work together and use the synergies from the different sectors and systems.

Up to now, the activities of working together with builders, housing associations, transport planners, engineers and the local residents were essential for the success of the IBA process

and supported the development from singular interests of actors to a common concept and an integrated planning.

Lyon, Part-Dieu

On the political level, as the Part-Dieu project is considered one of the flagship projects of Lyon, the Mayor and President of Greater Lyon is the political reference contact for this project.

In 2014 the status of the Part-Dieu mission transformed into a Société Publique Locale (Local Public Company) (SPL). This organization will implement delegation procedures of project management (concession-type) or development operations. SPLs are governed by the provisions of the code général des collectivités territoriales (General Code of Local Authorities) (CGCT) and the Commercial Code, and have the following characteristics:

- 100% of shares are held by the public including at least 2 local authorities or groups of local authorities,
- An activity exclusively beneficial to its shareholders, in a single territory,
- The possibility for its shareholders to sign contracts with the SPL without

This tool allows the reconciling of public control, corporate management and flexibility offered in terms of contracting, risk control based on the distribution of share capital and a high scalability of the structure. The Lyon Part-Dieu SPL will thus be commissioned to determine the strategy, conduct studies, coordinate and carry out the activities of the Lyon Part-Dieu's urban and economic projects.

The Part-Dieu SPL will operate exclusively on behalf of its members in the Lyon Part-Dieu area of operation which is located in the territory of local authorities and local authority groups which are members.

Vienna, aspern Seestadt

The development agency, Wien 3420, has the mandate to develop the area at least until realization of the entire SUL (planned for about 2030). There are no further agreements concerning the time after finalization so far.

The neighbourhood management (Stadtteilmanagement) for aspern Seestadt is intended for an important contact point and meeting place for residents of aspern Seestadt and population of neighbouring settlements and started in 2014. The focus of the neighbourhood management is neighbourhood and community-oriented development of the SUL and bridging the connection between the old and new parts of the city. Activities shall facilitate the arrival of the new residents and the development of an attractive and lively district by encouraging to explore and learn about new urban quarter, organizing meeting spaces, exchanges and cooperation and a variety of events that deal with housing, leisure, culture, sustainability, employment and education. The mandate for its work is temporary, but there are reasonable options for continuation.

Monitoring approaches

Similar to the different plans for future management of the SULs and strongly connected to these agreements also the envisaged monitoring activities vary.

Monitoring data will be probably available in Lyon and Amsterdam, where new management organizations will be in charge of SUL management after the first cycle of finalization.

In Hamburg and Vienna, monitoring of SULs mainly relies to research projects, specific activities from public institutions and municipal departments are unclear up to now. Nevertheless, in Hamburg the city-wide energy atlas provides with an opportunity to follow the environmental outcomes of the measures implemented in Wilhelmsburg. In Vienna, monitoring (at least during the implementation phase) was planned and prepared by agreements with building developers, but the realization of these measures is facing barriers at the moment. Additionally, the energy department is assessing the options for an energy atlas currently. Thus in future, an energy atlas will probably be available also for aspern Seestadt. The research undergone by ASCR will be monitored (but not published) in great detail.

Copenhagen focuses monitoring at DGNB certified buildings, there are no activities known beyond that.

Table 11: Monitoring approaches

	Monitoring plans
Amsterdam, Energiek Zuidoost	New organization in charge of ongoing strategic planning, implementation and monitoring. Energy atlas as an important basis.
Copenhagen, Nordhavn	DGNB certified will be monitored at the level of buildings and settlements
Genoa, Mela Verde	Not yet decided
Hamburg, Wilhelmsburg	Monitoring of the SUL until March 2016, done by a research project.
Lyon, Part-Dieu	Detailed monitoring by metropolisis of Lyon, including actual performance of buildings, GIS and global consumption of the district supplied by different energy carriers.
Vienna, aspern Seestadt	Monitoring acitivies prepared, detailed monitoring by ASCR research for selected buildings (limited publication)

Amsterdam, Energiek Zuidoost

The new organization (Southeast Circular) founded of import stakeholders in the area (AmsterdamArena, NUON, the hospital AMC, city of Amsterdam, the district of Southeast) is in charge of the ongoing strategic planning, implementation and monitoring. A steering group will consist of end-users, the municipality and a knowledge institution.

By involving a knowledge institution in the program of Southeast Circular, learning shall be fostered. The aim is learning from own experiences and from initiatives and techniques from other places and communicating these results to others. By regularly evaluating the projects and administrating, it will become clear and explicit what the realized projects are able to contribute to the objectives.

The energy atlas forms an important basis for monitoring within the entire city of Amsterdam.

Copenhagen, Nordhavn

One of the foreseen measures is the certification of buildings by DGNB. Developers undergoing the certification will have to design a process for the documentation process and the monitoring of the building.

Genoa, Mela Verde

Not yet decided.

Hamburg, Wilhelmsburg

Monitoring is being conducted in the context of the research project “EnEff:Stadt” until March 2016. After completion of this research project, further monitoring is not fixed, yet. Nevertheless, the continuation of assessing data for the energy atlas provides with basic data for monitoring the development processes concerning energy issues in the area.

Lyon, Part-Dieu

The Part – Dieu district will be monitored in detail just like the monitoring for the elaboration of the energy audit. Grand Lyon will request a periodically update of consumption data of buildings across the area from the operators of electricity networks, gas and heat and cooling system. From the first full year of occupancy of new buildings, it will be possible to measure the actual performance of buildings constructed within the framework of the Part-Dieu project.

This data will then be translated into a map and integrated into a geographic information system (GIS) to help measuring changes in the global consumption of the district supplied by different energy carriers.

Vienna, aspern Seestadt

Monitoring activities are steered by Wien 3420 mainly in the framework of different research project in the moment. Although the installation of smart meters and monitoring was planned for aspern Seestadt from the beginning (laid down in the requirements for aspern Seestadt South), implementation is actually hindered by legal constraints (privacy matters). Negotiations with building developers and end-users are still ongoing.

In addition, ASCR (the research joint venture of Siemens together with Vienna’s energy utility and Wien 3420) will monitor the energy flows in those buildings which are part of the ASCR-research project for five years in a very detailed way.

Annex

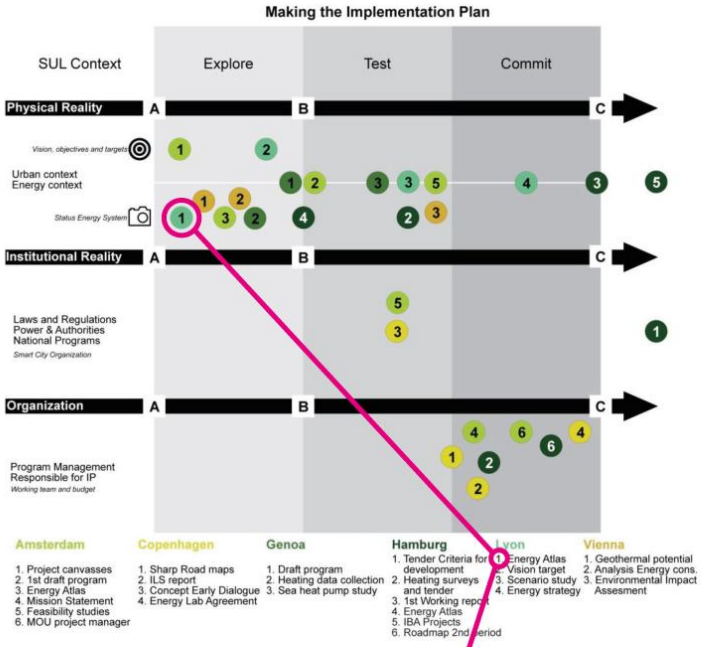
A.1
Toolbox for making an Implementation Plan

In deliverable 4.1 the planned roadmaps towards the Implementation Plans are compared in advance. In this section we are looking back on the real processes in practice: the roads taken. Per city there is a scheme that provides an overview of the themes, a timeline with products and moments and an indication on what domains they have been working for how long, and what is considered as innovative in working towards a plan.

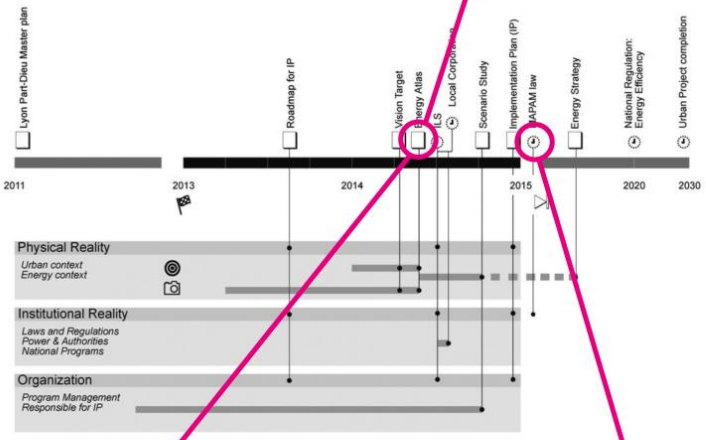
The products and the moments shown in the following charts are explained in separate tables. The products are part of the toolbox and can be found in paragraph 4.2 in the figure “The Toolbox: Overview of the products made within the framework”.

Toolbox for making an IP

Framework
Chapter 4



Timeline per city



Products and moments

Product

ENERGY ATLAS

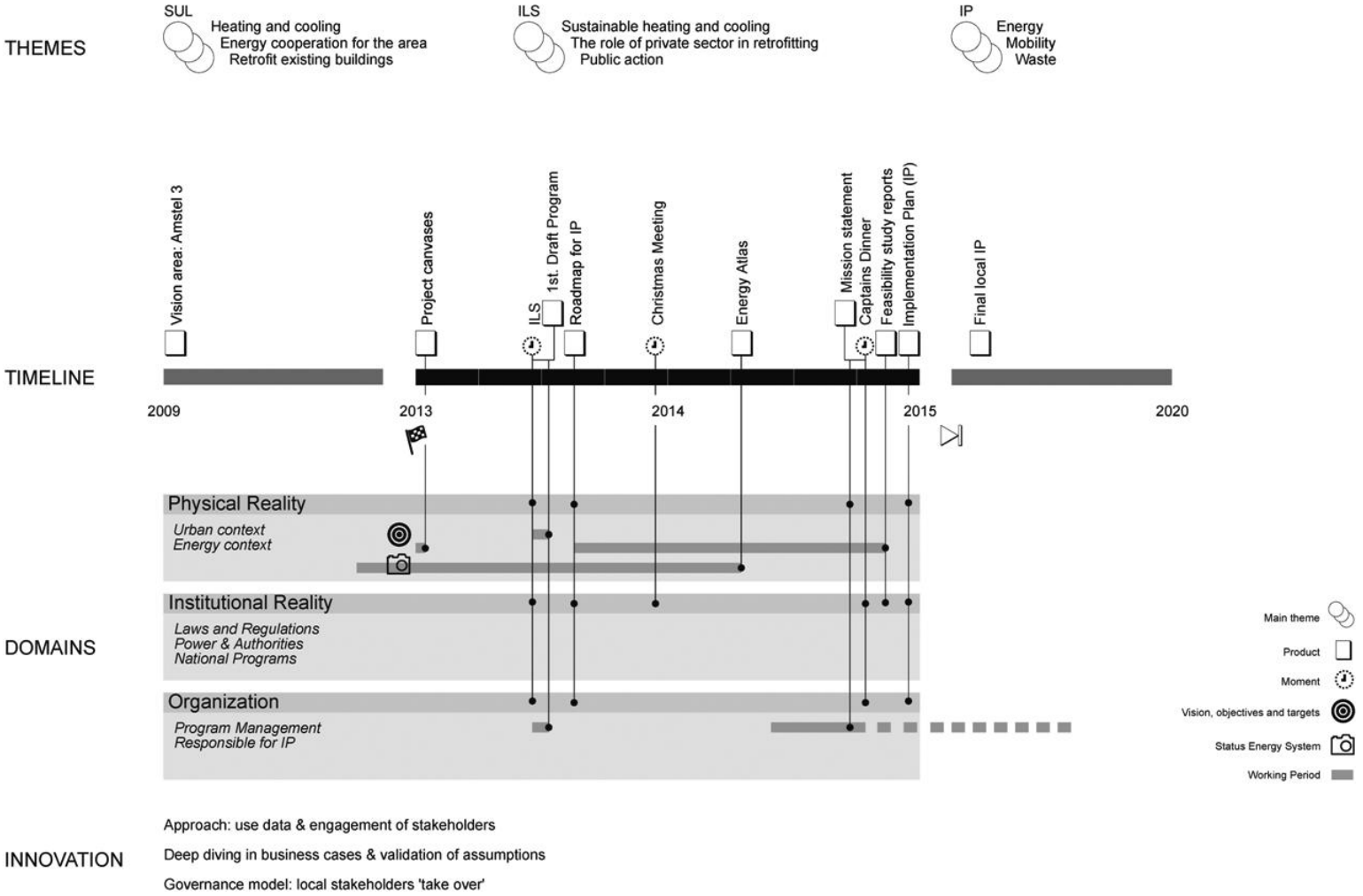
Product/result	Energy Atlas connecting consumption and building data to action plan
Type	IGS database – map
Leader	TRANSFORM Team – Metropole of Lyon
Stakeholders	ERDF/GRDF/Metropole of Lyon
Methods/tools	Signing agreement with data holders, gathering missing information, processing, mapping and transforming data
Necessities	
Data	Spatial and social context of the city, high level energy data, the potential for local energy production in the city or region.
Time	8 months
Budget	
Other	
Commitment	Yes, with data holders and about confidentiality agreements
Important moments	

Moment

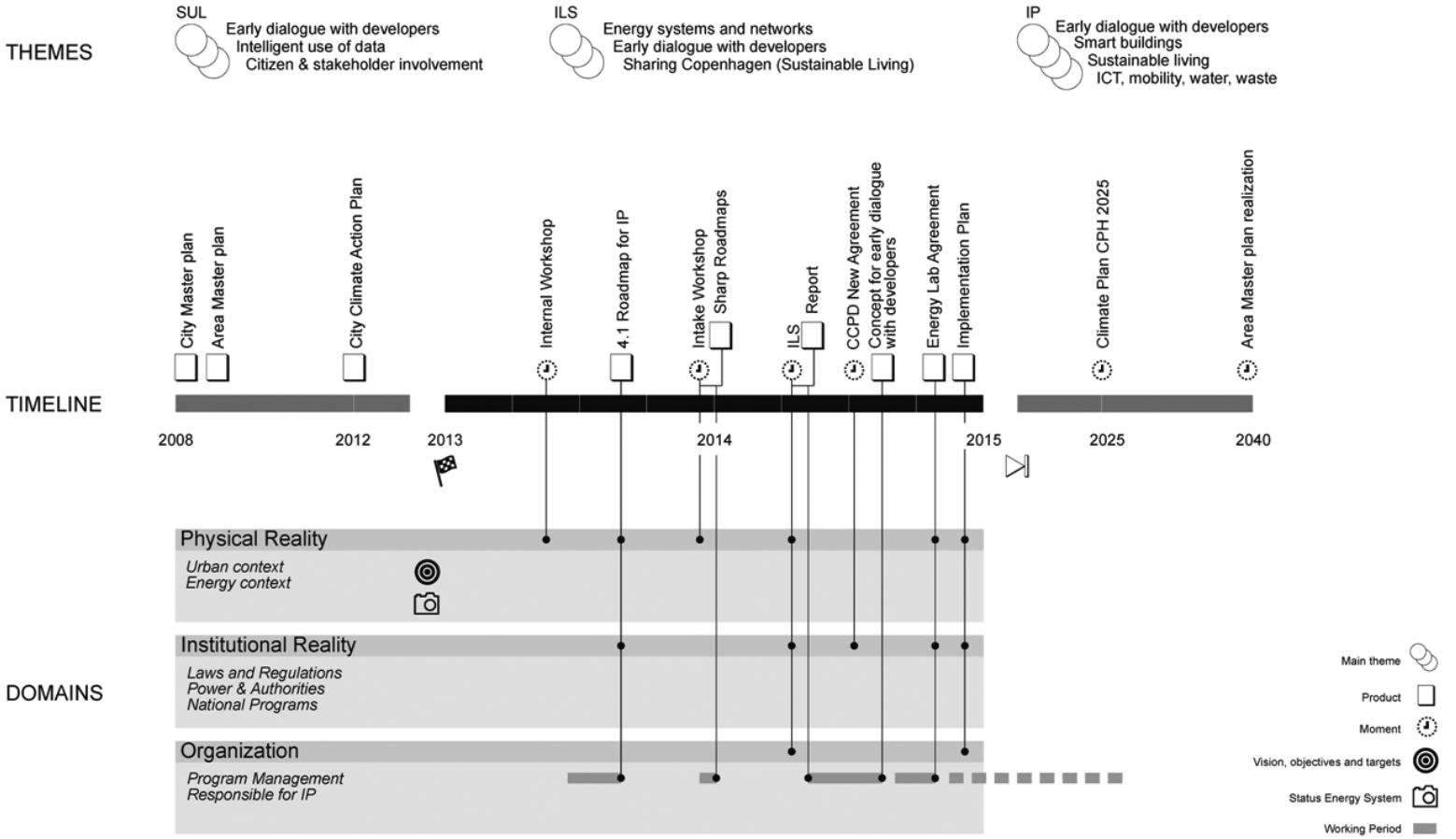
MAPAM LAW

Type	Modernization of territorial public action and affirmation of metropolises law.
Relevance on SUL	Clarifying the competences of local authorities, reorganizing the legal local context – Creation of Métropole de Lyon as a new local community.

Road taken towards IP - Amsterdam Zuidoost



Road taken towards IP - Copenhagen Nordhavn

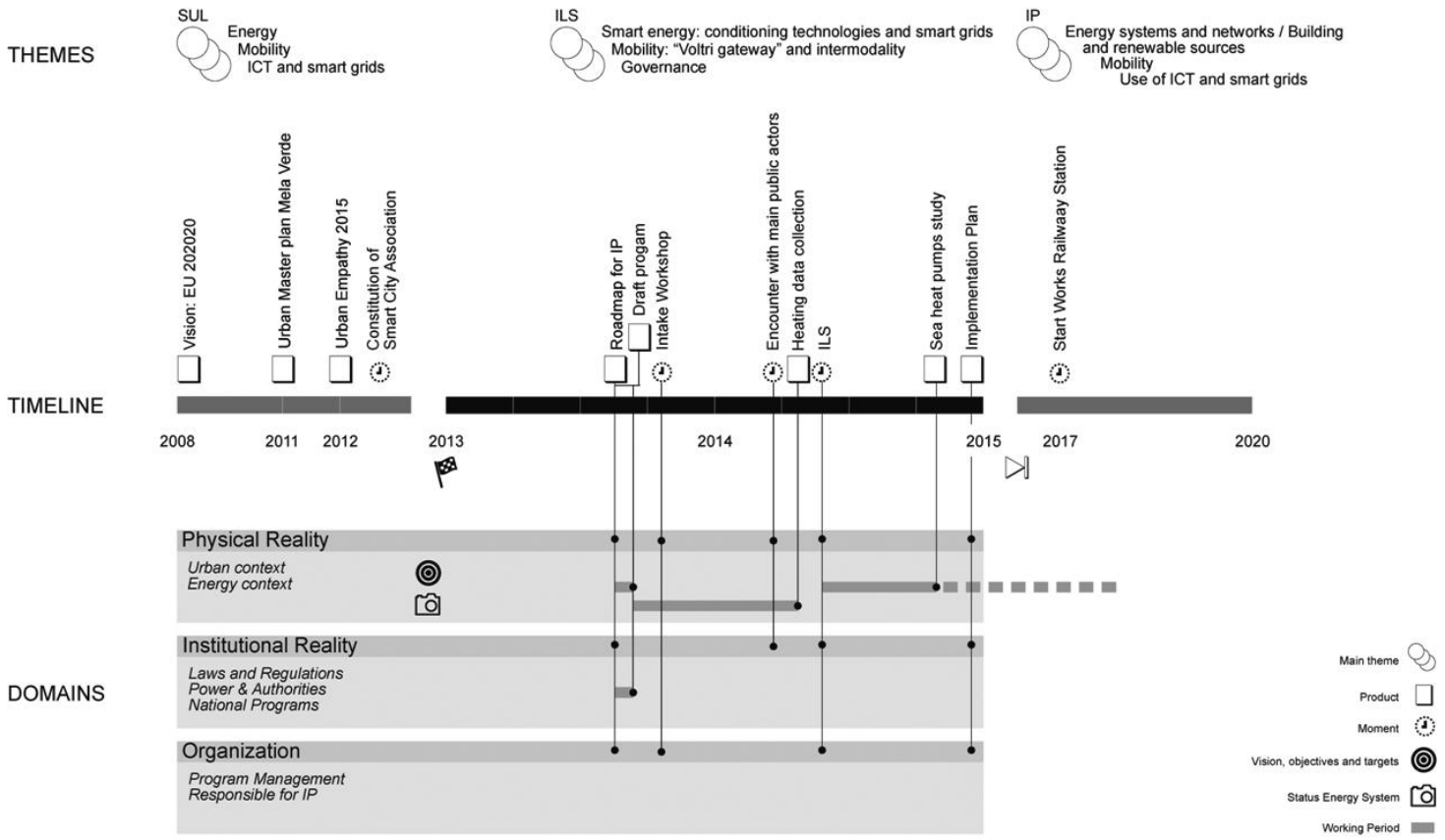


INNOVATION

Co-creation with stakeholders - early dialogue concept.

Energy Lab Nordhavn as a boost lead area for innovation.

Road taken towards IP - Genoa Mela Verde



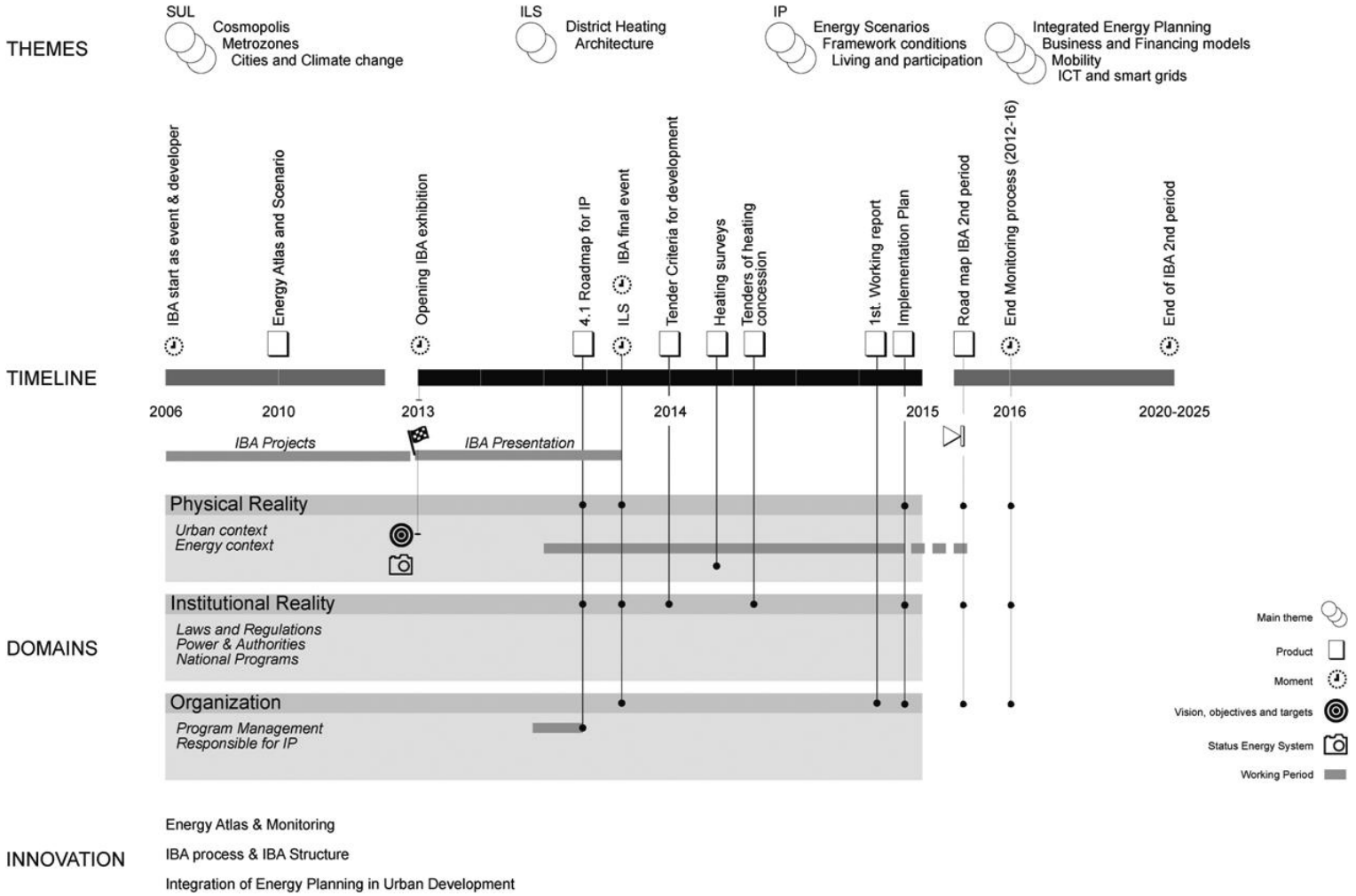
INNOVATION

Collaboration among Municipality, Port Authority and National Railway System about the "Shared Masterplan" of the area. Important laboratory for experience of common planning at national level. (First case)

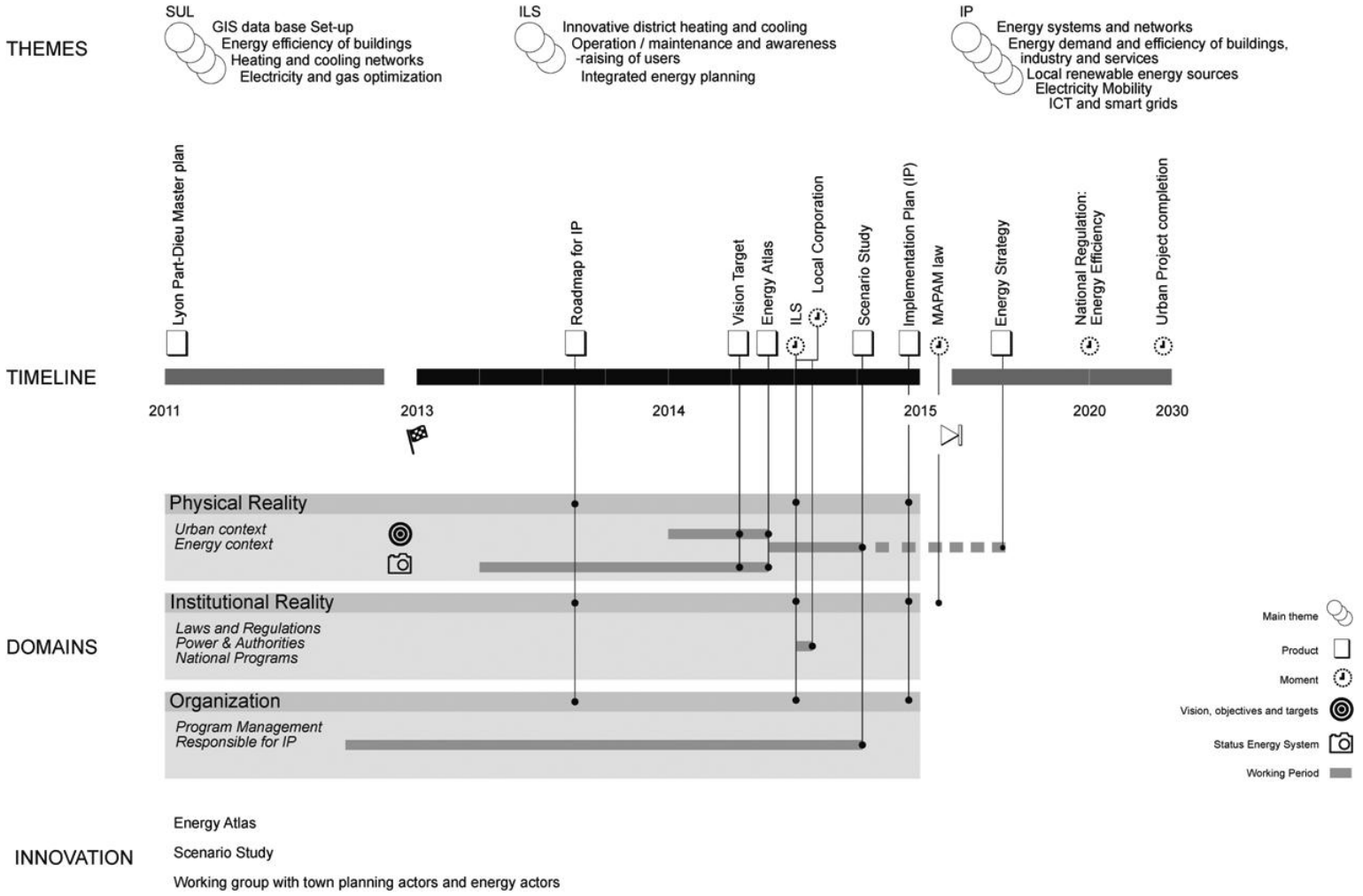
Synergy with European Directives about Port Management and environmental policies (Expectation of new National law)

* Note: Parallel to TRANSFORM the URBAN EMPATHY project was running in Genoa

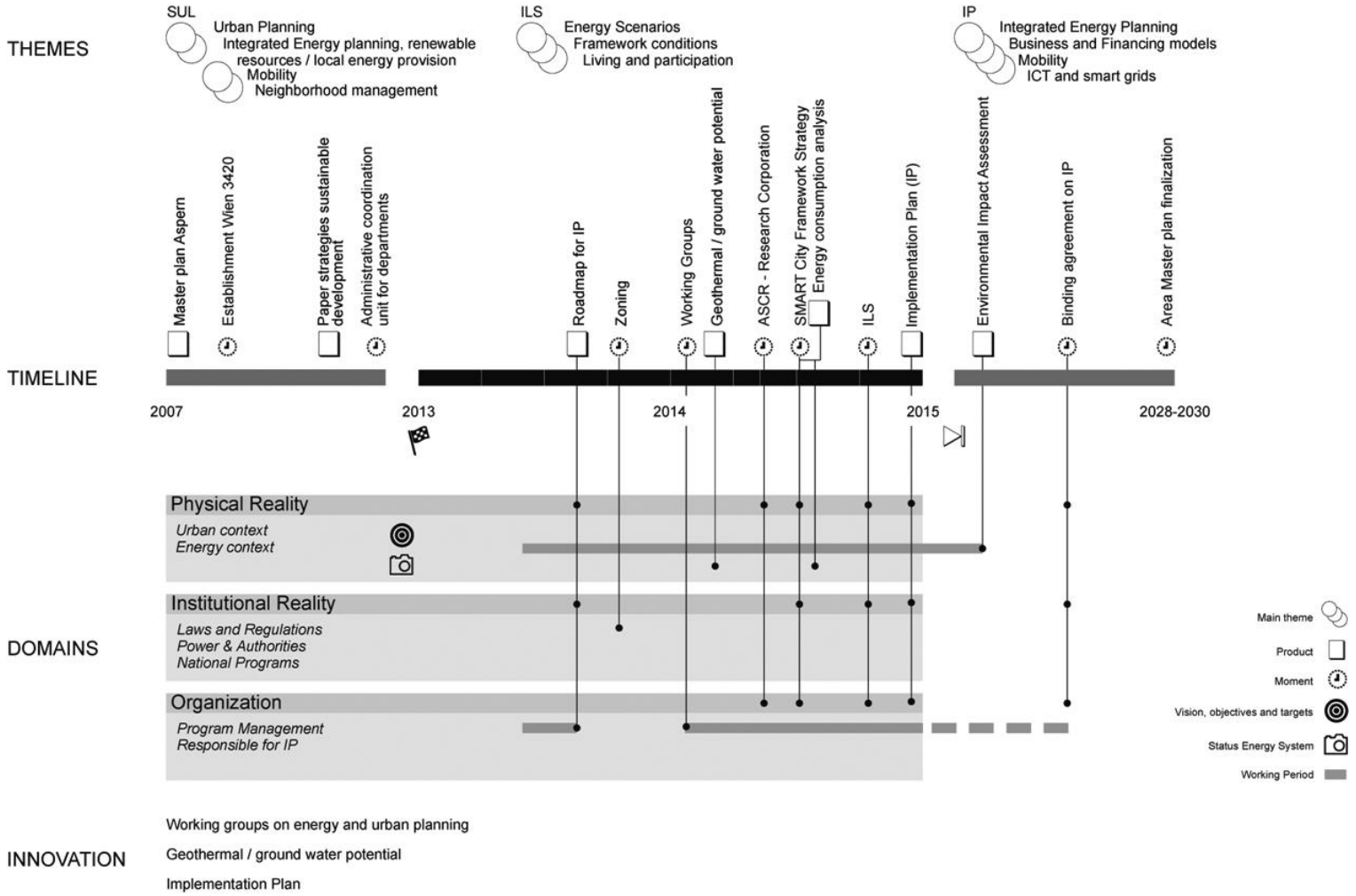
Road taken towards IP - Hamburg Wilhelmsburg



Road taken towards IP - Lyon Part-Dieu



Road taken towards IP - Vienna Aspern Seestadt



AMSTERDAM – Moments

ILS

Type	Workshop with international expertise, knowledge partners, big companies and local stakeholders.
Relevance on SUL	Program set up with project proposals – Booklet result

CHRISTMAS MEETING

Type	Workshop, meeting with mayor stakeholders, project and program management.
Relevance on SUL	Commitment program management.

CAPTAINS DINNER

Type	Captain dinner on CEO and Political level – previous work groups.
Relevance on SUL	Mission statement and agreement signed on intention of collaboration and express for project management.

WORKING GROUP

Type	A public private working group on strategic level with main stakeholders: City, ArenA, NUON, AMC Hospital, city district
Relevance on SUL	to coordinate actions in the making of the IP, to prepare Captains Dinner, goals and cooperation in implementation.

AMSTERDAM – Products

PROJECT CANVASSES

Product/result	Exploration of Project ideas
Type	Posters
Leader	TRANSFORM Team -City of Amsterdam
Stakeholders	20
Methods/tools	Design thinking, brainstorming workshop
Necessities	
Data	First results energy atlas
Time	4 x half day
Budget	10,000 Euros
Other	External consultant to guide the workshops
Commitment	
Important moments	

1st DRAFT PROGRAM

Product/result	Program set up with project proposals
Type	Booklet
Leader	TRANSFORM team – City of Amsterdam
Stakeholders	Big companies, (inter)national expertise, knowledge partners, and local stake-holders.
Methods/tools	I.L.S.
Necessities	
Data	Energy Atlas
Time	3 days workshop and two weeks for making the booklet
Budget	Human resources
Other	
Commitment	
Important moments	Sharing it with stakeholders in the SUL-area

ROAD MAP TO IP

Product/result	4.1 The process of making an Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – City of Amsterdam
Stakeholders	
Methods/tools	SWOT, PESTLEGS
Necessities	
Data	Analysis, mission statement, list of projects
Time	8 months
Budget	Human resources
Other	
Commitment	
Important moments	

ENERGY ATLAS

Product/result	Interactive Amsterdam Energy Atlas platform
Type	Open data interactive map, and book
Leader	TRANSFORM Team – City of Amsterdam, Accenture.
Stakeholders	Liander, Waternet, NUON, TNO, the Amsterdam Federation of Housing Associations AFWC and Amsterdam Smart City.
Methods/tools	Gathering, processing, mapping and transforming data
Necessities	
Data	Spatial and social context of the city, high level energy data, the potential for local energy production in the city or region.
Time	2 years
Budget	180,000 Euros in developing and making the energy atlas for the whole of Amsterdam. Mostly spend on human resources.
Other	
Commitment	
Important moments	Public launch of Energy Atlas

MISSION STATEMENT

Product/result	Mission statement
Type	Drawings and statements
Leader	ArenA, TRANSFORM team – City of Amsterdam, NUON, AMC.
Stakeholders	16
Methods/tools	Captain dinner on CEO and Political level – previous work groups.
Necessities	
Data	General presentation
Time	1 evening (dinner) – 5 months preparation
Budget	
Other	Good food and representation, facilitator.
Commitment	Yes, Intention of collaboration and express for project management.
Important moments	

FEASIBILITY STUDY REPORTS

Product/result	Final feasibility report on local waste processing. Sustainable heating study: demand and supply. Quick scan legal possibilities Feasibility study on the implementation of a legal framework to to electric sustainable heating for new developers
Type	Document – PDF, powerpoint
Leader	TRANSFORM team – City of Amsterdam
Stakeholders	Specialists, technicians, advisors, consultants, local actors.
Methods/tools	Study of business cases, feasibility report, second opinion.
Necessities	
Data	Program, project full documentation and studies
Time	Differs per product: second opinion in a week, study on waste 4 months
Budget	Differs per product: sometime for free (university working along, expert check by interested business partner) until 15,000 Euros
Other	
Commitment	
Important moments	

IMPLEMENTATION PLAN (IP), AND FINAL LOCAL IMPLEMENTATION PLAN

Product/result	4.2 Implementation Plan; Final local Implementation Plan
Type	Document – PDF; website
Leader	TRANSFORM team, City of Amsterdam; Project manager
Stakeholders	Local IP: major stakeholders in the area
Methods/tools	Local IP: Designed by HvA, City, supervised by stakeholders
Necessities	
Data	Energy atlas, feasibility reports, projects evaluation and feedback loop with stakeholders
Time	1 year, 4 months; local: 4 months
Budget	Local: Approximately 20,000 Euros = financed for approval by local stakeholder
Other	
Commitment	Local IP: Commitment on content by stakeholders, signing by CEOs
Important moments	End event Transform

MOU on hiring a project manager

Product/result	Agreement on hiring an external project manager to organize the next steps in organizing the implementation of the IP.
Type	Memorandum of Understanding, 2 pager
Leader	ArenA, City of Amsterdam
Stakeholders	Other stakeholders can join
Methods/tools	Ongoing cooperation between the City and the ArenA in formal and more informal ways
Necessities	
Data	
Time	
Budget	120,000 Euros
Other	
Commitment	contract
Important moments	

COPENHAGEN – Moments

INTERNAL WORKSHOP

Type	City of Copenhagen administration internal Workshop – Master plan and Vision for Nordhavn review and check.
Relevance on SUL	Theme selection, generation of ideas to realize goals -1st. draft of the IP. Share knowledge inside municipality

INTAKE WORKSHOP

Type	City level development workshop with stakeholders, developers and the University. Output SWOT analyses
Relevance on SUL	Road map to IP adjustment, Nordhavn as a push up area.

ILS

Type	International Transform Workshop.
Relevance on SUL	Early dialogue with stakeholders on sustainable urban development – Sustainable living discussion with citizens. Smart Buildings – ideas for Energylab Nordhavn. New input and qualification.

Co-creation workshops

Type	Workshops where the municipality and the developers made a new concept on early dialogue with developers together!
Relevance on SUL	Hopefully more sustainably buildings in the area.

COPENHAGEN – products

ROAD MAP TO IP

Product/result	4.1 The process of making an Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – City of Copenhagen, Greater Copenhagen Utility
Stakeholders	
Methods/tools	SWOT, PESTLEGS
Necessities	
Data	Analysis, mission statement, list of projects
Time	8 months
Budget	
Other	
Commitment	
Important moments	

SHARP ROAD MAPS

Product/result	Road map to IP adjustment
Type	Document – PDF
Leader	TRANSFORM team – City of Copenhagen
Stakeholders	Area developers, University, concerned parties on city level
Methods/tools	Intake workshop, share information, early dialogue with stakeholders
Necessities	
Data	
Time	1 day workshop – 4 months process
Budget	
Other	Transformation Agenda
Commitment	
Important moments	Nordhavn as a push up area.

ILS REPORT

Product/result	Adjustment of roadmaps
Type	PP
Leader	Transform team
Stakeholders	Transform cities, developers, architects,
Methods/tools	
Necessities	
Data	
Time	3 day workshop
Budget	
Other	
Commitment	
Important moments	

CONCEPT FOR EARLY DIALOGUE WITH DEVELOPERS

Product/result	New concept for early dialogue with developers on sustainability
Type	PP on how to organize this within the municipality and CCPD
Leader	City of Copenhagen and CCPD
Stakeholders	City of Copenhagen, Developers in Nordhavn.
Methods/tools	SWOT, workshops, co-creation
Necessities	
Data	ILS theme
Time	Start January 2015
Budget	0
Other	
Commitment	Yes, agreement on new ownership structure (City of Copenhagen 95% – CCPD 5%). Part of agreement with CCP
Important moments	Workshops together with developers in designing the concept..

ENERGYLAB NORDHAVN

Product/result	The work with the IP have given input to Energylab Nordhavn. Research and demonstration program to support the transformation of the energy system based on renewable energy.
Type	Demonstration project
Leader	DTU, Center for Electric Power and Energy of DTU

Stakeholders	City of Copenhagen, HOFOR, DONG, CCPD, ABB and CLEAN.
Methods/tools	Research and demonstration
Necessities	
Data	ILS theme
Time	Start January 2015 – 4 years
Budget	10,000 Euros
Other	
Commitment	
Important moments	

IMPLEMENTATION PLAN (IP)

Product/result	4.2 Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – City of Copenhagen, HOFOR, DTU
Stakeholders	HOFOR, CCPD,
Methods/tools	
Necessities	
Data	
Time	1 year, 4 months
Budget	0, related to energy lab
Other	
Commitment	Meeting with CCPD and chief of Climate Action Plan
Important moments	ILS act CPO was there to hear result.

GENOA – Moments

INTAKE WORKSHOP

Type	Workshop divided in work groups; Energy, mobility, governance
Relevance on SUL	Theme selection for the ILS; Deepening of the selected themes

ILS

Type	Workshop and meeting with the international Transform team, technical experts, Municipality, District and stakeholders: plenary and parallel thematic sessions – Report after.
Relevance on SUL	Stakeholder and politicians involvement on the analysis of the current situation.

CONSTITUTION OF SMART CITY ASSOCIATION

Type	Coordination Team
Relevance on SUL	Setting out the process from the overall city to the selected district

ENCOUNTER (3 main public actors)

Type	Institutional meeting leaded by the Municipality
Relevance on SUL	Availability for collaboration within the three main public powers/land owners

GENOA – products

ROAD MAP TO IP

Product/result	4.1 The process of making an Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – City of Genoa
Stakeholders	IRE, University, Enel
Methods/tools	SWOT, PESTLEGS
Necessities	
Data	Analysis, mission statement, list of projects
Time	8 months
Budget	
Other	
Commitment	
Important moments	Selection of Key-themes according to the Transformation Agenda and I.W. Results.

DRAFT PROGRAM

Product/result	Program set up with project proposals, dedicated Working group
Type	Encounter minutes with Draft Index
Leader	TRANSFORM team – City of Genoa
Stakeholders	IRE, University, Enel
Methods/tools	Detailed analysis on a technical level, meetings
Necessities	
Data	Existing papers and projects, Cat Med Mela Verde, Urban plan, SEAP, Municipality's internal planning, Port's Authority Development and Energy plan, RFI's Development strategy and projects.
Time	

Budget	
Other	
Commitment	No, Political validation needed to raise importance also towards external stake-holders
Important moments	

SEA HEAT PUMPS STUDY

Product/result	Technical details for assessing the real feasibility of the renewables use in the case of Voltri
Type	Report
Leader	Regional Agency of Energy
Stakeholders	University, Enel, TRANSFORM team – City of Genoa
Methods/tools	Calculation, validation of technologies
Necessities	
Data	
Time	
Budget	
Other	Input data/General Statistics (need of an Energy Atlas)
Commitment	No
Important moments	ILS, for the primary knowledge of the context

IMPLEMENTATION PLAN (IP)

Product/result	4.2 Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team, City of Genoa
Stakeholders	University, IRE and Enel
Methods/tools	Coordination
Necessities	
Data	Existing Planning Tools, General Statistics
Time	1 year, 4 months
Budget	
Other	
Commitment	
Important moments	To Be decided

HEATING DATA COLLECTION

Product/result	Technical details for testing renewable energy
Type	
Leader	TRANSFORM team – city of Genoa, IRE
Stakeholders	University
Methods/tools	Calculation
Necessities	
Data	General Statistics
Time	
Budget	
Other	
Commitment	
Important moments	

HAMBURG – Moments

PRESENTATION ENERGY ATLAS

Type	Conference
Relevance on SUL	Presentation of vision/first implementation projects

OPENING IBA EXHIBITION

Type	Exhibition
Relevance on SUL	Presentation of built projects

ILS

Type	Workshop
Relevance on SUL	Discussion on heating concepts and architecture concepts for further developments

FINAL IBA EVENT

Type:	Conference
Relevance on SUL:	Presentation of first results/discussion on further development

PRESENTATION ENERGY ATLAS WORKING REPORT

Type	Conference
Relevance on SUL	Discussion of interim results/presentation of roadmap until 2020

HAMBURG – Products

ENERGY ATLAS

Product/result	Publication/Document
Type	White Paper PDF & Book
Leader	Publisher: IBA Hamburg GmbH Survey on energy demands in buildings: Bremer Energie Institut (BEI) Climate Protection Concept: University of Applied Science Nordhausen, JHJ Bleicherode and egs Netzwerk Nordhausen
Stakeholders	
Methods/tools	Survey on energy demands in buildings and development of a Climate Protection Concept of the potentials of increased energy efficiency and local renewable energy production Combined with corresponding articles and reports
Necessities	
Data	Energy demand and RE potentials of building typologies, scenario analysis
Time	2 years
Budget	Studies and Publication: 380,000 Euros, staff costs
Other	
Commitment	Collaboration with Hamburg Ministry of Urban Development and the Environment (BSU)/mentioned in Hamburg Climate Action Plan 2013
Important moments	Conference Dec 2010: Presentation

PILOT PROJECTS

Product/result	Projects of the International Building Exhibition IBA
Type	Built projects
Leader	IBA Hamburg GmbH
Stakeholders	Hamburg Ministry of Urban Development and the Environment (BSU)/Hamburg Real Estate Administration (LIG)/Hamburg Local Borough Hamburg Central and Hamburg Harburg Several private investors IBA participation bodies like IBA partnership

Methods/tools	70 realized projects along the key themes Cities and Climate Change, Metrozones and Cosmopolis, open to the public from March to October 2013, around 500,000 visitors, numerous (international) delegations
Necessities	
Data	Project development and implementation
Time	6 years
Budget	90 Mio. Euros for the development and implementation of the urban development, the projects and the exhibition (together with conferences, tours,…) 300 Mio. Euros for public infrastructure 700 Mio. Euros private investments
Other	
Commitment	City owned and financed company, part of the official Hamburg Urban Development Plan
Important moments	23/03/2013: Opening of Exhibition

ROAD MAP TO IP

Product/result	4.1 The process of making an Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – IBA Hamburg GmbH
Stakeholders	
Methods/tools	First draft of IP and compilation of development and participation elements
Necessities	
Data	IBA projects, structure, concept, development and knowledge data base.
Time	8 months
Budget	staff costs
Other	
Commitment	no commitment needed – reviewed by TRANSFORM team
Important moments	

TENDER CRITERIA FOR DEVELOPMENT

Product/result	Working paper
Type	Text
Leader	IBA Hamburg GmbH
Stakeholders	Hamburg Ministry of Urban Development and the Environment (BSU)/Hamburg Real Estate Administration (LIG)

Methods/tools	Development of criteria for the tender of city owned estates based on concept qualities (architecture, urban planning, social aspects, energy and sustainability standards), based on citywide concepts, adapted to IBA standard and specifications
Necessities	
Data	Based on citywide concepts
Time	-
Budget	-
Other	
Commitment	Confirmed by Hamburg Real Estate Administration (LIG)
Important moments	

HEATING SURVEYS/TENDER OF HEATING CONCESSIONS

Product/result	Working paper
Type	Text
Leader	IBA Hamburg GmbH
Stakeholders	Hamburg Ministry of Urban Development and the Environment (BSU)/Energy Suppliers and Grid Operators
Methods/tools	Research on energy demand of the urban development structures, definition of grid supplied areas, integration of binding regulations in Land Use Plans, reference concept for the energy supply, tender of concessions for the supply by district heating based on criteria like energy costs, technical concepts and GHG emissions
Necessities	
Data	Urban development data (gross floor area, uses,...), energy demand of similar buildings, investment and energy costs
Time	-
Budget	-
Other	
Commitment	Confirmed by Hamburg Ministry of Urban Development and the Environment (BSU)
Important moments	

IMPLEMENTATION PLAN (IP)

Product/result	4.2 Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – IBA Hamburg GmbH
Stakeholders	TRANSFORM team – IBA Hamburg GmbH, EnEff-Stadt – IBA Hamburg

Methods/tools	
Necessities	
Data	IBA projects, structure, concept, development and knowledge data base.
Time	1 year, 4 months
Budget	staff costs
Other	More detailed than Roadmap/in English
Commitment	Checked by Hamburg Ministry of Urban Development and the Environment (BSU)
Important moments	

WORKING REPORT/MONITORING

Product/result	Publication/Document
Type	White Paper PDF & Book
Leader	Publisher: IBA Hamburg GmbH, Technical University Darmstadt, Federal Environment Agency (Umweltbundesamt) Monitoring: Research project "EnEff-Stadt – IBA Hamburg" (Technical University Braunschweig, Energy Research Center Lower Saxony (EFZN)/Technical University Clausthal, Hafencity University Hamburg)
Stakeholders	Energy Suppliers and Grid Operators
Methods/tools	First results of monitoring and reflection of IBA projects
Necessities	
Data	Detailed monitoring data of own sensor systems, energy use data recorded by users, total energy use data provided by grid operators
Time	2 years
Budget	Publication: 130,000 Euros staff costs
Other	
Commitment	Report – no commitment needed
Important moments	Conference 26/01/15: Presentation

ROAD MAP IBA 2nd PERIOD

Product/result	Publication/Document, part of the Working Report
Type	White Paper PDF & Book
Leader	IBA Hamburg GmbH, Technical University Darmstadt, Federal Environment Agency (Das Umweltbundesamt)
Stakeholders	Hamburg Ministries and District's Administrations and Energy Suppliers
Methods/tools	Continue with IBA working process and methods

Necessities	
Data	IBA projects, structure, concept, development and knowledge data base.
Time	4 month
Budget	staff costs
Other	Different timeframe, power and framework than IBA – same competence and network
Commitment	Collaboration with Hamburg Ministry of Urban Development and the Environment (BSU)
Important moments	Presentation and Conference 26/01/15: Discussion of implementation during new urban development period until 2020 or 2025

LYON – Moments

ILS

Type	First result presentation workshop
Relevance on SUL	Comprehensive measures proposal with example of EU other projects.

LOCAL CORPORATION

Type	
Relevance on SUL	

MAPAM LAW

Type	Modernization of territorial public action and affirmation of metropolises law.
Relevance on SUL	Clarifying the competences of local authorities, reorganizing the legal local context – Creation of Métropole de Lyon as a new local community.

LYON – Products

ROAD MAP TO IP

Product/result	4.1 The process of making an Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team – Metropole of Lyon
Stakeholders	
Methods/tools	Energy path proposal, network deployment possibilities
Necessities	
Data	
Time	8 months

Budget	
Other	
Commitment	
Important moments	ILS

ENERGY ATLAS

Product/result	Energy Atlas connecting consumption and building data to action plan
Type	IGS database – map
Leader	TRANSFORM Team – Metropole of Lyon
Stakeholders	ERDF/GRDF/Metropole of Lyon
Methods/tools	Signing agreement with data holders, gathering missing information, processing, mapping and transforming data
Necessities	
Data	Spatial and social context of the city, high level energy data, the potential for local energy production in the city or region.
Time	8 months
Budget	
Other	
Commitment	Yes, with data holders and about confidentiality agreements
Important moments	

VISION TARGET

Product/result	Clear visionary goal: double programme while keeping the same energy consumption.
Type	powerpoint
Leader	TRANSFORM Team – Metropole of Lyon
Stakeholders	
Methods/tools	Signing agreement with data holders, gathering missing information, processing, mapping and transforming data
Necessities	
Data	Spatial and social context of the city, high level energy data, the potential for local energy production in the city or region.
Time	
Budget	

Other	This objective is linked with existing policy climate objectives: divide the CO_2 emissions and energy consumptions (75% less by 2050). The aim to test is to manage to do 50% less by 2030 (end of the Part – Dieu project).
Commitment	Mayor/President knows this objective which has been formalized but we prefer to say that we have the will to test the objective
Important moments	

SCENARIO STUDY

Product/result	Four scenarios
Type	Energy efficiency of buildings and energy careers sharing
Leader	Hespul and Grand Lyon
Stakeholders	ERDF
Methods/tools	Working group planning and energy
Necessities	
Data	Energy atlas
Time	4 months
Budget	
Other	
Commitment	Yes, Political commitment to build scenarios, but politicians have not yet chosen a scenario.
Important moments	

IMPLEMENTATION PLAN (IP)

Product/result	4.3 Implementation Plan
Type	Document – PDF
Leader	TRANSFORM team: Hespul, Metrople of Lyon, ERDF
Stakeholders	Part Dieu engineering consulting firms, Hespul, ERDF, heating and cooling network, property developers and building owners, shopping mall and railway station.
Methods/tools	
Necessities	
Data	
Time	1 year, 4 months
Budget	
Other	

Commitment		**Commitment stakeholders**	**Commitment by high level administration**	**Political commitment**
		Given/foreseen/expected/not decided yet	Given/foreseen/expected/not decided yet	Given/foreseen/expected/not decided yet
1 Energy systems and networks	Programme approach (changes in the shares of the various energy vectors)	Given		
	Pre-sizing subscribed power of all buildings tob e constructed and refurbished in P-D by 2030	Given	Given	
	Technical and economical impact on the electricity grid of the evolution of Part-Dieu district	Leader of the task is ERDF. Given by ERDF	Leader of the task is ERDF. Given by ERDF	
2 Buildings, industry and services – energy demand and energy efficiency	The production of a reference framework for environmental issues and for the energy performance of buildings	Given (achieved)	Given (achieved)	Given (achieved)
	The constitution of an authority to monitor the environmental aspect of new building projects	Given (ongoing)	Given (ongoing)	Given (ongoing)
3 Local renewable energy sources	Reflection on the changes to the energy mix of the urban heating and cooling networks	Given Agreement to increase the part of renewable energy in the heating network from 50% to 60%	Given	Given
4 Mobility	Mise en place de prises de recharges pour VE	Given	Given	
5 Use of TIC and smart grids	Study of the cold demand on the district cooling network	Given	Given	Given
	Modelling study of the electrical load	Leader of the task is ERDF.	Leader of the task is ERDF.	

	curve of the Part-Dieu district	Given by ERDF	Given by ERDF	
	Study of the flexibility potential on Part-Dieu district	Leader of the task is ERDF. Given by ERDF	Leader of the task is ERDF. Given by ERDF	
	Reflection on reducing the peak demand on the heating and cooling networks	Leader of the task is ERDF. Foreseen	Leader of the task is ERDF. Foreseen	
Important moments:				

ENERGY STRATEGY

Product/result	Action plan to realize the target of doubling building capacity with the same energy demand.
Type	
Leader	Grand Lyon
Stakeholders	Heating and cooling operators, ERDF, GRDF
Methods/tools	Working groups with the stakeholders led by Grand Lyon
Necessities	
Data	Based on scenarios
Time	2014/2015
Budget	
Other	
Commitment	
Important moments	

VIENNA – Moments

Establishment of Wien3420

Type	Moment
Relevance on SUL	Leader of the development of the area (area developer), main actor with sustainable development vision, main partner for municipal departments

Administrative coordination unit for departments

Type	Moment
Relevance on SUL	Municipal unit for the coordination between Wien 3420 and all different municipal departments, easing work flow and discussion

SMART CITY FRAMEWORK STRATEGY

Type	Vision including objectives and quantitative targets
Relevance on SUL	Overall framework for the implementation of concrete plans and projects in the area (aspern Seestadt as a pilot project for implementation)

ILS – Intensive Lab Session Vienna

Type	Moment: 3 days of intensive workshops led by the relevant municipal departments
Relevance on SUL	Impulse for further work with local stakeholders. High priority for smart city implementation by applying integrated planning and enforcing the need for agreements between stakeholders.

ZONING PLAN

Type	Moment/Product
Relevance on SUL	The urban zoning plan is an important basis for all planning activities in the area (zoning of the southern part has been published in 2014, the zoning plan of aspern Seestadt North has been published as draft version recently).

Aspern Seestadt ENERGY WORKING GROUP

Type	Moments: Intensive discussion on major aspects of integrated energy planning for the area.
Relevance on SUL	Research group (funded by project Transform+), input for planning decisions of the developer (Wien 3420) and partly also for relevant municipal planning departments (energy planning, urban planning)

ASCR RESEARCH CORPORATION FOUNDING

Type	Moment
Relevance on SUL	The founding of ASCR as a research cooperation of Siemens, Wien Energie, Wien 3420 allows for the implementation of highly innovative research projects in the area, testing, demonstrating and monitoring measures in terms of energy production, demand side management and smart grids in real environments). Successful approaches – based on the findings of the research projects – shall be rolled out to larger areas of aspern Seestadt in a later phase.

VIENNA – products

MASTERPLAN aspern Seestadt

Product/result	Masterplan, winner from a competition for developing the area
Type	Product (Document – PDF)

Leader	Wien3420, City of Vienna
Stakeholders	local politicians, municpal departments, residents
Methods/tools	masteplan
Necessities	
Data	Projected inhabitants and jobs
Time	unknown
Budget	n/a
Other	
Commitment	Commitment from the city of Vienna and Wien 3420
Important moments	Result of the contest, masterplan presentation and approval by the municipal council 2007

ROAD MAP TO IP

Product/result	TRANSFORM Deliverable 4.1 – The process of making an Implementation Plan
Type	Product (Document – PDF)
Leader	TRANSFORM team, leaders of WP 4 – Vienna City and OIR, Amsterdam City
Stakeholders	Smart Urban Lab Coordinators (SULCos) of all 6 cities were involved in the elaboration of D4.1 (consultatively)
Methods/tools	SWOT, PESTLEGS, Interviews – common template for the description of implementation plans
Necessities	
Data	Technical analysis of energy flows, description of the planning/implementation process, mission statement and vision, strategy list of projects
Time	8 months
Budget	TRANSFORM budget
Other	none
Commitment	Commitment from SULCos to use the template
Important moments	delivery of D4.1, October 2013

ENERGY CONSUMPTION ANALYSIS

Product/result	Deliverable for nationally funded parallel Project Transform+
Type	Elaboration of two scenarios on energy demand in the area: Miniumum scenario and smart city scenario, considering different energy efficiency standards of buildings and different behaviour of electricity use Basis for the elaboration of an energy concept for the area
Leader	AIT, Wien3420, Wien Energie (municipal energy provider)

Stakeholders	supported by the TRANSFORM/Transform+ team – City of Vienna (Energy planning department, urban planning department), OIR and other consulting and research partners
Methods/tools	Calculation/forecast on the basis of average energy consumption and square-meters of living/working area
Necessities	
Data	information on building standards and related energy demand, square-meters of living/working area
Time	6 months
Budget	Transform+ budget (nationally funded parallel project)
Other	
Commitment	basis for further work (environmental impact assessment, discussion on smart city scenario)
Important moments	Finalization of energy consumption analysis as a basis for EIS and scenarios for the IP

IMPLEMENTATION PLAN (IP) aspern Seestadt, Vienna

Product/result	4.2 Implementation Plan aspern Seestadt
Type	Product (Document – PDF)
Leader	TRANSFORM team – City of Vienna/OIR
Stakeholders	Wien 3420, Wien Energie (municipal energy provider), Energy planning department, Urban planning department, coordination unit aspern Seestadt, ETA (energy policy consultants), ARBOS (financial consultant)
Methods/tools	according to D4.1., intensive discussion on relevant aspects, mainly concerning the energy
Necessities	
Data	Scenarios for the estimation of future energy demand (heat and electricity) and needed capacities of a heat network – minimum scenario and smart city scenario Overall data on geothermal potential (study) and solar potential (estimation of available roof area)
Time	1 year, 4 months
Budget	TRANSFORM, supported by the nationally funded parallel project Transform+ (KLIEN)
Other	
Commitment	partial commitment expected in 2015
Important moments	Intensive Lab Session (September 2014), Environmental impact statement (March 2015)

ENVIRONMENTAL IMPACT ASSESSMENT

Product/result	Product/legally obligatory environmental impact statement
Type	Official declaration of environmental impacts to be expected (obligatory for urban projects of this size)
Leader	Wien3420
Stakeholders	supported by the TRANSFORM/Transform+ team – City of Vienna (Energy planning department, urban planning department), Wien Energie (municipal energy provider), AIT, OIR and other consulting and research partners
Methods/tools	Detailed analysis of environmental impacts
Necessities	
Data	input from the elaboration of implementation plan (energy group discussion)
Time	1 year of implementation
Budget	Work done or commissioned by Wien3420 (as a task of the area developer)
Other	
Commitment	Official submission by Wien3420 (March 2015)
Important moments	Submission, Approval (expected in 2016)

GEOTHERMAL GROUND WATER POTENTIAL

Product/result	Study on geothermal/ground water potential
Type	Product
Leader	Wien3420 (client), Geologische Bundesanstalt/Federal Agency for Geology (contractor)
Stakeholders	involved: Energy planning department, Water planning department, Wien Energy (municipal energy provider)
Methods/tools	Geological analysis of the area, potential for the use of ground water medium and deep geothermal heat
Necessities	
Data	Studies and drillings in the area
Time	6 months
Budget	n/a
Other	
Commitment	principal commitment to use local renewable potential in the area as much as possible
Important moments	Presentation of the studies outcomes

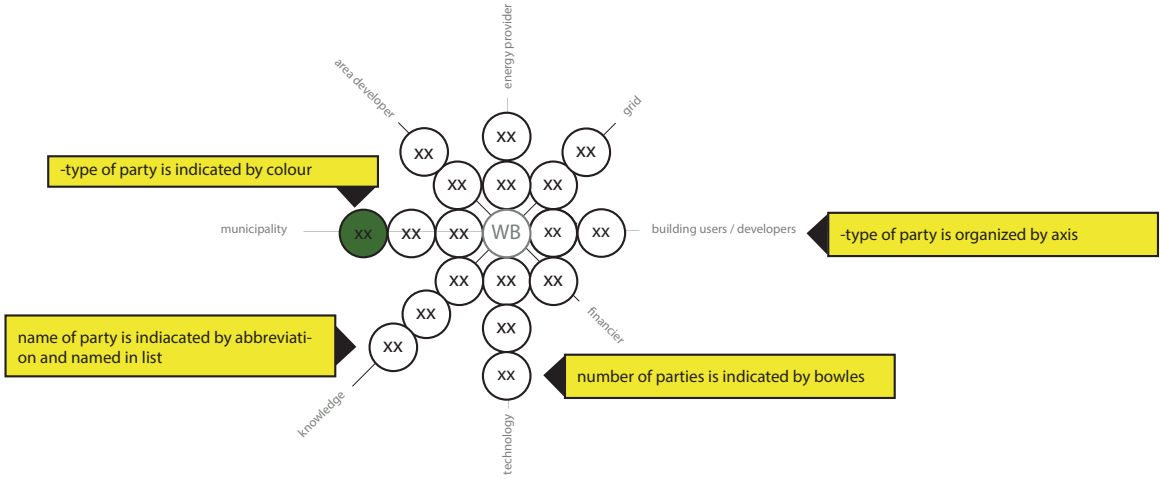
A.2
Main stakeholders involved in the integrated planning and implementation of Smart Urban LABS (SULs)

This annex shows in a graphical and abstract which main stakeholders are involved in the intergrated planning and implementation of Smart Urban LABS (SULs).
And, the role of each party in the collabation is indicated in a infographic.
Also, for each SUL a short discription of the district development organisation is given.

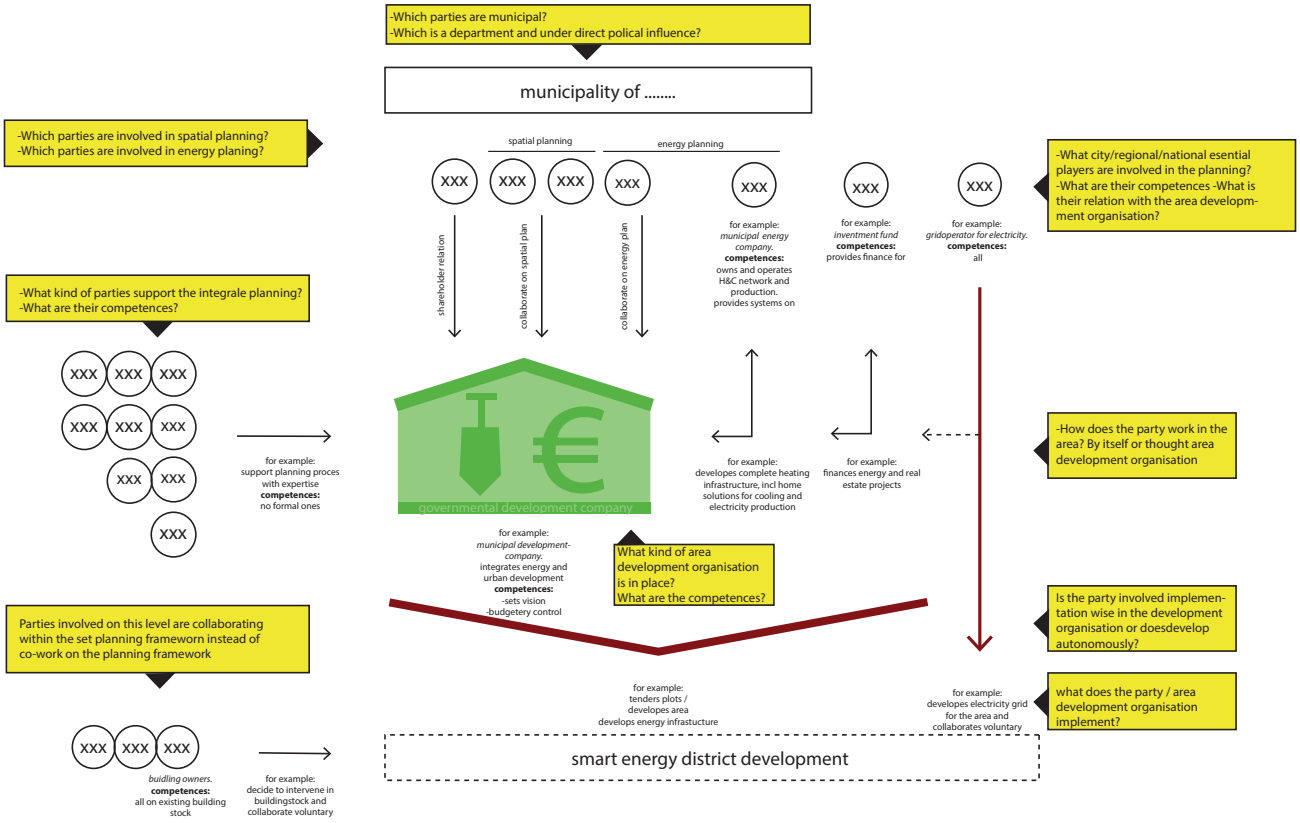
The purpose of this annex is to give insight in the organisational part of the SULs: how and between which parties the collaboration evolves and how power to implement is distributed.

Below, two images are added to clarify the grapics on the following pages.

explanation of inventarisation of main parties

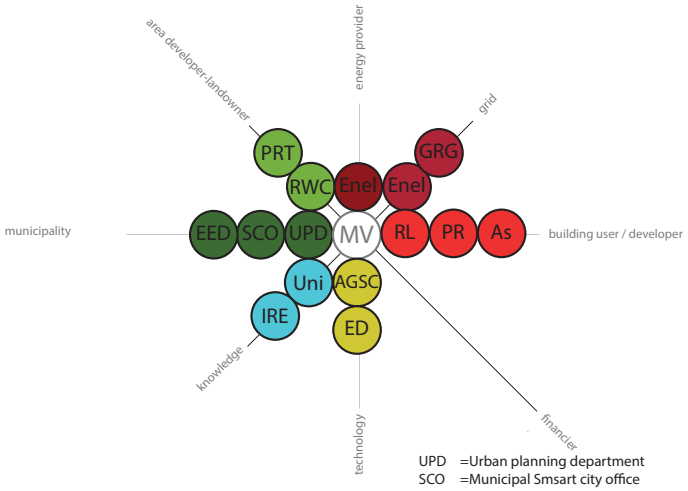


explanation of infographic of the collaboration

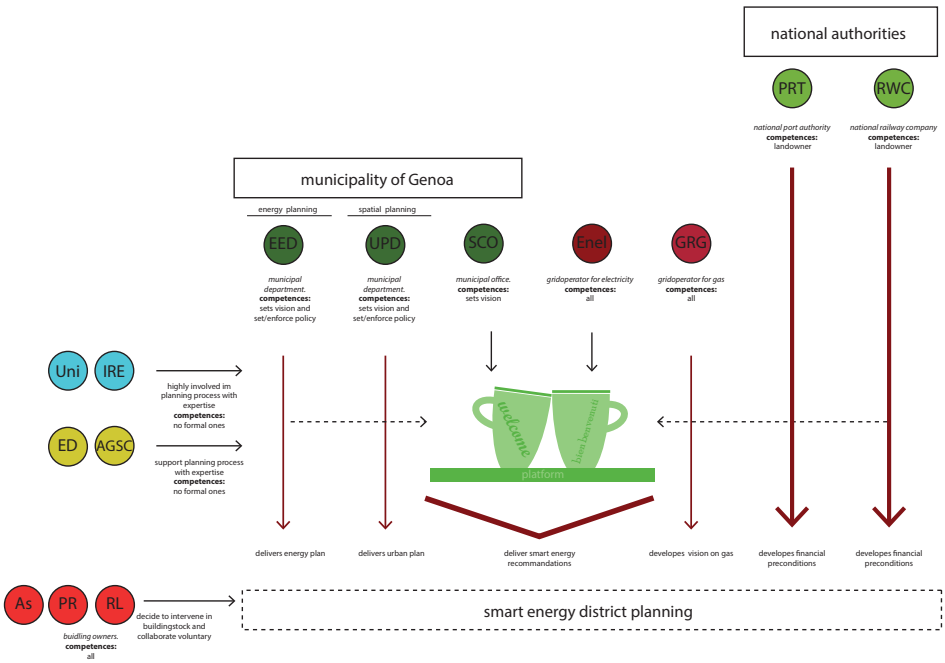


Mela Verde, Genoa, Italy

The city of Genoa and Enel are providing the platform to facilitate collaboration between the key players in Mela Verde. The collaboration between the city of Genoa and Enel was born in the Smart City association and set into action by raising the platform.
Essential in the constellation of partners in Mela Verde are the national Railway Company and Port Authority. These parties own the land and have great influence on the further develop of Mela Verde. Genoa and the National Port Authority are at the verge to start a unique pilot collaboration between a city authority and national authority by appointing Mela Verde as a smart energy pilot area. This would bring together the competences of setting vision and landownership, resulting in a stronger power to implement.

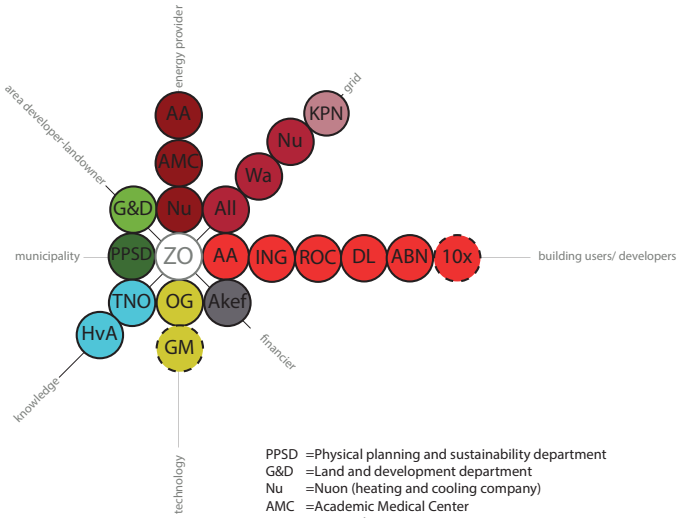


UPD =Urban planning department
SCO =Municipal Smsart city office
EED =Energy and invironmental department
RWC =Railway company
PRT = Port authority
GRG =Gridcompany for gas
Enel =Gridcompany and energy provider electricity
RL =Region Liguria
PR =Povincial Government
AS =Associatons
AGSC =Smart City Assocation Genoa
ED =Builders Assocation
Uni =University of Genoa
IRE =Energy agency of Liguria

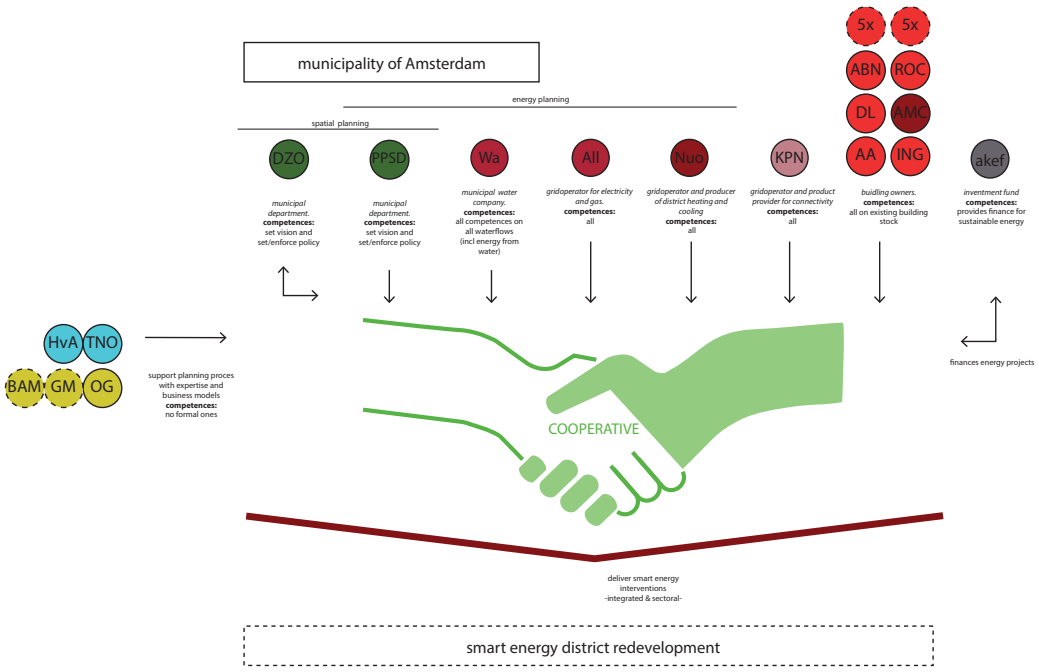


Southeast, Amstedam, The Netherlands

In Amsterdam a 2,5 year bottom up approach has led to a cooperative of local enterprises (prosumers), grid companies, knowledge institutes and the municipality. In this cooperative in essence all the competences implement are united. For the further enrollment of successful projects, more parties need to get involved. This cooperative is driving the area as a living lab. Meaning that by testing projects on site feasibility is studied and new value models are developed. Some of the projects are funded by the Amsterdam Climate and Energy fund. Essential in this way of collaborating is ensuring the project management.



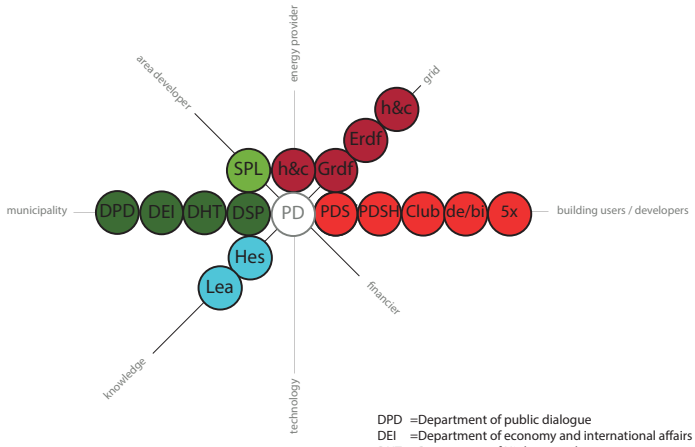
PPSD =Physical planning and sustainability department
G&D =Land and development department
Nu =Nuon (heating and cooling company)
AMC =Academic Medical Center
AA =Amsterdam ArenA
All =Alliander (utility for gas and electricity)
Wa =Waternet (utility for water)
ING =ING bank
ROC =ROC education
DL =Delta Lloyd
ABN =ABN AMRO bank
Akef =Climate and energy fund
OG =Orange gas
GM =Grontmij
TNO =National research institute
HvA =Amsterdam University of Applied Science



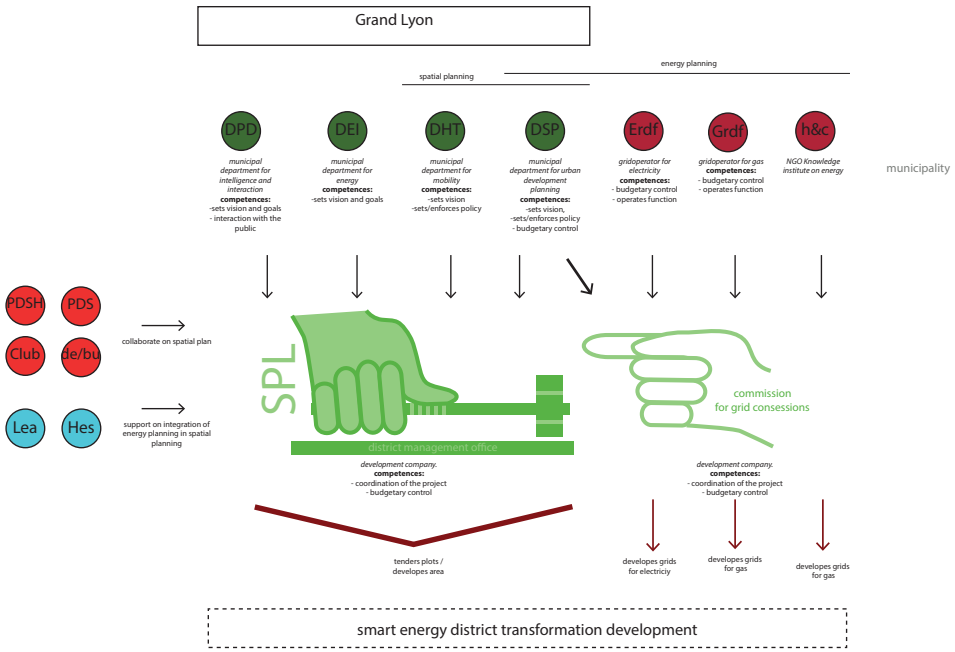
Part Dieu, Lyon, France

The organizational model and distributed powers in Grand Lyon and the district of part Dieu are unique in TRANSFORM. Due to a shift in competences, Grand Lyon is empowered to set vision on energy ánd energy infrastructures. On the district level the municipality has set up a specific management office, to manage the development of Part Dieu. Grand Lyon is part of this office through several departments.

The combined competences on energy and urban development generates a strong power for smart energy city implementation for new to develop parts of the district. By encaging stakeholders of existing parts of the district, Grand Lyon is increasing its influence to ensure implementation.

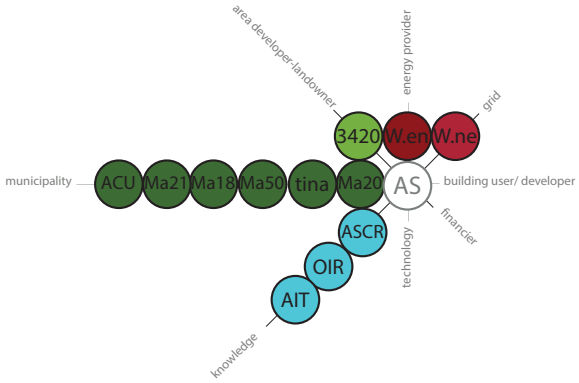


DPD =Department of public dialogue
DEI =Department of economy and international affairs
DHT =Department of Highway and transport
DSP =Department og strategy of conurbation
Grdf =Gridoperator for electricity
Erdf =Energy producer and grid operator for heating and cooling
h&c =Heating and cooling grid operator
PDS =Part Dieu station
PDSH=Part Dieu shoppng center
club =Part Dieu club of entrepreneurs
Hes =Hespul
Lea =Local energy agency
de/bu=Developers and builders

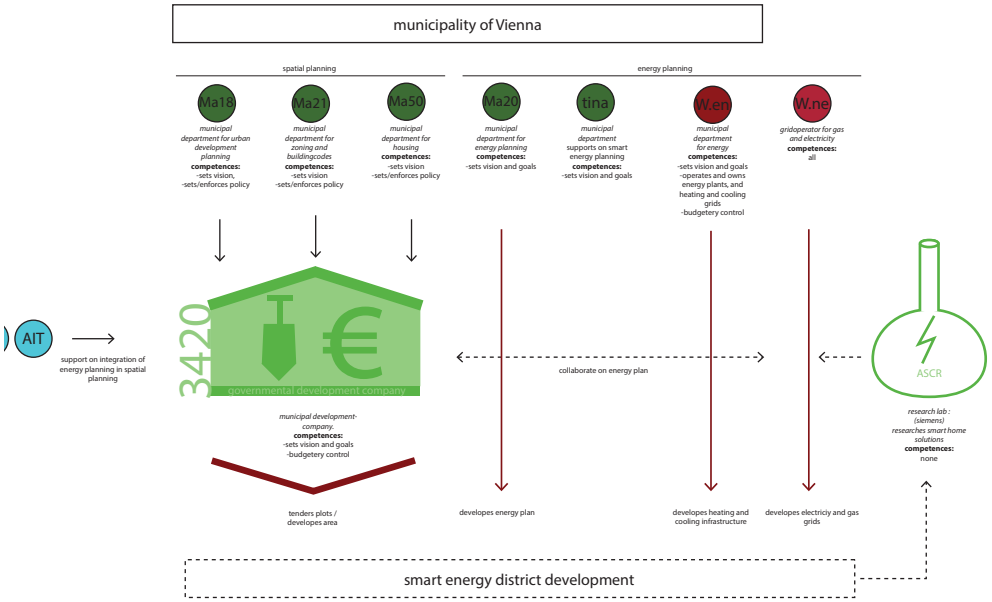


Aspern, Vienna, Austria

In Aspern the competences to ensure the implementation of the set vision is under responsibility of several parties. In the first part of the development this was lined up by the legal framework (environmental impact analysis), in the second part of the development this is organized by collaboration. The municipal development company Wien 3420 then becomes an essential player. Wien 3420is now at the verge of developing local energy systems, supported by the city wide energy parties like MA 20 and Wien Energy. This a collaboration model in which Wien 3420 acts as an energy system developer too. Moreover, to support innovation and to improve collaboration with electricity grids company Netze, the research lab ASCR is erected. Besides a formal construction, Vienna introduced a living lab construction to move towards integral planning and implementation (see also Copenhagen)

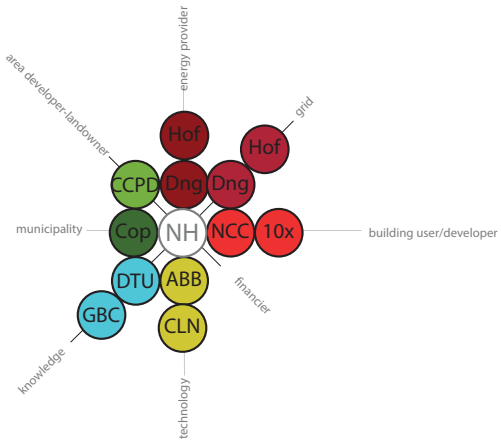


Ma 21 =Department for zoning and building codes
Ma18 =Department for urban planning
Ma 20 =Department for energy
MA 50 =Department for housing
W.en = Wien energie
W.ne =Wiener netze
Tina = Tina vienna
ACU =Acquisition coordination unit
3420 =Area developer
ASCR =Research company

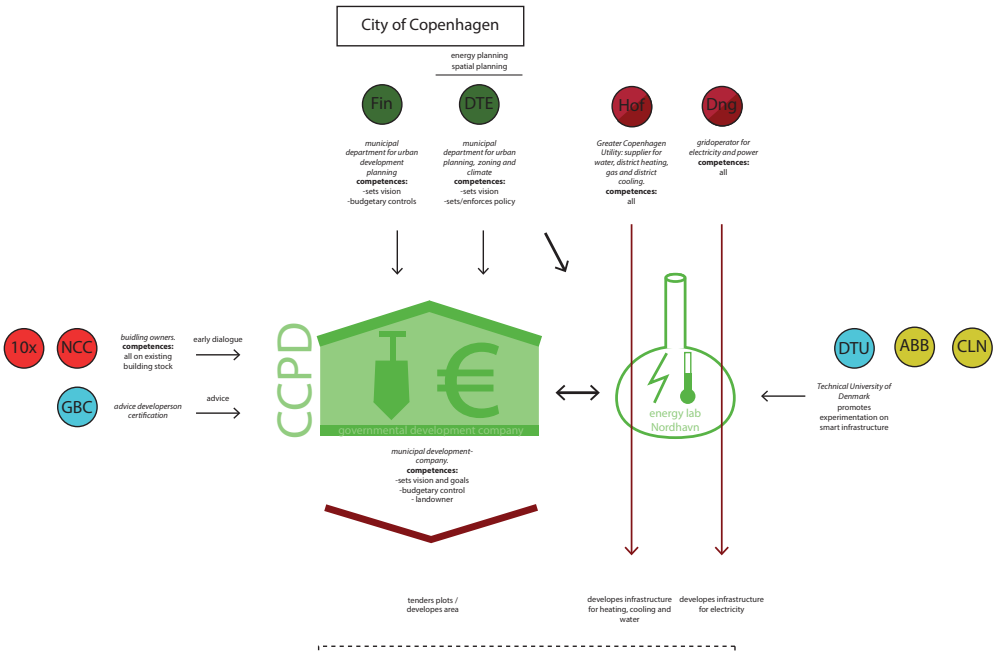


Nordhaven, Copenhagen, Denmark

For the development in Nordhavn a special municipal development company is erected. This development has great competences but adapts the framework set up by the municipality. Also the development company is not directly in charge of developing energy infrastructure but by the Energy lab Nordhavn the collaboration with utility company Hofor is intensified. By testing innovations on the electricity grid (and in home solutions) the collaboration with dong is improved too. Besides a formal construction, Copenhagen introduced a living lab construction to move towards integral planning and implementation. (see also Vienna)



Cop =city op Copenhagen
CCPD =Copenhagen City and Port Development
DNG =Dong
Hof =Hofor (greater Copenhagen Utility
NCC =ABB
ABB =Cleantech Company
CLN =Clean tech Company
DTU =Technical University of Demark
GBC =Green Building Counsil Denmark



Wilhemsburg, Hamburg, Germany

Hamburg is acting in a extraordinary way concerning district development. Besides installing a municipal development company with special focus on smart energy topics, the city also invested in Hamburg Energie, a sustainable energy production and heating grid company, and a city wide fund with a focus on energy projects was made. Although these three 'instruments' are still progressing, this is an expression of a strategy in which the government takes a strong lead in the execution of the climate goals.