Integrative energy planning: How to support decarbonisation by integrating energy planning + urban planning

EXPERIENCES FROM AMSTERDAM, BERLIN, PARIS, STOCKHOLM, VIENNA, WARSAW, ZAANSTAD, ZAGREB

URBAN LEARNING

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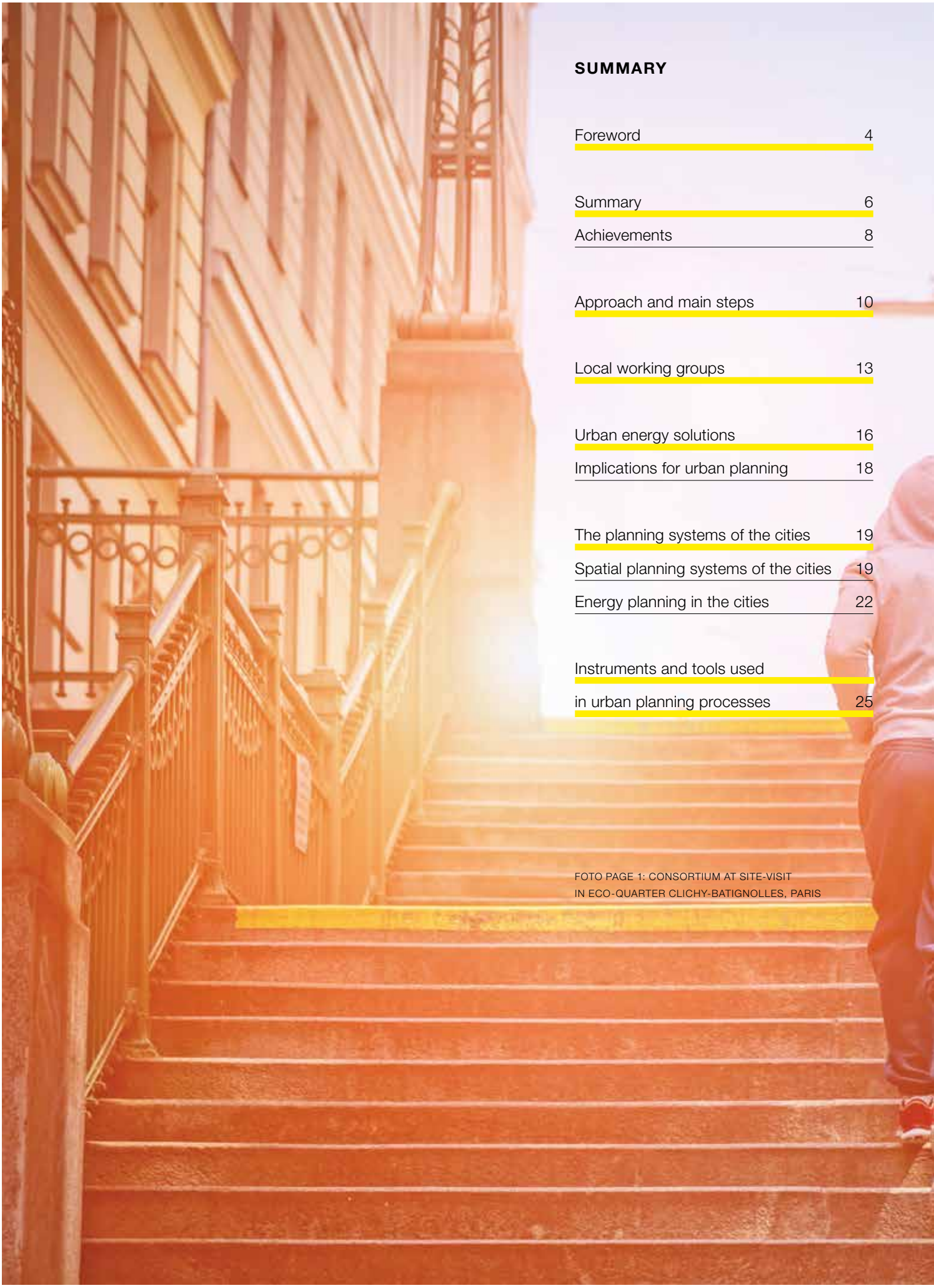
For further information on URBAN LEARNING: www.urbanlearning.eu

INTEGRATIVE ENERGY PLANNING: HOW TO SUPPORT DECARBONISATION BY INTEGRATING ENERGY PLANNING AND URBAN PLANNING. EXPERIENCES FROM AMSTERDAM, BERLIN, PARIS, STOCKHOLM, VIENNA, WARSAW, ZAANSTAD, ZAGREB → →

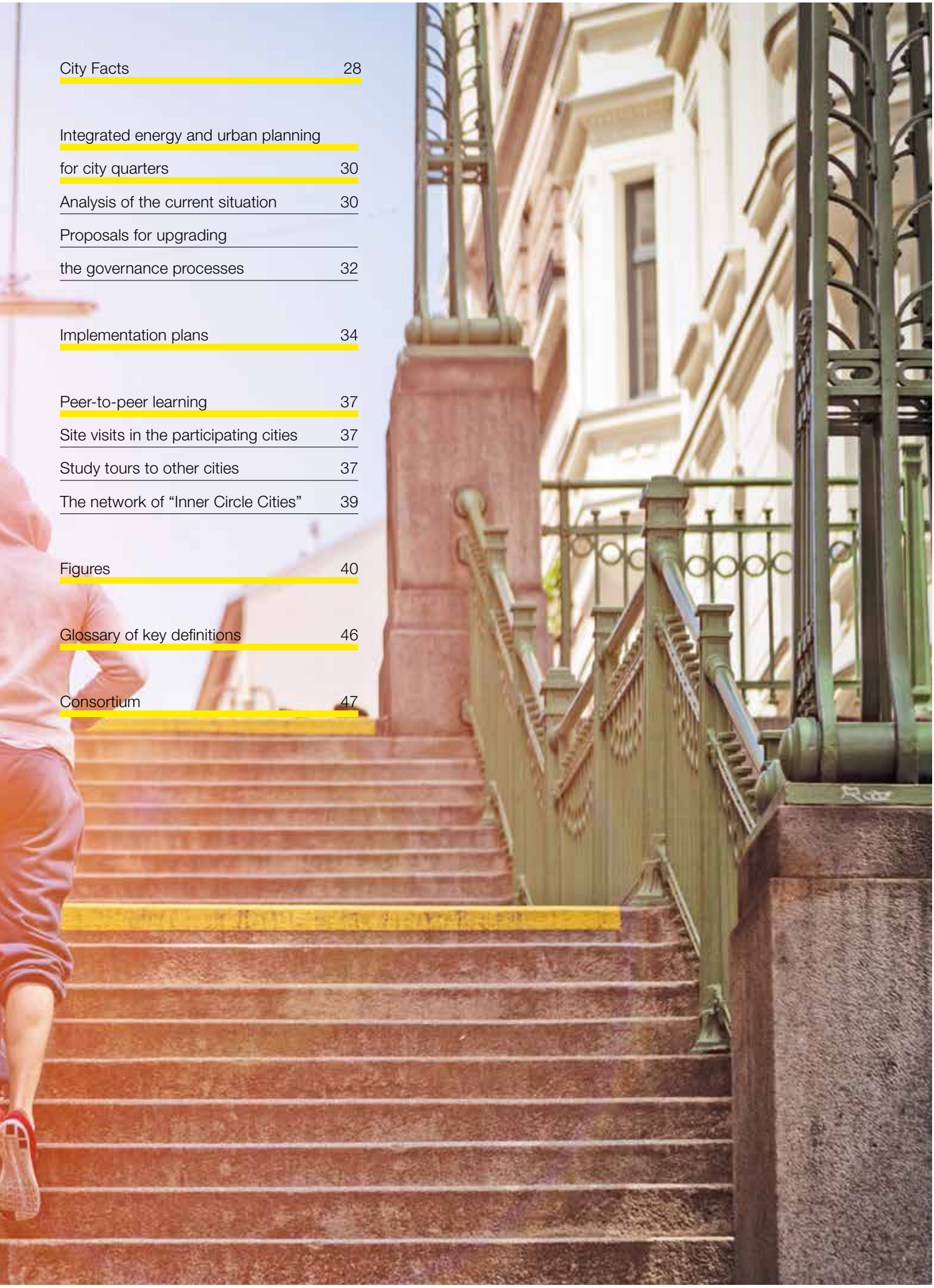
FOTO: WALTRAUD SCHMID



SUMMARY

FOTO PAGE 1: CONSORTIUM AT SITE-VISIT IN ECO-QUARTER CLICHY-BATIGNOLLES, PARIS

FOTO: ISTOCK / AND-ONE



Foreword

The idea for URBAN LEARNING grew from discussions in Vienna, a growing city with high pressure to build new affordable homes, with an energy system under pressure due to European energy market conditions and with a long-term commitment to decarbonise the city. Other cities turned out to be in a similar situation. Thus, a European project tailored to the needs of dense urban areas seemed the adequate answer.

The project work started in spring 2015. A few months later the Paris Agreement was adopted and added even more authority to the need to decarbonise the energy systems. Looking back this Agreement was a real booster.

WHY THE FOCUS ON THE INTEGRATION OF ENERGY PLANNING AND URBAN PLANNING?

The long-term decarbonisation of the energy system needs solid ground for which cities must be prepared and equipped with appropriate means, starting with those for the planning and development of urban areas. To achieve sufficient depth, this project concentrates mainly on the planning of new urban developments.

Finding appropriate solutions requires first thorough understanding of the "worlds" of energy and urban planning, the legal frameworks, local planning cultures, etc. A success of the project was indeed the in-depth preparing

FOTO: CH FÜRTHNER

of the ground. To do so at the same time in eight European cities though considerably increased the challenge of finding common ground, but – with all the differences across Europe – it also helped immensely to understand the importance of these influencing factors.

As this is a rather new topic, the terminology used is not yet settled. Even among the German speaking countries exist more than three terms for expressing the integration of energy and urban planning. In addition, 'energy' in most cases in fact correctly mainly means 'heat'. Environments from Croatia, France, the Netherlands, Poland and Sweden added complexity, and working on this matter in English meant another layer.

Still, being a peer-to-peer project – from cities for cities – our exchanges were exciting, intensive and rich, and offered continuous learning from each other. The learning from other city departments and from other cities allowed combining the views from the inside and the outside.

Being a very timely topic the projects' groundwork was well received and already resulted in first changes in our cities. Additionally, in best European spirit, it created valuable bonds for future work and exchanges will last.

The project consortium

THE CONSORTIUM WORKING
THE SWITCHES

Summary

Driven by decarbonisation, population growth, short-term energy market and technological developments, URBAN LEARNING's key objective is to mainstream and institutionalise integrative energy planning within the city administrations of Vienna, Amsterdam, Berlin, Paris, Stockholm, Warsaw, Zaanstad and Zagreb in support of decarbonised local energy systems and of economically viable grids.

It is a project from cities for cities, with energy planners and urban planners, local decision-makers as well as energy utilities as key target group. The project's focus is set on the governance processes for the development of urban sites.

Without exact definition, 'Integrative energy planning' refers to the integration of energy aspects into the urban design and planning processes, where supply side and demand side are looked at together from the very early stage, involving relevant parties as early as possible, and where also infrastructure (particularly energy and mobility, and ICT) is looked at in an integrative way.

For effective learning the project pursued:

- a dialogue process to build bridges between disciplines and departments, e.g. between city departments from urban development and planning, infrastructure, energy, housing, environment;
- institutional learning within each city administration and peer-to-peer learning from other cities (frontrunners, partner cities, etc.).

The backbone for the dialogue process were Local Working Groups (LWG), established in all cities. They served as interdisciplinary platforms for learning and institutional capacity building. Over the duration of the project, members from different city departments and perspectives debated the various aspects of the project.

At the beginning of the project all cities thoroughly analysed the current situation regarding its urban planning processes and relevant framework conditions, the used instruments and tools as well as available technological options. Key tool for these analyses were process flow charts, created for all cities. Site visits and study tours for first-hand experience completed this capacity building.

Though different in many aspects, the analyses across all cities commonly showed that

- energy aspects, particularly related to the supply of heat, are in none of the cities well integrated in the urban planning process (except for pilot areas);
- planning processes are strongly linked to legal and strategic frameworks as well as to planning cultures and traditions. Consequently, there is not only one way of doing;
- the legal and strategic framework needs more attention as it is the indispensable basis for integrative energy planning;
- there is a strong need for better data and models to soundly support a spatial differentiation of energy supply;

- there is a lack of continuity, and good intentions in master plans etc. get lost in the steps until realisation;

- there is a lack of monitoring the outcomes of planning processes.

Based on the analysis and intensive exchanges, the cities with their Local Working Groups moved on to identify and assess options for improvements. Each city elaborated approaches for upgrading its urban planning process to achieve decarbonised energy quarters in the future.

Key proposals for process upgrades address four main topics:

- Framework conditions for integrative energy planning
- Competences/stakeholders
- Changes to/within the urban planning process
- Data base / data modelling

Not surprisingly, there is not only one way of doing. Some proposals are rather 'either or' then 'and', e.g. in case of enhanced energy qualities through obligations versus voluntary, individual contracts.

Finally, concrete implementation plans were developed. These plans outline priority actions and next steps for each city on the way towards integrative energy planning.

Overall the project's approach proved to be appropriate and effective. As the selected cities differ in many aspects, the relevance and replicability of the approach as well as the results is pertinent for many European cities. A web-based toolbox with a step-by-step guidance, process flow-charts, short videos as well as this brochure and detailed deliverables are all available on the project's website, www.urbanlearning.eu.

URBAN LEARNING TOOLBOX

The project approach, main steps and practical working tools as well as its findings are summarised for take-up by other cities and planners. Similarly, information on the involved cities, their individual ways forward towards integrated energy planning as well as their already achieved improvements are made available for further replication. Information by topic is complemented by a video explaining the what, why and how of integrated urban energy planning.

A web-based toolbox offers all information via an easy-access platform at HTTP://WWW.URBANLEARNING.EU/TOOLBOX/.

ACHIEVEMENTS

Firstly, URBAN LEARNING successfully prepared the ground for integrative energy planning in major European cities. The local working groups improved the working together with benefits beyond the actual project. Also, the new process flow-charts proved to be good tools to structure discussions and are much used beyond the project. Energy transition at the local level became more operational and concrete.

The project achieved

- a substantially increased understanding about the need to integrate energy and urban planning and the municipal role and responsibility;
- enhanced institutional capacity of the administrations of leading European cities to plan urban (re-)development areas in an integrated manner;
- an increased common understanding among key stakeholders (city administration, utility, developers) on these issues that already resulted in improved planning coordination between the city and infrastructure providers;
- eight upgraded governance processes and implementation plans equipped with clear commitment to realise them; in fact, in many cities first implementation steps started already;
- lasting structures for exchange between the key stakeholders as most cities confirmed to continue their local working group;
- and finally active learning in more cities of the home countries (the 'inner circle cities') as well as a reach out to a much larger number of cities and stakeholders.

ACHIEVEMENTS IN FIGURES

The implementation of URBAN LEARNING will have significant energy impacts in support of decarbonisation: For the three million new inhabitants to be accommodated within the next 20 years, it is expected that better governance of integrative urban energy planning can result in energy savings of at least 620 GWh/a and can lead to increased renewable energy production of at least 1.500 GWh/a in the participating cities. With the expected reach-out to other cities this impact will be even higher.

In the participating cities, the project has already triggered many new developments, for example:

In Amsterdam/Zaanstad newly built areas will no longer get connected to the natural gas network. First changes in the urban planning processes in both cities have been made so that energy is dealt with as a specific topic of major importance in all stages.

In Berlin, the project triggered the development of a new "Service point for Energetic Neighbourhood development" to improve governance in integrative energy planning and to overcome the identified lack of actors at quarter level. Main elements were piloted in a concrete quarter ("Obstallee" Borough of Spandau).

Paris included the results from URBAN LEARNING in the new Paris Climate Action Plan (to be adopted 2018) that states dedicated energy aims for urban development, including improvements of urban planning and energy planning governance.

In Stockholm, the project led to the elaboration of a new energy handrail, a process tool used to coordinate the work of the different departments during the building process. The result is a more developed process model for integrated energy planning, which will be further developed.

For Vienna, the project paved the way for two new working groups with representatives of different city departments and external stakeholders to discuss the energy supply of new quarters at the early stage. Furthermore, URBAN LEARNING provided the groundwork for the strategic concept on integrative energy planning currently under development by the City of Vienna.

Warsaw developed new assumptions for its plan of supply with heat, electricity and gas fuels and enhanced the development of the Low-Carbon Economy Plan for Warsaw.

The City of Zagreb worked out a framework for integrative energy planning with strategic and operational energy planning guidelines.

Key information on the technical as well as on the human factors of URBAN LEARNING are captured in two videos:

FOTO: BEATRIX RAUSCHER

HIGH-LEVEL REPRESENTATION FROM THE URBAN LEARNING CITIES TO DEBATE NEXT STEPS TOWARDS INTEGRATIVE ENERGY PLANNING AT FINAL CONFERENCE IN VIENNA.

FROM LEFT TO RIGHT: THOMAS STOLL, PLANNING DIRECTOR STOCKHOLM, OLIVERA MAJIĆ, VICE-MAYOR, ZAGREB; MICHAL OLSZEWSKI, VICE-MAYOR WARSAW; MARLOES MICHELS, DIRECTOR SUSTAINABILITY AND PLANNING, AMSTERDAM; MARIA VASSILAKOU, VICE-MAYOR VIENNA; EPHRAIM GOTHE, VICE-MAYOR OF DISTRICT BERLIN-MITTE; THOMAS MADREITER, PLANNING DIRECTOR, VIENNA.

Approach and main steps

APPROACH: To increase their knowledge and capacity about integrative energy planning the cities of Vienna, Amsterdam, Berlin, Paris, Stockholm, Warsaw, Zaanstad and Zagreb developed a hands-on capacity building approach. It relies on three pillars:

1. A dialogue process to build bridges
   - between disciplines – interdisciplinary, involving different perspectives to urban and energy planning
   - between city departments – from urban development and planning, infrastructure, energy, to housing and environment.

2. Peer-to-peer learning on two levels
   - from other departments within the city, and
   - from other cities (frontrunners, partner cities, etc.),

3. Institutional learning within each city administration, involving hierarchies and units outside the own directorate to pave at the same time the way for the implementation of the identified improvements.

These pillars are not independent but interlocked and support each other.

FOTO: WALTRAUD SCHMID

EXCHANGE

AMSTERDAM, STOCKHOLM, VIENNA

MAIN STEPS: Broken down into a manageable workflow, seven main steps were identified:

1. Formation of an interdisciplinary, cross-departmental local discussion group. This group is the nucleus for the institutional learning and for trust building dialogue. It accompanies and/or is involved in all subsequent steps.

   In the URBAN LEARNING project this group was called “Local Working Group”. Tailored to the local circumstances, the Local Working Groups varied in terms of constellation, size, involvement of external stakeholders, etc.

2. Injection of knowledge: Particularly at the beginning external expertise and knowledge is required to raise awareness and knowledge about different aspects related to low-carbon urban energy systems as well as energy planning.

Due to the interdisciplinary composition of the Local Working Groups it turned out to be very important to dedicate sufficient time to capacity building regarding the "energy perspective" particularly regarding new technological developments and the need for municipal energy planning.

3. In-depth analysis of the current governance processes for planning new urban quarters, investigating the different planning phases and involved stakeholders, the applied instruments and tools as well as the related framework conditions.

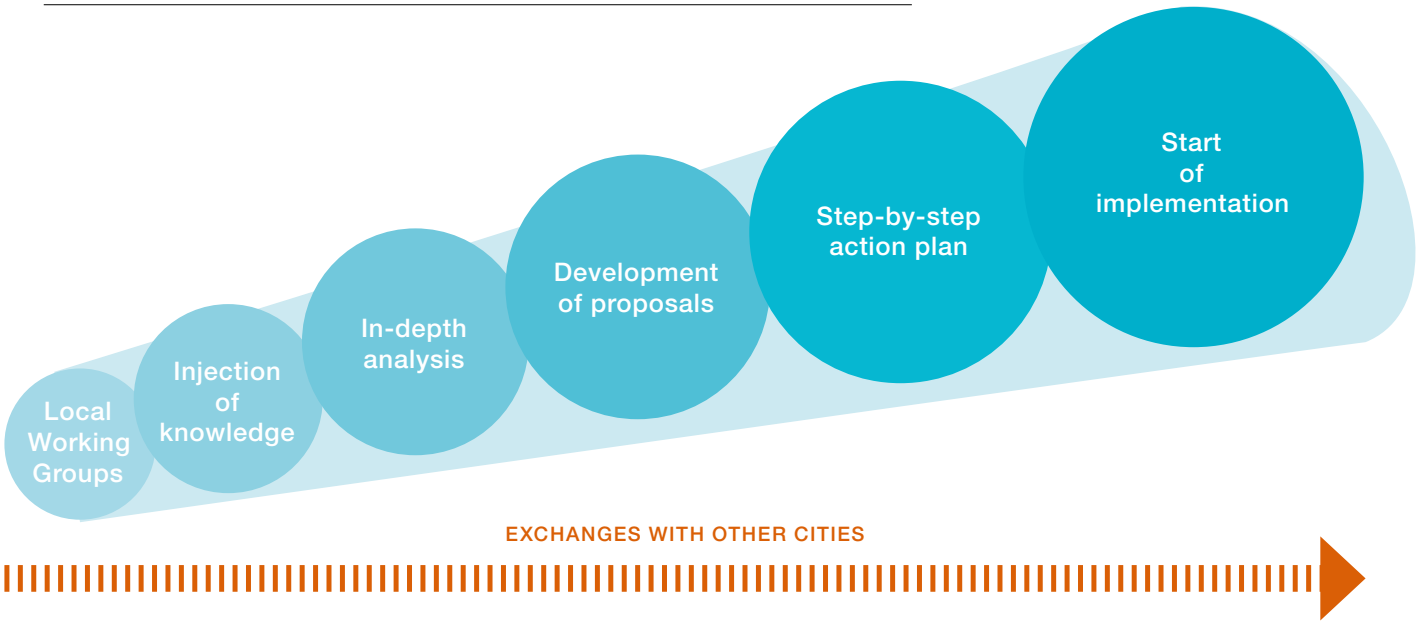
For the analyses of the urban planning processes cities have chosen different approaches: Vienna, Paris, Amsterdam/Zaanstad and Zagreb have analysed their whole planning processes – from idea to implementation – in detail. In Stockholm – with comparison to the process – the analysis was done in a specific lighthouse development area (Royal Seaport). Warsaw and Berlin focused on a section of the process, namely the formal adaptation of specific planning instruments; Berlin, with its focus on urban renovation, emphasised the transformation process for refurbishment of the existing urban quarters. In all cases, process flow-charts were a key outcome.

Instruments and tools were mapped according to a common grid and then analysed regarding strengths, weaknesses, gaps and possible adaptations. Each instrument and tool was assigned to a spatial level and a type using four spatial levels as well as five different types of instruments and six types of tools.

4. Identification of possibilities to integrate energy planning and urban planning: a systematic screening and development of proposals for improvements from the legal framework, strategies, competences, new energy qualities, involved stakeholders, new or upgraded tools, etc.

Based on the analysis of the own urban planning process and the exchanges with peers from other cities, each city identified options and developed proposals for an energy-related upgrade of their governance for urban planning. The output were a number of approaches for upgrading the governance processes in each city on how and where to integrate energy qualities to meet the challenges of decarbonisation and economically viable energy grids.

MAIN STEPS OF URBAN LEARNING



❺. Development of a step-by-step action plan towards integrated urban energy planning ('implementation plan'): identified priorities are further elaborated including responsibilities, next steps and timeframe.

From the full set of possibilities each city derived priority actions and elaborated an implementation plan. In line with local circumstances, the implementation plans range from one very concrete measure with detailed next steps as in Berlin to a set of measures on a more aggregated level in most of the other cities.

❻. Start implementing activities: investments in necessary data, tests of new tools, clarification of competences and responsibilities for municipal energy planning, upgrade of local strategies.

Piloting some of the proposed new elements was part of the activities to gather experiences for large-scale application. And – already during the project duration, opportunities for upgrading the local governance were taken, particularly related to necessary framework conditions such as strengthening the importance of energy planning in strategic city documents.

❼. Exchanges with other cities working on similar issues, with cities from other countries but also with cities from the home country, to enrich the own work with new ideas and to sharpen the understanding of the own situation.

In URBAN LEARNING the European collaboration and thus the constant looking beyond one's own nose, combined with site visits and study tours, were strong means to support the capacity building.

SET-UP In Amsterdam/Zaanstad, Stockholm, Vienna and Warsaw the local working groups were, at least initially, formed only by representatives of different city departments. Paris, Zagreb and Berlin included external stakeholders from the very beginning. Most groups were formed at the occasion of this project, while in Berlin, Paris and Stockholm an existing group was used, enlarged or reshaped with a new focus.

The groups consisted of 10 to 20 members, mostly from different municipal departments related to urban development and planning, land use and district planning, infrastructure, energy, construction, housing, mobility and green space. Larger groups often included also external stakeholders and then had a smaller core group. Members were largely from the operational level.

To strengthen the commitment, the members were formally appointed – in Zagreb e.g. by the Mayor, in Paris by the General Secretary of the City of Paris.

As energy is a cross-cutting issue for which the competences are often dispersed, working with an interdisciplinary group from different city departments is essential. Furthermore, energy objectives might be supporting or conflicting with other objectives, they might also compete with other objectives for scarce financial resources. It is important to understand other perspectives and be aware of trade-offs as well as win-win situations.

Local working groups

Local working groups are interdisciplinary, cross-departmental working groups established in each of the URBAN LEARNING cities to foster the common learning and working together in the city administration. Tailored to the local circumstances these working groups varied in relation to their members, size and focus of work. In many cases, such an interdisciplinary working over a longer period happened for the first time.

City		Amsterdam/ Zaanstad	Berlin	Paris	Stockholm	Vienna	Warsaw	Zagreb
Scope:	City level	–	x	x	x	x	x	x
	Quarter level	x (4 areas)	x	x	x	x	–	–
Based/Related on/to an existing group		–	x	x	x	–	–	–
Focus		new areas	existing areas	new + existing areas	new areas	new areas	existing areas, low carbon area	new + existing areas
Members:	City dep.	x	x	x	x	x	x	x
	Utilities	x*	x*	x		x*	x	x
	Developers	x*	x*	x		x*	x	
	Chambers		x					x

* at later stage

OVERVIEW OF THE LOCAL WORKING GROUPS

AGENDA The groups in Amsterdam/Zaanstad, Stockholm and Vienna focused on new development areas. In Berlin and Warsaw, the Local Working Groups put the renovation of existing quarters into the spotlight while Paris and Zagreb looked at both. Except for Amsterdam/Zaanstad's group, who looked at four specific areas, all other groups addressed both, city level and quarter level.

Fit for purpose was also the agenda and meeting frequency of the groups. Overall, at the beginning, the groups were dedicating time to understand the need and reasoning for integrated urban energy planning and to increase the knowledge, e.g. in relation to innovative low-carbon energy technologies and systems for the city or applied instruments and tools. This capacity building was supported by study tours, which were carried out on specific topics (see chapter on peer-to-peer learning).

Later the groups were involved in the analysis of the urban planning process and elaborated a common picture of the planning process, its framework conditions, the phases and key steps as well as the involved stakeholders. Based on this analysis, the groups were also involved in identifying possibilities for a better integration of energy supply considerations into urban quarter planning processes as well as in the validation of elaborated proposals for improvements.

FOTO: WALTRAUD SCHMID

MEMBERS OF THE VIENNA LOCAL WORKING GROUP DISCUSSING THE URBAN PLANNING PROCESS FROM DIFFERENT DEPARTMENTS' PERSPECTIVE ...

... AND BRAINSTORMING ON PROPOSALS HOW TO UPGRADE IT FOR ENERGY MATTERS.

EVALUATION The Local Working Groups showed that working together over a longer period facilitates the mutual understanding of different arguments and points of view. It enables common learning as institution and increases in the longer run the acceptance of proposals for improvements of the local governance.

In many instances the closer collaboration, between various departments involved along urban planning processes as well as between city staff and external stakeholders (mainly energy supplier and urban developers), or between city administrations as in the case of Amsterdam and its neighbouring city Zaanstad, was a first positive and lasting outcome of URBAN LEARNING.

Feedback from the Local Working Groups members generally confirmed the need for interdisciplinary working across departments ("break-up the silos") and the benefits of working together. Resources should not be forgotten; they were sometimes underestimated, particularly when groups were deeper involved in the elaboration of new proposals.

Working in groups across departments/groups is nowhere standard practice. In many cases, it was rather a first of its kind and an innovative new way of working together.

FUTURE OF THE LOCAL WORKING GROUPS It was one of the objectives to showcase the benefits of working together on cross-cutting topics and have these working groups, in one way or another, "institutionalised". At this point, all cities intend to continue the work of their Local Working Group, and formats are currently negotiated. In Vienna, institutionalisation was already successful with the installation of two working groups: the working group "Stadtteilenergieversorgung", which has members from different city departments and energy infrastructure providers, and the working group for the thematic concept on integrative energy planning.

EXCHANGE IN ZAGREB

FOTO: CITY OF ZAGREB

Urban energy solutions

To support long-term decarbonisation by city planning requires to understand possible energy supply options with their characteristics and planning requirements as well as how planning requirements influence energy demand.

Today in the URBAN LEARNING cities heat is predominantly supplied by central networks of district heating and natural gas. Less dense areas are not connected to a heating grid. The share of district heating is between 0 % and 90 % of the total consumption for heating and warm water; the share of natural gas is between 0 % and 50 %. Sources for district heating vary considerably: in cities such as Warsaw and Berlin the majority is still fossil-fuel based, whereas in Stockholm waste heat and recycled fuels already have the biggest shares, thus significantly contributing to accomplish the climate change objectives.

In the future, there will be more decentralised heating and cooling systems, with many more local sources feeding into the grid and a larger variety of technologies, including storage technologies ("fourth generation of district heating"), connected by smart grid technologies. The temperature level will decrease from over 100 degrees Celsius to 60–70 degrees and lower. The decrease in temperature is needed to enable the use of lower temperature heat from local sources. In urban areas, these local sources are ambient heats from waste water and rivers, the soil, the air and the sun as well as waste heat from industry and service sector, e.g. from data centres, supermarkets and hotels. The decrease in temperature fits also the reduced demand of buildings and to technological changes on the building side (e.g. floor and wall heating).

The decarbonisation of the natural gas grid will partly be a conversion into a green gas grid and partly a reduction of the grid through a switch to district heating or stand-alone alternatives such as heat pumps, pellets, etc. Discussions on the future of gas supply have started. Amsterdam/Zaanstad and more Dutch cities are advanced and have tabled already plans for the phase out of natural gas.

Which options to be pursued where is not least dependent on the heat demand, heat density and locally available resources. Heat density as well as the availability of on-site energy sources is not the same across a city. They differ considerably, which is one of the main reasons for a spatially differentiated approach to energy planning and the integration of energy and urban planning.

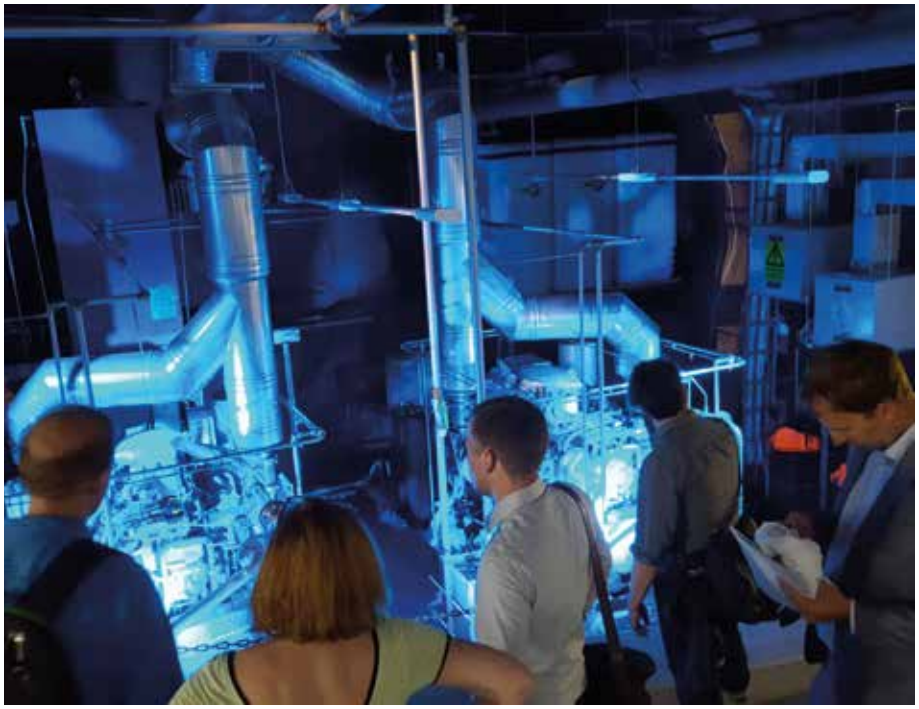


FOTO: MICHAEL CERVENY

URBAN ENERGY RESOURCES: STUDY TOUR FROM VIENNA TO DATA CENTER BAHNHOF IN STOCKHOLM, WHICH FEEDS ITS WASTE HEAT INTO STOCKHOLM'S OPEN HEAT NETWORK

In cities, the decarbonisation of the energy system challenges particularly the transition of the heating and cooling systems and urban mobility and logistics. Technological changes will bring the systems of heat, electricity and transport much closer together, with electricity as the leading energy carrier.

The transformation of the heating systems is also an economic challenge. Not only will this transformation need considerable investments into the heating system, the reduced energy demand of the buildings also impairs the long-term economic viability of grid-connected heating systems.

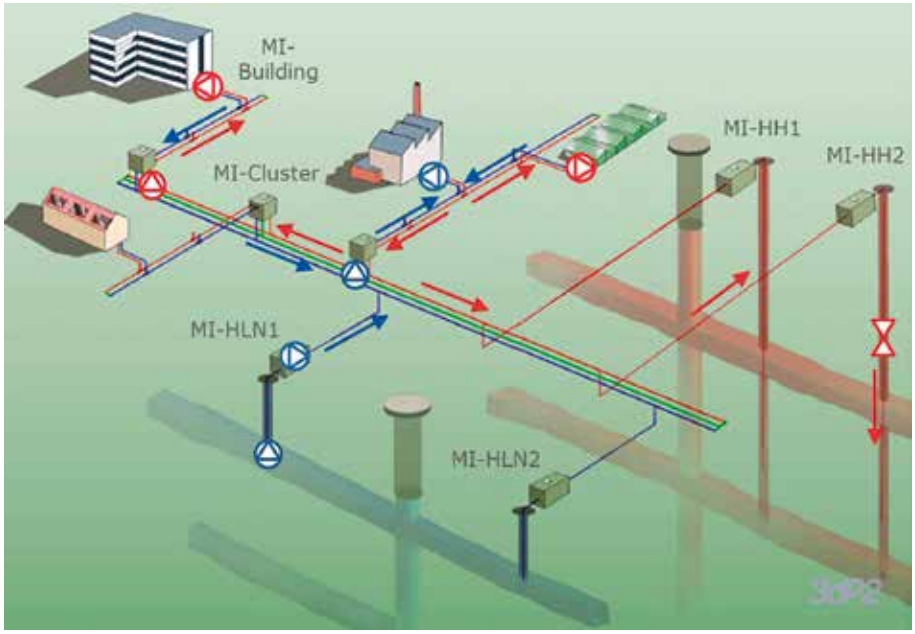
Therefore, early considerations of suitable energy systems in the context of (new) development areas have to address the following questions:

- Which energy demand (for heating, cooling, power, electro mobility) and energy density is expected based on the foreseen land use (residential only /mixed), building density and energy standards? Does this demand support a grid-connected heat supply?

- Which local resources (renewables and waste heat) are available on-site or nearby?

- Which energy supply systems are technically feasible for the development area based on the spatial circumstances, the locally available energy sources and the existing infrastructure? Which ecological factors (CO_2 emissions, primary energy factor, urban heat islands) are expected from different technical solutions?

- How can an energy-efficient and in particular renewable energy supply be realised? Who are potential implementers and operators of the energy supply systems? Which costs incur for which party (tenants, owners, city etc.) through the construction and operation of different energy supply system alternatives?



GRAPHIC: TRI-SKILL BV

STUDY TOUR:

SMART THERMAL GRID MIJNWATER 2.0

There are three main implications for the integration of energy planning and urban planning, regarding current planning criteria, regarding the consideration of local resources and regarding the timing.

IMPLICATIONS FOR HEAT DEMAND THROUGH URBAN PLANNING CRITERIA Heat demand and heat density of a specific quarter depends considerably on land use / building density of an area, use(s) of the buildings, surface-area-to-volume (A/V) relation of the buildings, as well as the energy performance standards for buildings. Except for the latter, all these factors are determined during the formal urban planning phase (zoning plan, building regulation plan) and prepared in the phases before (preparatory planning phase; feasibility and master planning phase). These factors should thus also be consciously recognised and steered from an "energy perspective".

IMPLICATIONS FOR MEETING HEAT DEMAND THROUGH LOCALLY AVAILABLE RESOURCES Which renewable energy sources, sources of excess heat or ambient heat are available on-site or nearby? This question is relevant for urban planning and should be systematically answered sufficiently early in each planning process. Open data systems of cities can facilitate these investigations and many URBAN LEARNING cities have started to improve GIS-supported online data.

In addition to the planning process there are also possibilities to support the transformation to lower temperature heating systems in the framework conditions of planning processes, e.g. could temperature ranges be indicated in building codes as e.g. in the province of Salzburg, Austria.

IMPLICATION REGARDING THE TIMING A key lesson not least from visited lighthouse examples is that considerations of energy supply options, particularly if grid-connected and/or using local resources, should be taken into account much earlier in the planning process, in the very early stages of the process. This, on the other hand, means that there has to be already a sufficiently solid idea of the uses (share of housing) that allows to estimate the heat demand as well as the quality and load profiles of the heat. In the absence of municipal steering towards decarbonisation, this sometimes turned out to become a "chicken and egg situation" between developer and energy provider.

Another argument for early consideration is that it allows a coordinated solution of supply-side and demand-side technologies, which is currently not the case.

FOTO: MARCIN WRÓBLEWSKI

URBAN ENERGY RESOURCES: SITE VISIT TO SLEDGE INCINERATION AND BIO-GAS GENERATION IN WARSAW'S WASTE WATER TREATMENT PLANT CZAJKA (COMBINED POWER AND HEAT GENERATION).

FOTO: WALTRAUD SCHMID

The planning systems of the cities

Starting point for all cities was a common view on the current way of urban planning in the cities – on the spatial planning systems and the role of energy planning.

LEGAL BASIS In all cities except Vienna the legal basis for spatial planning (planning law, building code) is at national level. In Austria, spatial planning is the competency of the provinces, and Vienna – because the city has the status of a province (Land) – can define its rules for spatial planning.
The responsibility for urban planning is in most cities at city level. Only in Berlin and Amsterdam also the districts have certain competencies, though in Amsterdam current revisions will reduce them. In Berlin, the district planning departments are responsible for the building regulation plan as well as for detailed land use planning. In the other cities, the districts only have a responsibility for concrete local urban developments and for smaller-scale decisions such as bicycle lanes.

SPATIAL PLANNING SYSTEMS OF THE CITIES

OVERVIEW OF LEGAL BASIS AND RESPONSIBILITY FOR URBAN PLANNING IN EACH CITY

City	Legal basis for spatial (urban) planning and building regulation (laws, regulations)	Level of legal basis	Responsible unit for urban planning
Amsterdam	Spatial planning law, building regulation => "Space and Environmental law" will replace them as of 2018	national	Department of Physical Planning and Sustainability (part of Cluster Area and Economy)
Zaanstad	Spatial planning law, building regulation => "Space and Environmental law" will replace them as of 2018	national	Urban development domain (with 2 sectors "Urban development" + "Knowledge and Expertise")
Berlin	Spatial Planning Act – Raumordnungsgesetz (ROG), Federal Land Use Directive – Baunutzungsverordnung (BauNVO), (Building Code – Baugesetzbuch (BauGB))	national, (province)	> City: Senate Department for Urban Development and Environment > Districts: Department for Urban Development
Paris	Urbanism Code Building Code	national	Urbanism Department
Stockholm	Planning and Building Act	national	City Planning Administration
Vienna	Building Code of Vienna (is also the Spatial Planning / Urban Planning Act)	province	Municipal Department for Urban Development and Planning (MA18) & Municipal Department for District Planning and Land Use (MA21)
Warsaw	Law on Spatial Planning and Land Management	national	Architecture and Spatial Planning Department
Zagreb	Physical Planning Act, Building Act	national	City Bureau for Physical Planning & City Office for Strategic Planning and Development of the City

KEY PLANNING INSTRUMENTS AND SPATIAL LEVELS

⊸ Strategic urban planning – urban development plan. Each city has an urban development plan (concept) for the whole city. In most cases, it is binding for the city administration but is not binding third parties. It steers land uses (zoning) and city development on a strategic level (as a guiding document).

⊸ Plans and concepts on borough level. All cities use planning concepts for districts or quarters or for special urban development areas. These are most often indicative and vary according to circumstances. Usually, it is a master plan or an urban design concept on different scales. Only Paris (as part of the PLU) and Berlin have binding planning instruments at district level.

⊸ Planning instruments at property/parcel level. The zoning plan (land use plan) and/or building regulation plan (in some cities it is one plan) regulate exactly the land uses (zones), size, dimension, uses for buildings at property level (or for parcels). It is binding on a scale of 1:1.000 or 1:2.000 and available for the whole city (mostly divided in separated planning documents) except for Zagreb and for Warsaw, where it is only available for parts of the city area. Zagreb has a land use plan ('general urban plan') for the whole urban area on a scale of 1:5000. it designates some areas in which a building regulation plan (in Zagreb called 'urban development plan') on a scale of 1:1000 is compulsory, and for the rest of the city the General Urban Plan defines land use and building regulations on parcel level.

PLANNING INSTRUMENTS
AT DIFFERENT SPATIAL LEVELS

City	Guiding urban development instrument(s) at city level
Amsterdam	"Structural Vision Amsterdam 2040" (2011) – Urban development concept translated into > midterm strategy "Strategic Plan" (2015) > Investment Agenda "Koers 2025" (2016)
Zaanstad	> Maak Zaanstad > Vision on urban planning (2012–2020) > Vision on housing (2016–2020)
Berlin	> BerlinStrategie 2030 – Urban development concept; > Land Use Plan on city level – Flächennutzungsplan (scale 1:50.000/1:25.000) > 6 different thematic Urban Development Plans (scale 1:50.000/1:25.000)
Paris	PLU – part "presentation report" & "planning and sustainable development plan" & zoning plan (and additional thematic maps) for the whole city (scale 1:25.000)
Stockholm	City Plan 'The walkable city' = comprehensive plan (2010, under reconsideration)
Vienna	Urban development plan "STEP 2025" (2014) supplemented by thematic concepts
Warsaw	"Study of conditions and directions of spatial development" (2006)
Zagreb	> "ZagrebPlan 2015" (Zagreb Development Strategy) – the ZagrebPlan 2020+ is in drafting process > Spatial Plan of the City (scale 1:25.000)

FOTO: MICHAEL CERVENY

Planning at district / quarter level	Binding instrument(s) in land use planning / at property level (parcels)
Different concepts for development areas	Bestemmingsplan = land use plan and building regulation plan (scale 1:1.000)
Different concepts for development areas	Bestemmingsplan = land use plan and building regulation plan (scale 1:1.000)
District development plans (scale 1:10.000/1:5.000)	Districts: Local Development Plans (building regulation plan) – Bebauungsplan (scale 1:1.000)
PLU – “planning and sustainable development plan” and guidelines for each of 22 urban development areas / districts (scale 1:2.000)	PLU – part regulation & maps (scale 1:2.000, down to parcels)
Different “Structured area plans” for urban development areas (urban design, analysis)	Detailed Plan (building regulation plan, scale 1:1.000 dependent of the project size)
Different concepts for development areas (master plan, urban design)	Land Use / Zoning Plan and Building Regulation Plan (scale 1:2.000; (“Flächenwidmungs- und Bebauungsplan”)
-	Local Development Plans (land use and building regulation plan, scale 1:1.000, binding but available for one third of the urban area)
-	General Urban Plan (scale 1:5.000) (Urban development plans [scale 1:1.000/1:2.000])

URBAN PLANNING PROCESSES Overall the main steps of urban planning processes are similar in the participating cities with various local specificities and details. Variations relate to:

- circumstances that require a change of zoning plan or not,
- procedures for adaptations of the zoning plan,
- size of the development area,
- use of different non-binding instruments (e.g. urban design, master plan) and support tools,
- number of involved city departments, public institutions and private stakeholder,
- involvement of the districts,
- level of public participation (from only public disclosure to high involvement like planning cell).

Generally, the development of urban areas implies a lot of consultation and negotiation over months and years (depending on the size of the development area). For larger areas, the first outcome is mostly condensed into an urban master plan or design for an area. These results are then transferred to and determined in the zoning plan and/or building regulation plan. The process(es) can be roughly divided in the following phases (see next page):

- Preparatory planning phase (exploration, scoping)
- Feasibility studies and master planning
- Formal planning phase (zoning)
- Design and implementation phase
- Operational phase

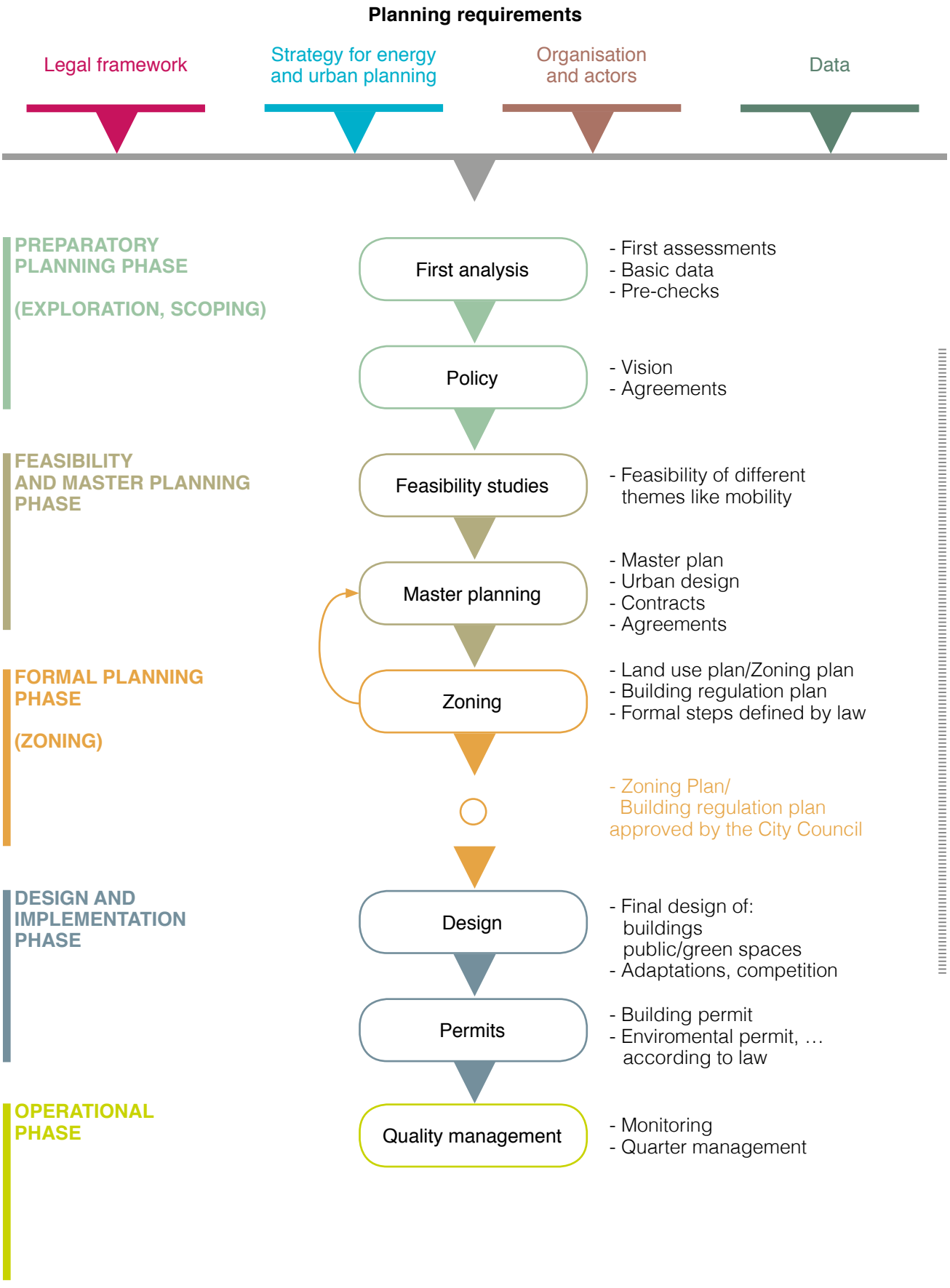
ENERGY PLANNING IN THE CITIES

In this context energy planning refers to all regulations, activities and instruments to steer the local energy supply and transformation of the energy sources used according to political objectives.

In all cities the steering at meta level is largely done by strategies, only in Berlin there is an energy transition law.

Except for Warsaw, none of the participating cities currently has a legal competence for energy (infrastructure) planning. The City of Warsaw has regulatory provisions for spatial designation of energy supply and a strong coordination between city and energy providers. The link to urban planning is missing though.

SIMPLIFIED URBAN PLANNING PROCESS



SOURCE: CITY OF VIENNA, MA20 H. HEMIS

On the organisational level, only in Vienna there is a dedicated department for energy planning within the city administration. As a consequence, the cities define energy objectives but partly lack implementing instruments, especially in relation to the supply of energy, more specifically to the supply of heating and cooling where infrastructure planning is in the hands of energy utilities.

OVERVIEW OF STEERING STRATEGIES, LAWS AND RESPONSIBLE UNITS (AS OF 2017)

City	Local strategies and laws driving energy issues	(Responsible) unit for energy planning in the city administration
Amsterdam	> Agenda on sustainability (2015) > Amsterdam without gas (2017)	Department of Physical Planning and Sustainability – Team Sustainability
Zaanstad	> Zaanse Energy Agenda 2014-2018 (ZEA) > Sustainability fund and subsidies (> Platform for marketing renewables)	Team ZEA, Zaanse Energy Agenda
Berlin	> Integrated Energy and Climate Protection Concept (2016) > Berliner Energiewendegesetz (Berlin Energy Transition Act (2016)	Senate Department for Urban Development and the Environment
Paris	> Climate Action Plan (2012) > (new plan for adoption in spring 2018)	Urban Ecology Agency (part of DEVE Environment Department)
Stockholm	> Vision 2040 > Roadmap 2050 (revision under preparation) > Environmental Programme (> Sustainable Energy Action Plan = SEAP)	City Executive Administration Environment Administration, (Energy specialists at Energy center support the city administration, companies and politicians.)
Vienna	> Smart City Framework Strategy (2014) > KLIP (Climate Action Programme) II 2020 (2009) = SEAP > Urban Energy Efficiency Programme (SEP 2030) in preparation in preparation: thematic concept on integrative energy planning)	Department for Energy Planning (MA20)
Warsaw	> Energy Policy 2020 (2006) > SEAP > Assumptions for plan of supply with heat, electricity and gas fuels > Plans of supply with heat, electricity and gas fuels	Infrastructure Department
Zagreb	(> SEAP) > EEAP	City Office for Economy, Energy and Environment

Instruments and tools[1] used in urban planning processes[2]

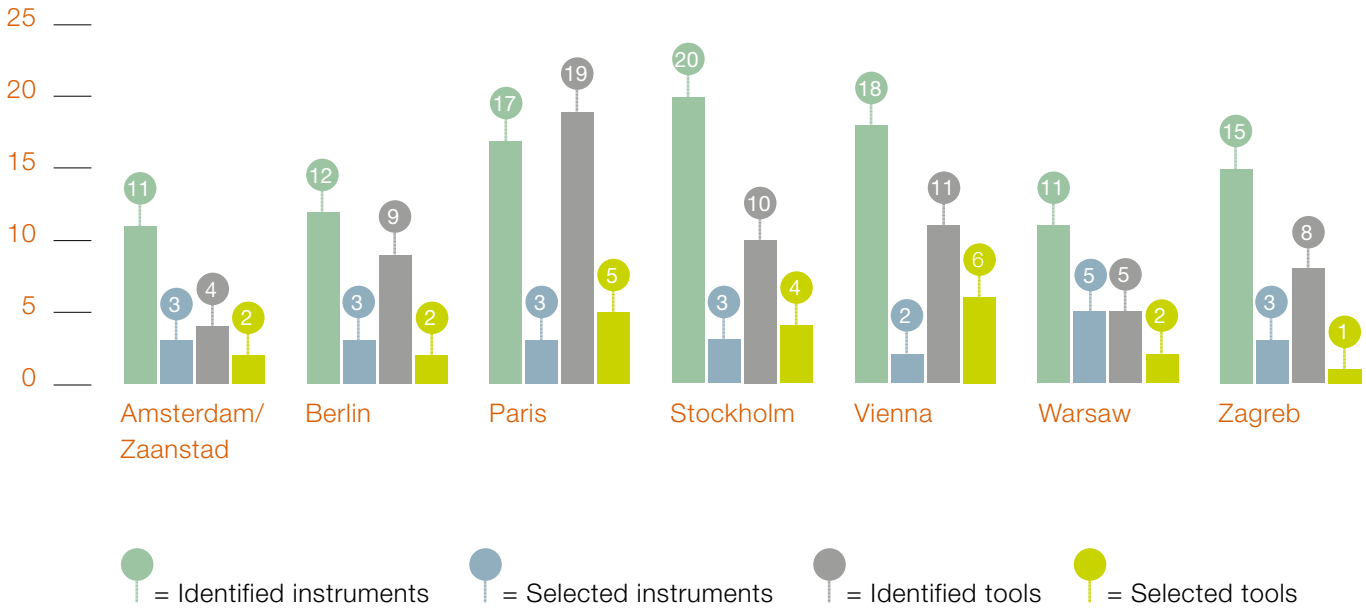
All instruments and tools currently used in urban planning processes that (potentially) impact the energy consumption of quarters were identified. In total, over 170 instruments and tools, 104 instrument and 66 tools. Due to the high number, the analysis focused on the most relevant 22 instruments and 22 tools.

Many of the selected instruments are regulations/laws (with binding character) and strategic documents (with political commitments). The strategic documents include energy and climate strategies or action plans (SEAPs, Roadmaps…) and urban planning documents. They usually apply to the city scale while selected regulations and laws often apply to a smaller scale (from the district to the building). The strategies are often overarching, addressing i.a. energy as well as environmental issues. Specific plans were e.g. a heating plan, a plan of supply with heat, electricity and gas as well as a transport plan. Some cities have also identified competitions as effective instrument to ensure high energy (supply) qualities.

Tools are even more specific to a city's situation. A big part of the selection are data-based tools, including different energy maps and energy databases but also a check of building land and a monitoring system software. Data-based tools are easily available at city scale but rarely at quarter or building scale. There is no tool for only to the quarter level, underlining the lack of support for objectives and activities addressing the quarter level.

Shaped by their framework conditions all cities use a set of energy-related instruments and supporting tools in their urban planning processes. Those were analysed and compared with the other cities, resulting in a structured overview, a gap analysis and a set of good practices that were inspiration for improvements.

IDENTIFIED AND SELECTED INSTRUMENTS AND TOOLS BY CITY



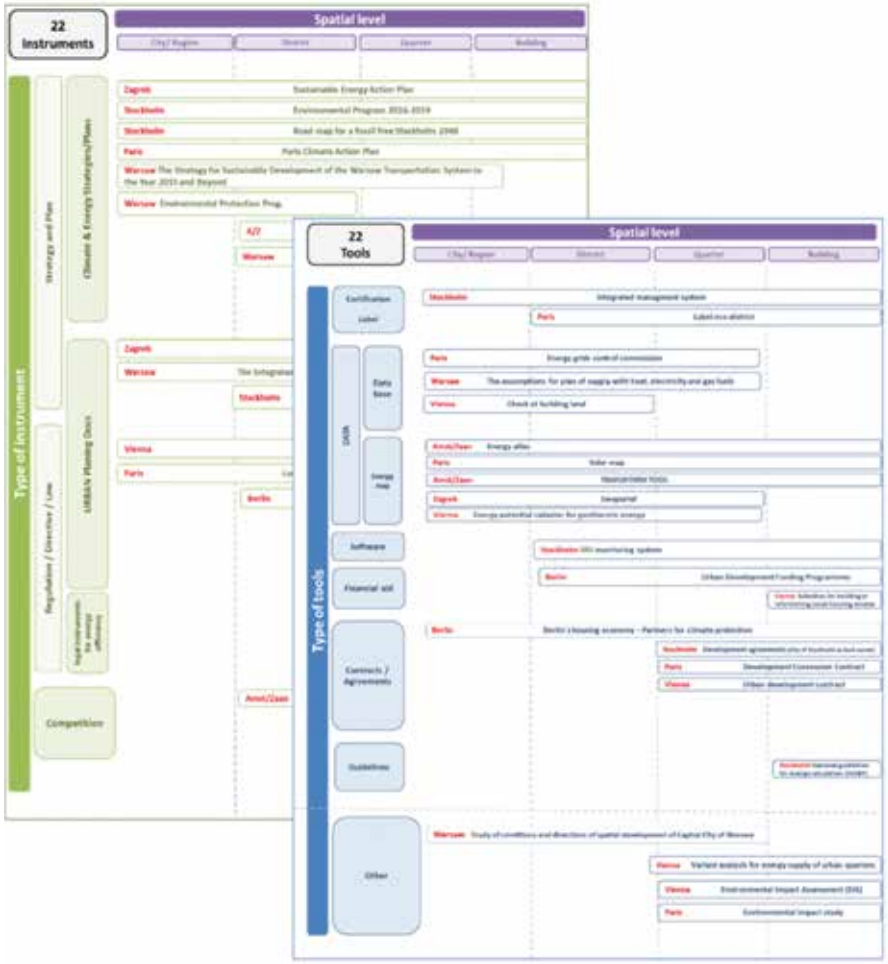
[1]_'Instruments' broadly refer to different ways of influencing energy and urban energy planning, while 'tools' refer to supporting means used when applying an instrument. However, this differentiation is not exact and could thus in some cases also be assessed differently.[2] DETAILS ARE PROVIDED IN DELIVERABLE 3.2 „REVIEW OF INSTRUMENTS AND TOOLS".

Comparing the situation of the URBAN LEARNING cities revealed several gaps:

- Lack of adequate instruments for energy planning (at city and even more at quarter level)
- Need for (improvement of) diagnosis tools and their use at an early stage
- Missing (legal) framework to integrate energy issues in contracts or competitions
- Lack of continuous process management from early planning to implementation
- Lack of performance monitoring after the implementation
- Need for an (environmental) certification at urban project scale

For the identified gaps, possible ways to close them were identified, differentiated according to the stage of development from discussion, experiment/test to under development.

The URBAN LEARNING cities intensively exchanged on the selected instruments and tools to find out how they could be transferred and applied in their city. Particular interest was shown in contracts or negotiated agreements, in certification and labels and in monitoring at quarter level. These exchanges resulted in a collection of good practices, documented as one-pagers for wider dissemination (see following page).

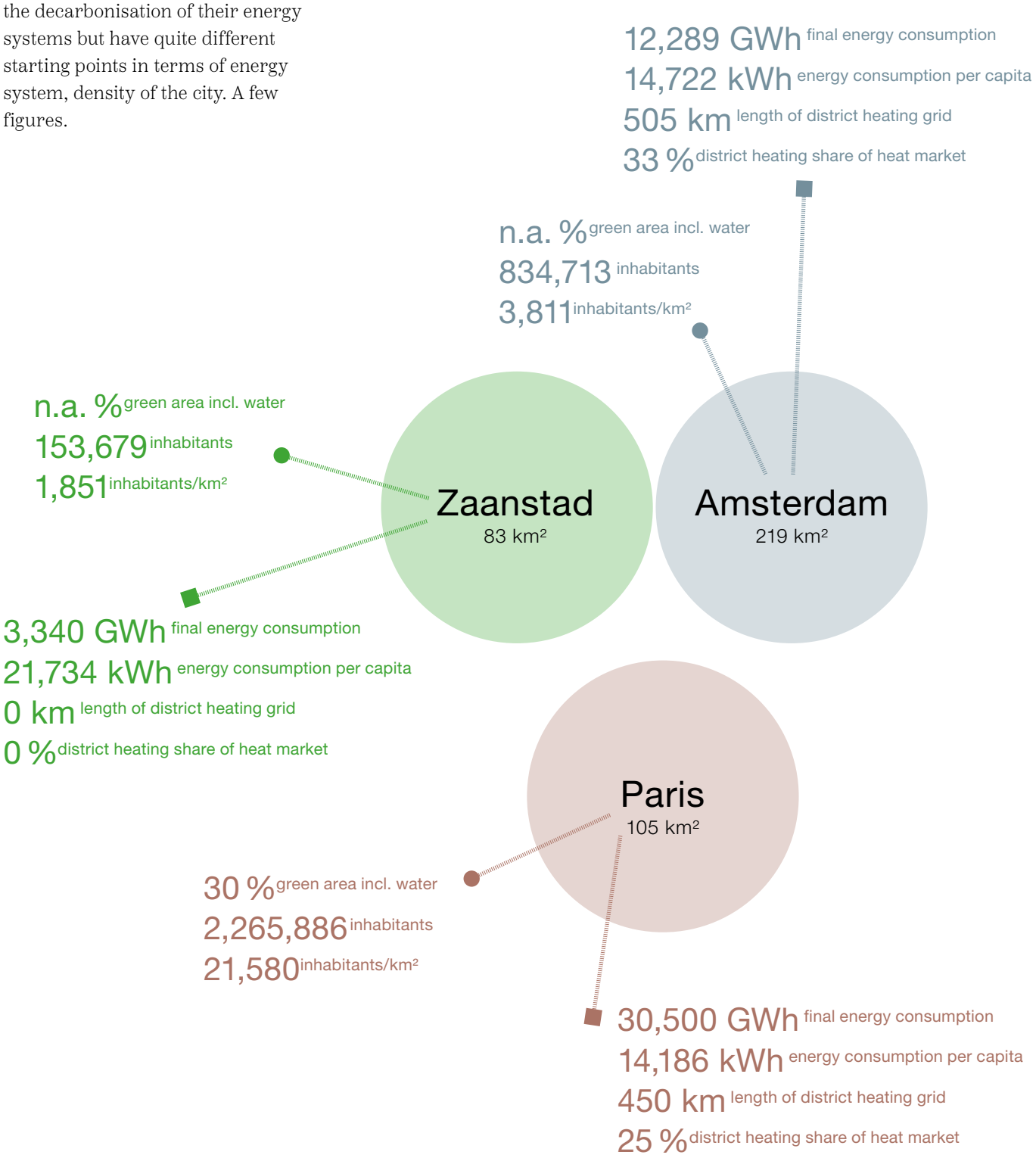


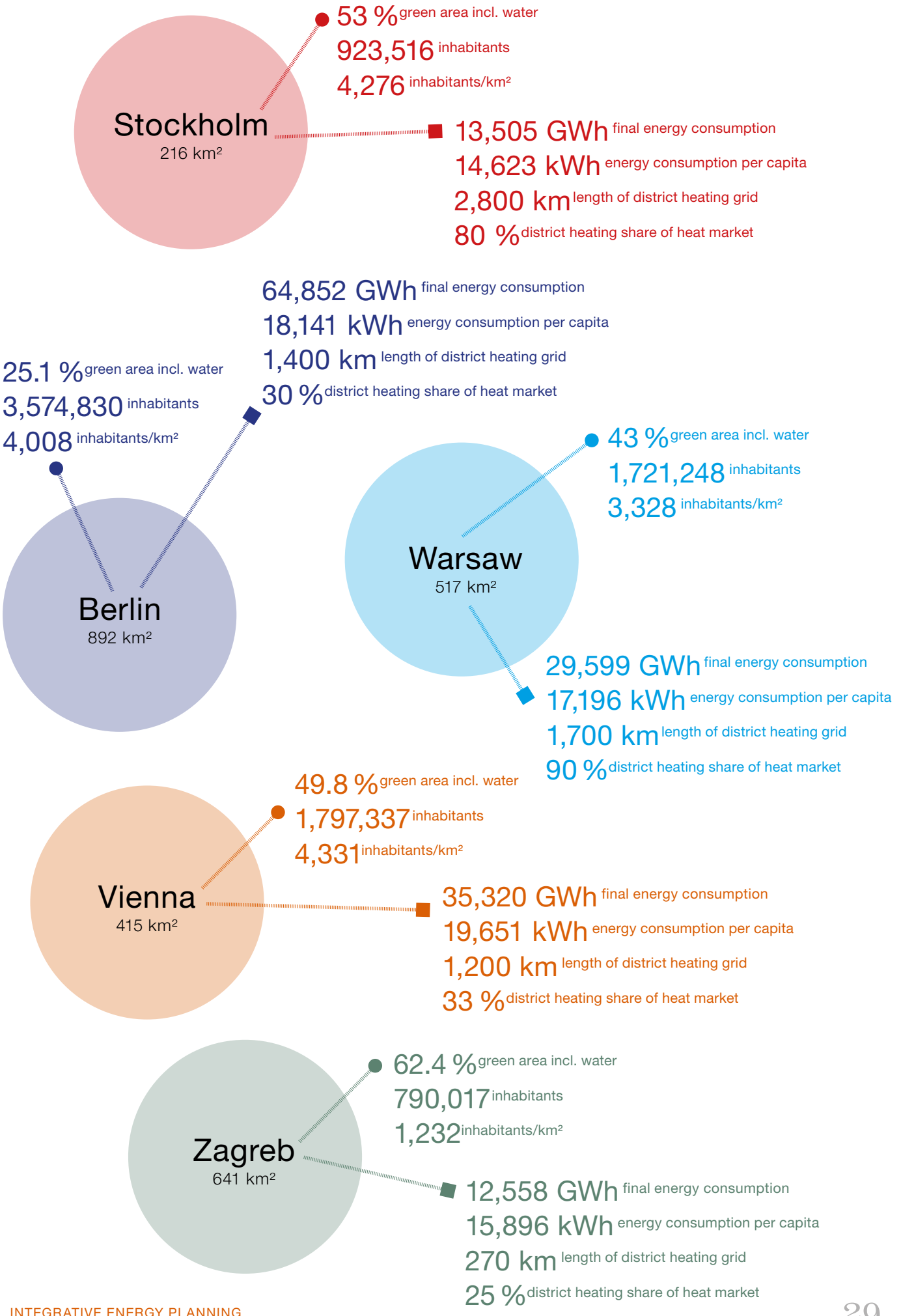
MAPPING OF INSTRUMENTS
AND TOOLS

EXAMPLES OF GOOD PRACTICES FROM
AMSTERDAM, PARIS AND STOCKHOLM

City facts

The URBAN LEARNING cities share common challenges with regard to the decarbonisation of their energy systems but have quite different starting points in terms of energy system, density of the city. A few figures.




Stockholm
216 km²
53 % green area incl. water
923,516 inhabitants
4,276 inhabitants/km²
13,505 GWh final energy consumption
14,623 kWh energy consumption per capita
2,800 km length of district heating grid
80 % district heating share of heat market
Berlin
892 km²
25.1 % green area incl. water
3,574,830 inhabitants
4,008 inhabitants/km²
64,852 GWh final energy consumption
18,141 kWh energy consumption per capita
1,400 km length of district heating grid
30 % district heating share of heat market
Warsaw
517 km²
43 % green area incl. water
1,721,248 inhabitants
3,328 inhabitants/km²
29,599 GWh final energy consumption
17,196 kWh energy consumption per capita
1,700 km length of district heating grid
90 % district heating share of heat market
Vienna
415 km²
49.8 % green area incl. water
1,797,337 inhabitants
4,331 inhabitants/km²
35,320 GWh final energy consumption
19,651 kWh energy consumption per capita
1,200 km length of district heating grid
33 % district heating share of heat market
Zagreb
641 km²
62.4 % green area incl. water
790,017 inhabitants
1,232 inhabitants/km²
12,558 GWh final energy consumption
15,896 kWh energy consumption per capita
270 km length of district heating grid
25 % district heating share of heat market

Integrated energy and urban planning for city quarters

The focus of the URBAN LEARNING project is on the planning of (new) urban areas. What is built from now on lasts beyond 2050 and should thus contribute to a low-carbon city. Project work had three main steps: A thorough analysis of the status of energy planning and urban planning in the participating cities at the beginning, followed by a screening of possible options for a better integration of energy planning and urban planning, resulting in consolidated priorities for upgrading the urban planning process and its framework conditions.

FOTO: MICHAEL CERVENY

ANALYSIS OF THE CURRENT SITUATION

PICTURE:
ECO-QUARTIER PARIS CLICHY-BATIGNOLLES

For the planning of new areas energy qualities relate to the following aspects:

1. the way an area and its buildings are defined in terms of density, volume, surface and use,
2. the way buildings and infrastructure are constructed,
3. the way the constructed buildings/areas are supplied with energy, and
4. the way transportation in an area is planned and realised.

While 1. and 4. are already subjects of urban planning processes, 2. is primarily regulated in overarching building codes and less a subject of urban planning and 3. could be a subject of urban planning processes, particularly in grid-compatible areas, but in most participating cities this is currently not the case. Discussions about integrating energy and urban planning thus centre on the 3rd aspect, the planning of the energy supply for an area.

Up to now the binding planning instrument(s) of the cities do not include any designations for energy supply and none of the participating cities follows an integrative energy planning approach. Urban planning and energy (supply) planning are not connected; energy (infrastructure) planning is not understood nor treated as essential part of urban planning.

Main findings from the analysis of the current governance of urban planning in relation to the application of energy qualities are:

- Climate change objectives are the key driver for energy policy. This affects responsibilities. All participating cities have climate (and energy) targets in place, many of them as part of an overarching strategy. Energy issues are thus mostly a subtheme – of climate protection or sustainability. Hence, environmental departments are often responsible for related activities.

- Municipal competences and capacity for energy planning were partly lost with liberalisation of EU energy markets. Before the liberalisation of the EU energy markets bigger cities often had own energy companies. Unbundling resulted in separating or selling the energy utilities and energy (infrastructure) planning is nowadays predominantly done by network operators and energy providers. The only city that currently has responsibilities for energy planning is Warsaw. As traditionally energy planning is linked with infrastructure, the responsibility for it is organised separately from climate protection and sustainability issues.

- There is significant indirect impact from urban planning on the energy consumption of the built environment. The way buildings for a new urban area are defined in terms of density, volume, surface and use as well as the way transportation is planned impacts on the energy demand of quarters – e.g. denser buildings need less energy, alternative multi-modal mobility offers can reduce the space for garages and the energy demand for transportation. As energy qualities, they are currently rather unnoticed and therefore not consciously steered from an energy point of view.

- Energy supply aspects are not considered in the planning process for new urban areas. Energy supply solutions for new development areas, even for grid-bound infrastructure such as gas and district heating, are usually decided between developers and energy providers. There is little to no municipal involvement / steering for the grid-bound energy systems.

- The point of property sale is a crucial moment not well used for steering decarbonisation yet. Large landowners, as the cities of Stockholm, Paris and Amsterdam, have here an important lever at hand. Stockholm, who owns 70 % of the city's land, is the only URBAN LEARNING city that uses this possibility in a consequent manner. The steering strategy for the energy requirements is the Environment Programme for the City of Stockholm from 2016–2019. In the case of private landownership, a city could integrate energy issues in voluntary contracts. This possibility is currently only used in Stockholm.

- The quarter level lacks actors. Responsibilities are clear at building level as well as city or district level but – unless a development agency is created for a development area – joint solutions for groups of buildings lack advocates.

- Qualities are lost throughout the process. If no development agency is in charge, the responsibility changes often several times throughout the process (see simplified urban planning process on page 23). This frequently results in a loss of qualities from one step to the next.

INTEGRATED ENERGY AND URBAN PLANNING FOR CITY QUARTERS

- Lighthouse projects show the way. Some cities already have lighthouse projects that include first approaches towards integrative energy planning and demonstrate the way towards carbon-free urban quarters. A good practice example is the development area Clichy-Batignolles in Paris. Such lighthouse projects can serve as drivers and urban living labs, though difficult to replicate in their full complexity due to special funding or legal conditions for lighthouse areas.

- Regulatory possibilities of cities are limited. A lot of relevant regulations are adopted at the national level. Still, cities can be frontrunners and influence adaptations of these regulations to enforce integrative energy planning at the local level.

- There are many guidelines and tools but voluntary and not integrated in the processes. E.g. guidelines for the installation and use of heat pumps, or cadastres for the potentials of geothermal or solar energy.

- Areas for refurbishment need different instruments. While the challenge to reduce the energy consumption of existing quarters is much higher than for new buildings, the possibilities to reduce it through urban planning processes are smaller.

PROPOSALS FOR UPGRADING THE GOVERNANCE PROCESSES

Developed proposals are not only covering the core of the planning processes but also the related framework conditions such as the legal framework, overarching strategies or the organisational structure. In fact, it turned out that the framework conditions are of great importance and have to be put in place first before being able to effectively adapt the planning process. Generally, the ideas and suggestions include new elements as well as adaptations of existing elements. They are partly complementary and partly alternative options as there is not only one way to achieve future low-carbon quarters.

The proposals are at different stages of development ranging from idea, under negotiation, already committed but not yet implemented, or already implemented.[3] They can be grouped into the following main topics:

1. Legal framework – to upgrade the legal framework to enable and enforce integrative energy planning

2. Strategy for energy and urban planning – to anchor decarbonisation and energy transition in all relevant strategies of a city, which thus should show the way until 2050

3. Organisation and actors – to adapt the city administration (structure and tasks) as well as the cooperation with stakeholders

4. (GIS) Data – to provide appropriate data as important basis for sound planning

5. Planning specifications – to steer concrete urban developments with requirements for energy qualities to be met

6. Urban planning process – to adapt elements from different phases of the urban planning process.

[3]_Proposals were compiled in city reports and then summarised in the synthesis report "INTEGRATING ENERGY IN URBAN PLANNING PROCESSES – INSIGHTS FROM AMSTERDAM/ZAANSTAD, BERLIN, PARIS, STOCKHOLM, VIENNA, WARSAW AND ZAGREB (D 4.2)".

Many topics focus on improving the framework conditions. Only the last two topics address directly the urban planning process and specifications for concrete urban developments.

FRAMEWORK CONDITIONS Proposals for improving the framework conditions aim to

- take and assume responsibility for strategic energy planning at city level,
- define a "keeper" for energy planning in the administration,
- have a clear and common vision for energy transition towards decarbonisation,
- connect strategic and operational level through legal, organisational and procedural changes, and
- provide sufficient energy-related (GIS) data to support informed decision-making at strategic and operational level.

AN OVERVIEW OF THE PROPOSALS MADE TO IMPROVE THE FRAMEWORK CONDITION PROVIDED IN THE FIGURE ON PAGE 40.

DATA

For all cities, it is important to have a comprehensive set of energy relevant data in good quality as part of its framework. This data should be available in GIS (Geographic Information System) format to link energy issues (e.g. energy consumption, kind of energy supply) with spatial units such as buildings, properties/plots or building blocks. To ensure this, it is essential to create a legal basis for exchanges of data between the city and the grid operator(s). In France, the Netherlands, Poland or Sweden regulations or commitments for data exchange exist.

A sound data base with visual applications is an essential basis for assessing the energy system and developing appropriate decarbonisation scenarios. For its planning a city needs to know how energy demand and heat demand will develop until 2050 (considering the high efficiency of new buildings and the decrease of demand due to renovation of existing buildings) and how this demand can be met, using as much as possible local energy sources.

As this differs for different parts of a city a sound data base is also part of the legitimation for the designation of energy zones and related measures.

PLANNING REQUIREMENTS Energy objectives and strategies are normally defined at city level. To link the strategic with the operational level, there is a need to break these objectives down to the borough level of districts, quarters and building blocks and to agree on appropriate indicators and criteria. This could be done by a city-wide energy zoning concept and/or by more detailed energy concepts for different areas of the city. While some indicators are relevant for all areas, some issues need to be determined specific for each area because of different preconditions and possibilities (e.g. availability of waste heat or grids). Clarification is furthermore needed how binding these criteria should be (e.g. CO_2 thresholds depending on the area defined in contracts or in agreements). This would contribute also to planning security for developers, energy providers and grid operator.

AN OVERVIEW OF THE PROPOSALS MADE REGARDING PLANNING REQUIREMENTS IS PROVIDED IN THE FIGURE ON PAGE 41.

AN OVERVIEW OF THE PROPOSALS MADE REGARDING THE PLANNING PROCESS IS PROVIDED IN THE FIGURE ON PAGE 42.

URBAN PLANNING PROCESS The proposals regarding the improvement of the urban planning processes aim on the one hand to provide suitable energy qualities / criteria for the quarter level (broken down from strategic level) and on the amelioration of the whole process through guidelines or better coordination. Other proposals address a specific phase of the urban planning process, particularly the preparatory phases and the formal planning phase.

Implementation plans

The elaborated implementation plans show specific pathways towards integrative energy planning. They are a priorised selection taken from the possible approaches for integrative energy planning. They focus on the short to medium term and delineate the next steps in the process for key elements, responsibilities and an indicative timeframe.

In most cases the implementation plans have a time horizon of about five years. Nevertheless, longer term elements are also included. The implementation of some of the mentioned elements has already started; for some of the suggested elements the implementation is dependent on the realisation of other elements. The plans are “work in progress” and all cities are committed to implementation[4].

AN EXCERPT FROM STOCKHOLM’S IMPLEMENTATION PLAN IS SHOWN ON PAGE 43.

Across all cities, the elements of the implementation plans can be clustered into themes such as data, strategies or organisation. The figure on the pages 44–45 provides an overview of all elements by city and categories.

Energy data and studies: To provide a sound basis for decision-making, proposals for GIS-based energy data, particularly to assess and forecast heat demand and how to meet it, are included in the implementation plans of most cities:

- Amsterdam: Energy Atlas, Calculation tool, Map heating sources, different energy studies for urban projects
- Berlin: Energy Atlas, Refurbishment Map
- Vienna: Energy Atlas, Basic Energy Data Model, Basic Building Data Model
- Warsaw: E-Map, Adaptation of the assumptions (new data and scenarios)
- Paris: Paris 3D model integrating energy, energy studies for urban projects
- Stockholm: GIS based energy data
- Zagreb: Urban Energy Study

Strategic documents and guidelines: Most of the cities want to implement a dedicated energy vision or strategy (in addition to climate strategies) to define objectives for the required energy transition, often with a specific focus on the heating and cooling sector:

FOR DETAILS SEE DELIVERABLE 4.3 “IMPLEMENTATION PLANS FROM AMSTERDAM/ZAANSTAD, BERLIN, PARIS, STOCKHOLM, VIENNA, WARSAW AND ZAGREB”.

- Amsterdam: Agenda Sustainable Amsterdam, Strategy 'Towards a city without natural gas' and Study for Sustainable Heat
- Berlin: Urban Energy Planning Guidelines

- Stockholm: Energy strategies for urban projects
- Paris: PLU – Energy guidelines (thematic OAP)
- Vienna: Energy Framework Strategy
- Zaanstad: Environmental vision, Heating vision
- Zagreb: General energy planning guidelines

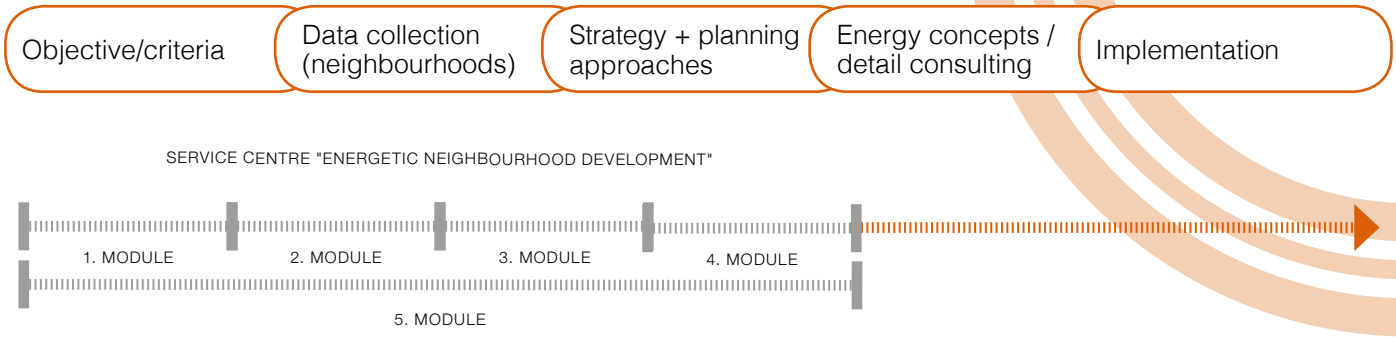
Organisational framework and integration of stakeholders: All cities intend to define clear responsibilities in their respective city administrations for integrative energy planning or build on existing ones. In some cases, it is not a separate unit but rather a permanent working group, committee or board:

- Amsterdam: Programme 'City without gas'
- Berlin: Service Point for Energetic Neigbourhood Development
- Stockholm: City-wide energy group
- Paris: Energy Board/Committee
- Zagreb: Administrative unit for energy planning

BERLIN

Berlin's proposal hooks on the regular funding procedure for urban renewal ("Stadtumbau Ost/West"), which requires as main element the initiation of Energy Neighbourhood Concepts for the refurbishment of the building stock in a selected area. A new, currently missing, organisational element is proposed: the "Service Centre for Energetic Neighbourhood Developments". This service centre takes over a strategic role and points out interfaces between different planning instruments (e.g. Building Regulation Plan) and processes to integrate energy at the quarter level. It is designed to close the gap between the city and the district authorities and to support and guide the process with the relevant stakeholders in an area. Furthermore, it should develop all relevant basic information and strategic paper as an important input for the Energy Neighbourhood Concept – see the figure below – or related urban energy actions. Finally, this organisational element should guide and give advice until implementation. Such a service point is currently tested in the quarter "Obstallee" (part of an urban transformation zone) in the district of Spandau.

"SERVICE CENTRE FOR ENERGETIC NEIGHBOURHOOD DEVELOPMENTS" – CENTRAL PROCESS PHASES



BERLIN – SERVICE CENTRE ENERGETIC NEIGHBOURHOOD DEVELOPMENT – PHASES AND MODULES. SOURCE: BERLIN ENERGY AGENCY

Planning instruments for spatial coordination of the energy supply: The implementation plans of some cities focus on planning instruments which enable a spatial coordination of energy issues:

- Amsterdam: Heating Plan, Extended zoning plan, Preparation of Environmental Plan
- Vienna: Thematic concept for integrative energy planning, Energy Zoning Plans, Energy Development Plan
- Paris: PLU – Energy guidelines (thematic OAP), Energy Master Plan
- Zaanstad: Preparation of Environmental Plan

AN OVERVIEW ON THE ELEMENTS OF THE CITIES' IMPLEMENTATION PLANS IS PROVIDED IN THE FIGURE ON PAGES 44–45.

Contracts as steering instrument: Cities also plan the use of contracts including energy qualities. Contracts are usually based on negotiations between the city and the developer, land owner or buyer. Though voluntary, at the end they will be legally binding:

- Amsterdam, Stockholm, Vienna, Warsaw and Zaanstad: voluntary 'urban contracts'
- Paris: concession contracts with developers and land sale contracts to define energy requirements.

Tools are included for different planning phases:

- Stockholm: Energy calculation tools and methods help to calculate the energy performance of a building in an early planning stage. Handrail tool (Ledstången) for structural definitions of planning processes
- Amsterdam and Zaanstad: Plaberum relaunch to ensure the coordination of energy issues between different departments as well as with developers and energy providers.
- Paris, Stockholm and Zagreb: monitoring for quality assurance

FOTO: ROLAND KLOSS

FOTO: WALTRAUD SCHMID

Peer-to-peer learning

The URBAN LEARNING project counted on peer-to-peer learning as effective learning method for city administrations – within each city administration and from one city to another. Ample opportunities and a variety of formats were used to foster this learning.

SITE VISITS IN THE PARTICIPATING CITIES

During consortium meetings site visits to innovative development areas were organised by members of the Local Working Groups and other experts from the city, developers and energy companies. They delivered insights into the different aspects from local governance to technical and economic concepts as well as involved stakeholders.

STUDY TOURS TO OTHER CITIES

Another effective way to deepen the understanding of various aspects of integrative energy planning were dedicated study tours. The topics were chosen fit for purpose by the members of the Local Working Groups to support their discussions and learning. The tours covered innovative energy solutions as well as planning instruments and governance aspects. In total 12 study tours were carried out. Destinations and topics of the study tours were:

STUDY TOURS

City visited	Topic	visited by
Munich (DE)	Energienutzungsplanung, data requirements	Vienna
Tübingen (DE)	Area of passive house buildings with district heating	Stockholm
Freiburg (DE)	Quartier Vauban, policies for energy transition	Warsaw, Stockholm, Amsterdam, Zaanstad
Stockholm (SE)	Excess heat from data centres for open heating grid	Vienna
Knivsta (SE)	Passive house buildings in cold climate, business model	Stockholm

PICTURES:
EXPLORING AMSTERDAM'S AND ZAANSTAD'S DEVELOPMENT AREAS BY BICYCLE AND BY BOAT

Paris (FR)	Heat supply and governance of Paris Clichy-Batignolles	Vienna
Metz (FR)	large urban development projects, governance issues including the role of public utility in the implementation of municipal policies	Paris
Koprivnica (HR)	Eco-houses with e-mobility	Zagreb
Heerlen (NL)	Underground mine water and thermal smart grid	Amsterdam, Zaanstad
Manchester (UK)	Policies for energy transition, low carbon heat network projects	Berlin
Dublin (IE)	municipality wide spatial energy demand analysis	Berlin
Copenhagen (DK)	planning and implementing low carbon areas, cooperation with external stakeholders	Paris, Warsaw

REPRESENTATIVES FROM DIFFERENT CITY DEPARTMENTS OF VIENNA, DEVELOPER AND ENERGY UTILITY AT ECO-QUARTIER PARIS CLICHY-BATIGNOLLES,

STUDY TOUR TO SMART THERMAL GRID IN HEERLEN

FOTO MICHAEL CERVENY

While the consortium meetings were the place to exchange with cities from other countries, the "Inner Circle of Cities" (ICC) was dedicated to exchanges with cities from the same country, acknowledging the importance of legal framework and planning cultures as well as of the advantage of speaking the same language.

Each URBAN LEARNING city chose 1-3 interested cities from its country, in total 13 cities and two associations of cities. With these cities, a closer link was established and lessons from the process analysis as well as thoughts about ways to improve the integration of energy and urban planning were shared at an early stage. This let more cities participate in the project work, helped to sharpen own ideas and provided feedback towards robust recommendations for replication. The exchanges were organised in a tailored way, back-to-back with network meetings, during joint study tours or as separate dedicated meetings.

THE INNER CIRCLE OF 13 CITIES AND TWO ASSOCIATIONS OF CITIES

- **AT: GRAZ, SALZBURG**
- **DE: FRANKFURT, HAMBURG**
- **FR: LYON, METZ, RENNES, PLAINE COMMUNES (9 CITIES)**
- **HR: KARLOVAC, KOPRIVNICA, VELIKA GORICA**
- **NL: LEIDEN**
- **PL: GDYNIA, NIEPOLOMICE**
- **SE: STOCKHOLM COUNTY COUNCIL (25 CITIES)**

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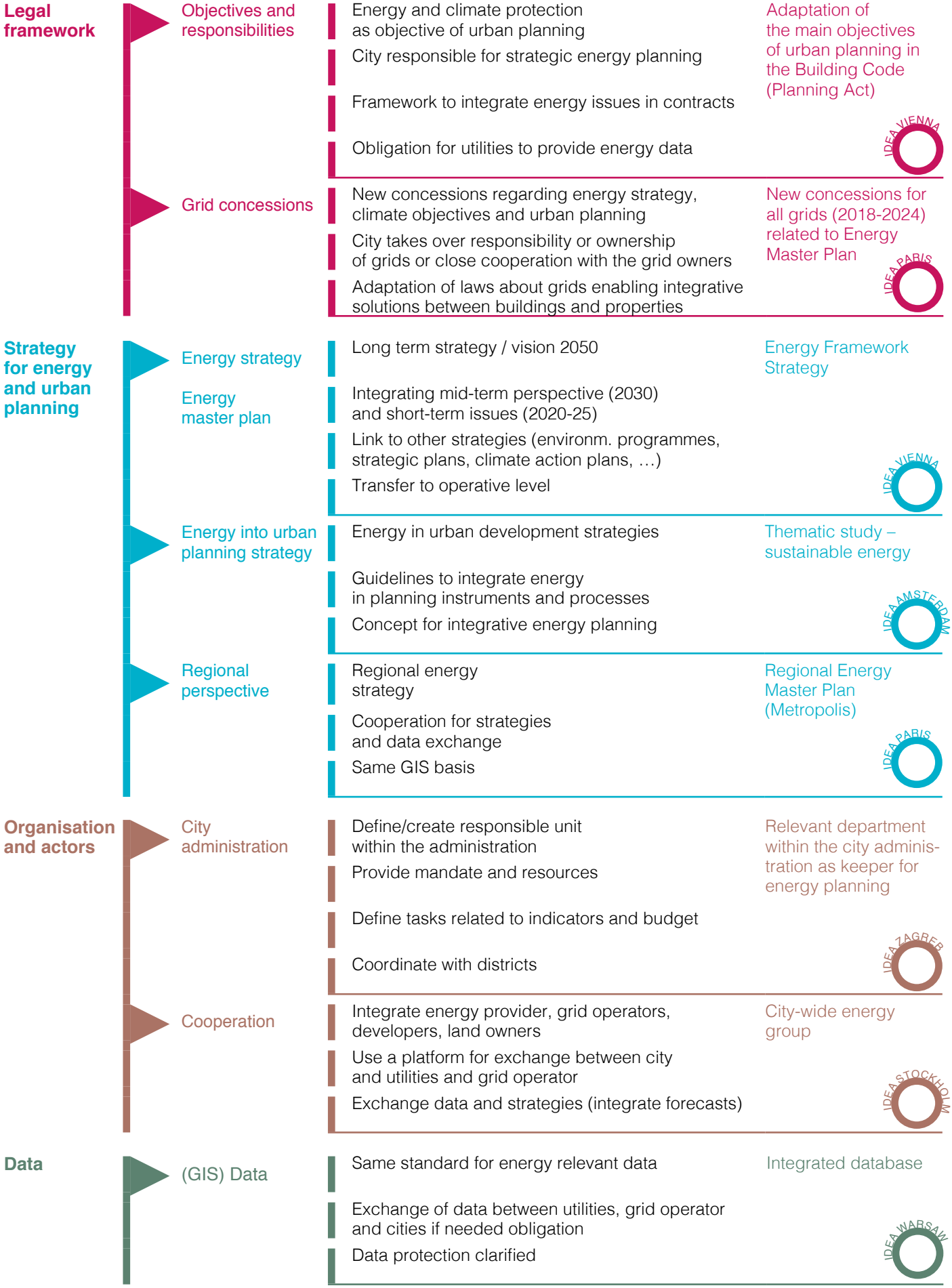
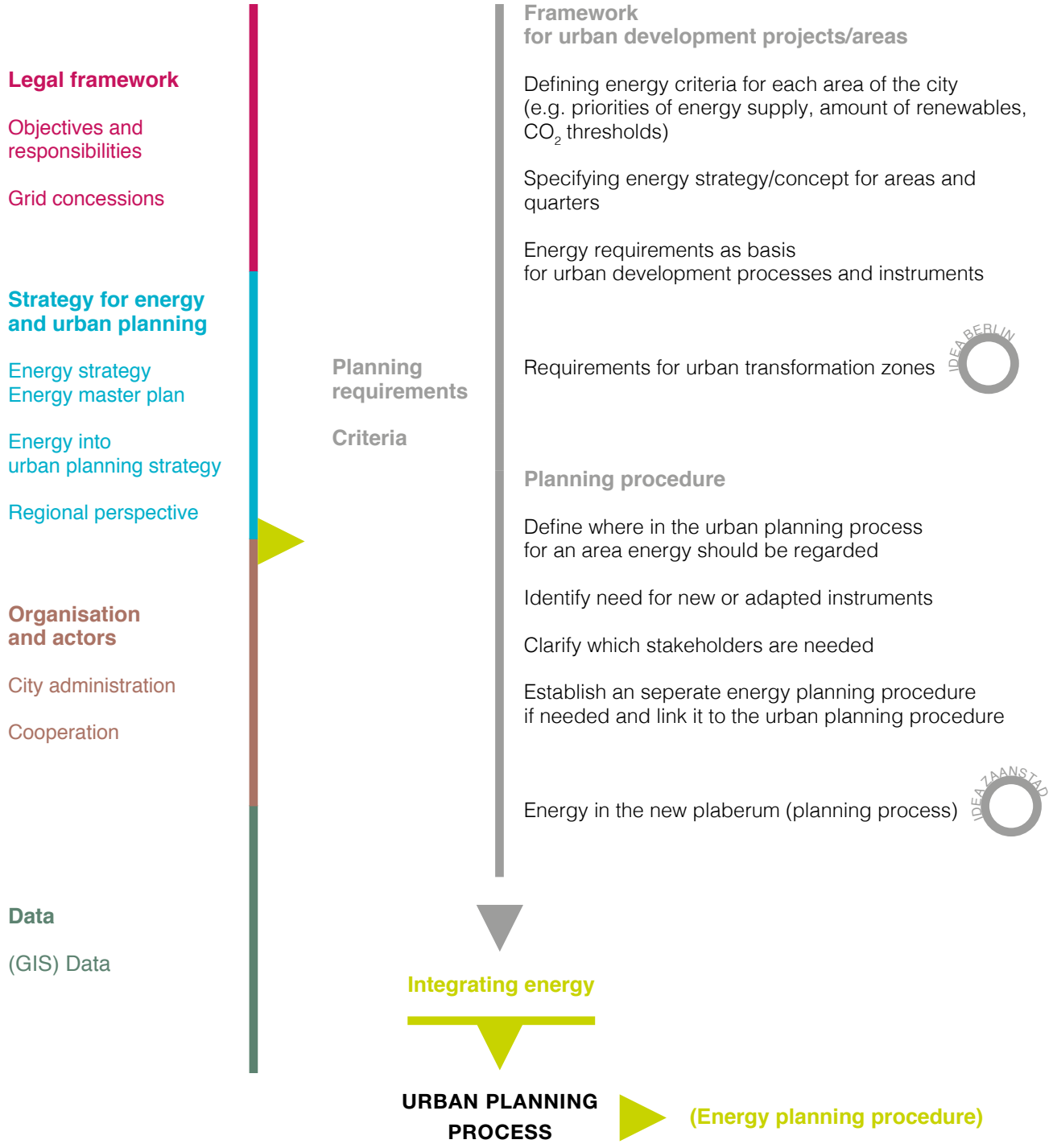
STOCKHOLM CITY ADMINISTRATION AND THEIR ICC, STOCKHOLM COUNTY COUNCIL, STUDYING A PROJECT IN INTERNATIONAL PASSIVE HOUSE STANDARD IN KNIVSTA, 50 KM NORTH OF STOCKHOLM. KNIVSTA CITY COUNCIL HAS OVER THE LAST 5-10 YEARS DECIDED THAT ALL NEW DEVELOPMENT PROJECTS SHALL BE BUILT IN INTERNATIONAL PASSIVE HOUSE STANDARD.

ELEMENTS FOR ENERGY-UPGRADED GOVERNANCE PROCESSES – OVERVIEW OF ALL CITIES



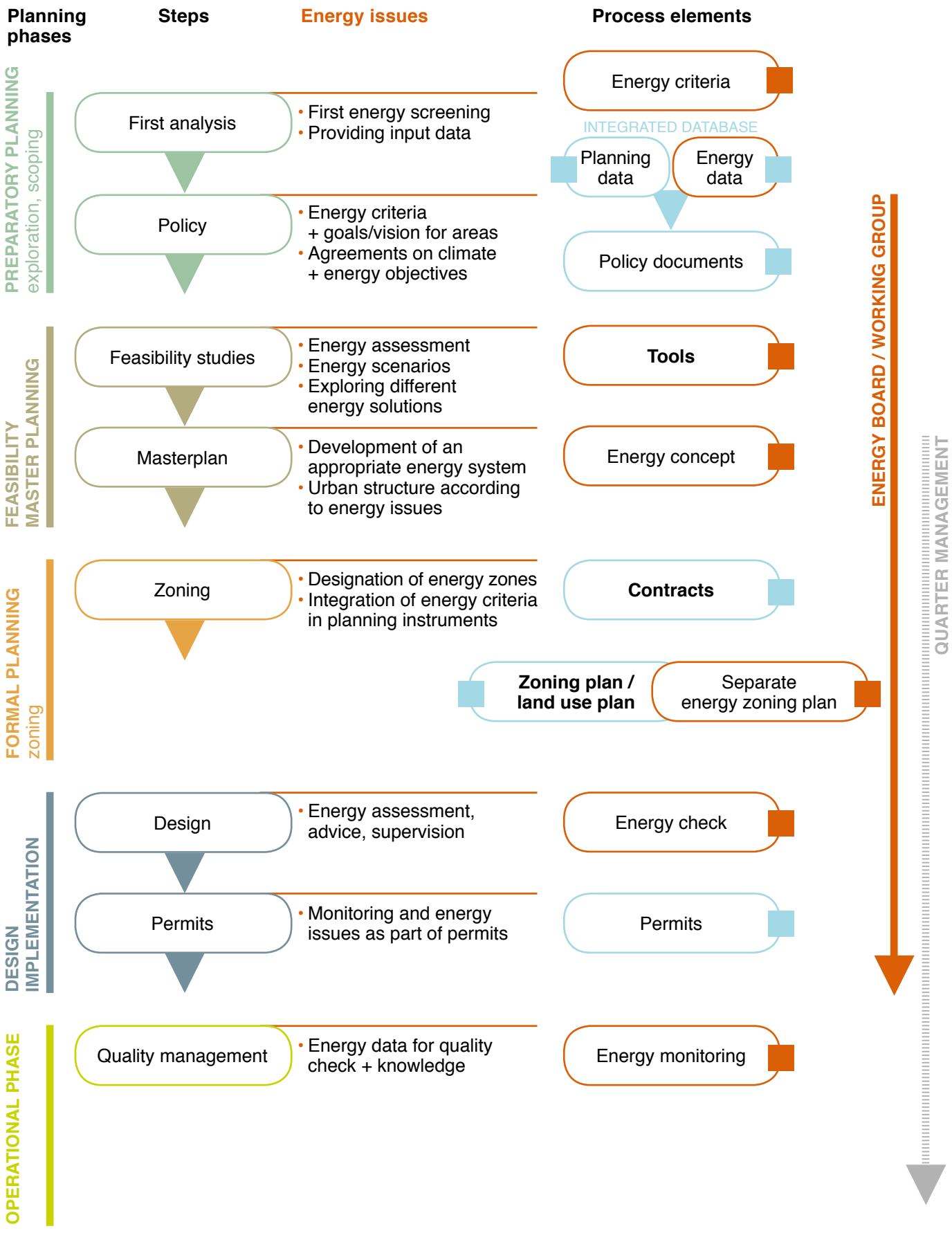
SOURCE: CITY OF VIENNA, MA20 H. HEMIS

ELEMENTS FOR ENERGY-UPGRADED GOVERNANCE PROCESSES – OVERVIEW OF ALL CITIES / 2



SOURCE: CITY OF VIENNA, MA20 H. HEMIS

PPROPOSALS FOR UPGRADING THE PLANNING PROCESS *)



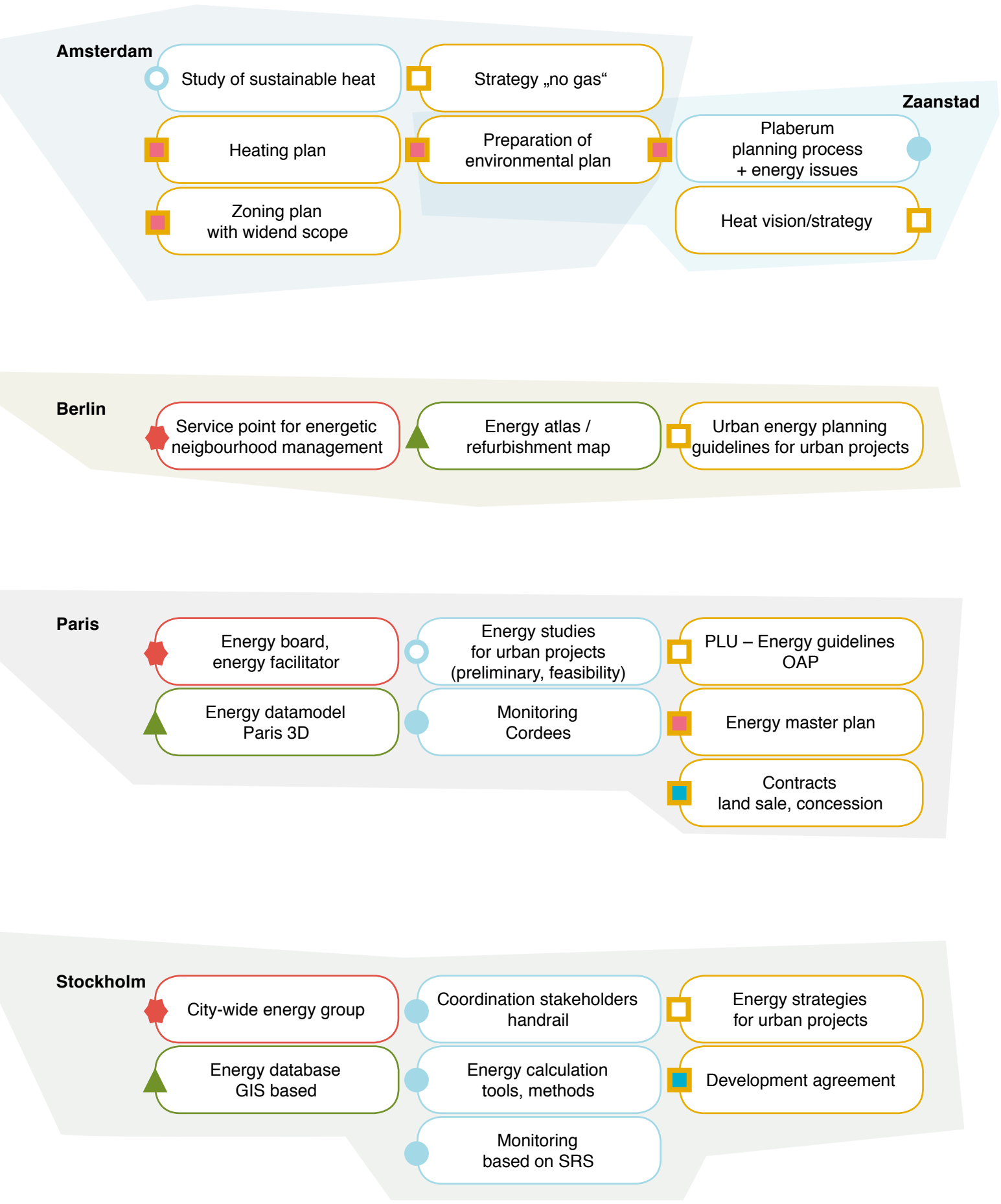
*) **Energy criteria:** Criteria defined on higher level by energy development plans or thresholds for areas. **Policy documents:** Integration in policy documents such as letter of intent or agreements. **Energy Board / Working group:** Decision about analysis, goals, criteria, process approach, energy supply, preparing competitions. **Tools:** Use of tools for assessment of energy performance and CO_2 emissions of planning elements and calculation of energy scenarios. **Energy concept** Energy concept for an urban area; selection of best energy solutions; regarding life cycle issues. **Contracts:** Energy issues in contracts:1 – City and landowner/developer (urban contracts). 2 – City and urban developer (concession). 3 – Land sale contracts – city as landowner. **Zoning plan / land use plan** Integrating criteria and zones. **Separate energy zoning plan:** e.g. Heating plan. **Energy check:** Checking detailed planning. **Permits** Integrating in permits (e.g. building permit) or separate energy permit. **Energy monitoring:** Connected to labels. **Quarter management:** Service point for urban transformation quarters; labels for quarters.

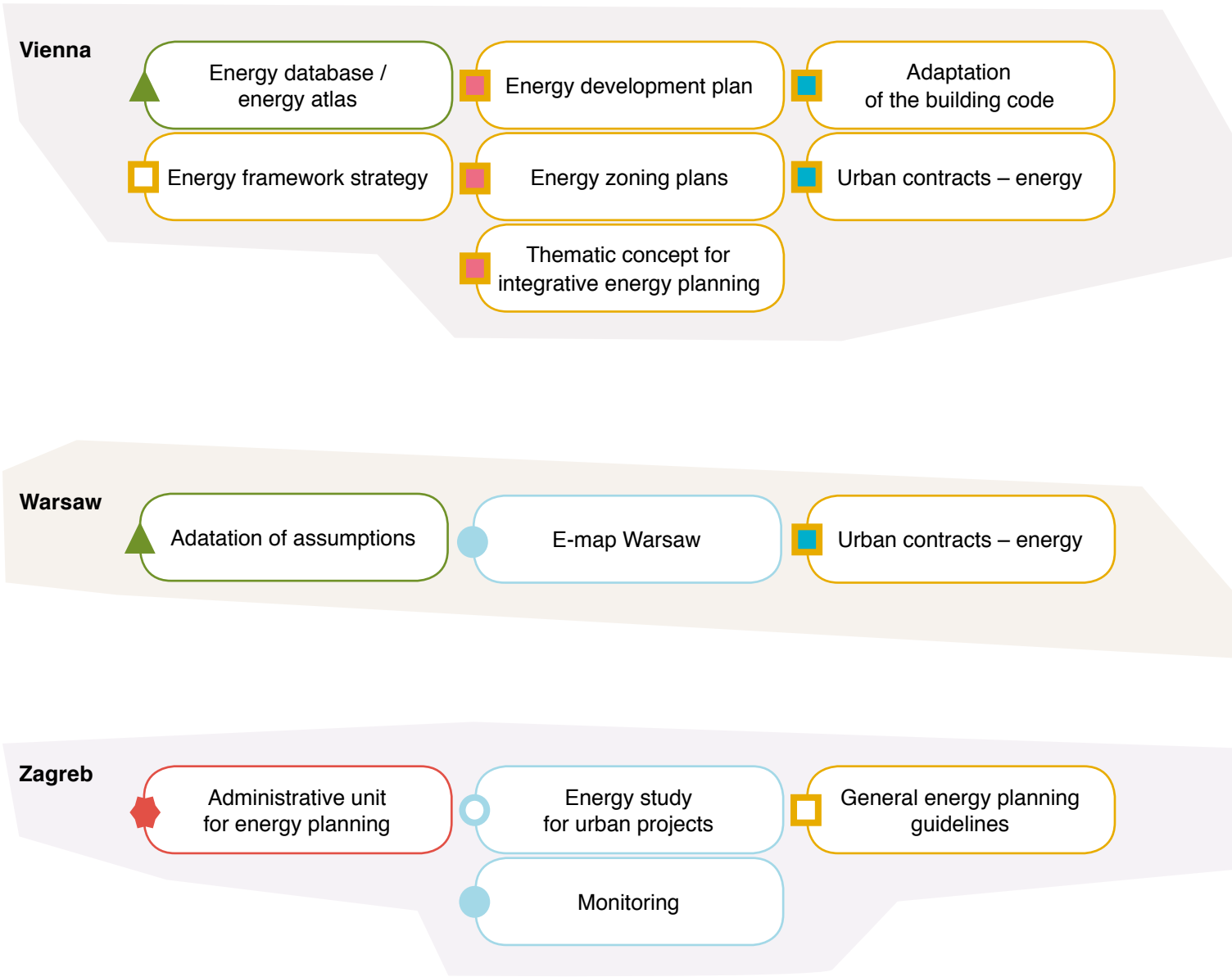
SOURCE: CITY OF VIENNA, MA20 H. HEMIS

EXCERPT FROM STOCKHOLM'S IMPLEMENTATION PLAN

Element	Decisions and actions	Responsibilities	Suggested timeframe
GIS based energy relevant data – NEW	Decision A = Installing hardware – new server facilities for pilot database	> Decision by Planning administration	Short-term
	Action A = Collecting data/building a database	> Planning administration in collaboration with development administration, environmental administration and external stakeholders	Mid-term
	Action B = Creating routines for data collection and sharing	> Planning administration in collaboration with development administration, environmental administration and external stakeholders	Mid-term
	Action C = Implementation of the use of GIS energy data for development of energy strategies in the area planning phase	> Planning administration in collaboration with development administration, environmental administration and external stakeholders	Mid-term

OVERVIEW OF THE ELEMENTS OF THE CITIES' IMPLEMENTATION PLANS





= STAKEHOLDERS, ACTORS

= DATA

TOOLS:
= Tools = Tools-studies

INSTRUMENTS:
= Strategies, guidelines = Plans and concepts for energy planning (incl. binding)
= Contracts and concessions, other legal instruments.

SOURCE: CITY OF VIENNA, MA20 H. HEMIS

GLOSSARY OF KEY DEFINITIONS

'ENERGY PLANNING' in this context refers primarily to the planning of the heating and cooling as well as electric demand of cities.

'INTEGRATIVE ENERGY PLANNING' names the integration of energy aspects into the urban design and planning process(es), including energy supply and demand and involving all relevant parties as early as possible. Where also infrastructure (particularly energy and mobility, and also ICT) is looked at in an integrative way to ensure the realisation of neighbourhoods with far higher energy efficiency, and energy production standards than currently without diminishing flexibility for its inhabitants.

GOVERNANCE PROCESSES FOR INTEGRATIVE URBAN ENERGY PLANNING: 'Governance processes' in this context refers to the administrative management processes related to integrative energy planning as part of the design and planning of urban areas, involving various departments of the city administration as well as their respective negotiating and/or contracting parties. The focus of this project is the district level, but the planning at city or at agglomeration level as well as at building level will also be examined for its possibilities and necessities to incorporate energy aspects in early stages.

'INSTRUMENTS AND TOOLS' relate to instruments and tools to integrate energy aspect in the spatial planning/town planning process as well as in the planning of concrete urban areas, the latter being the core of the analysis. 'Instruments' refer to different ways of influencing urban energy planning, while 'tools' refer to supporting means used when applying an instrument.

'INNOVATIVE TECHNOLOGICAL SOLUTIONS' refers to technological options on both, the demand side (low-energy to nearly zero-energy buildings and quarters including on-site use of renewable energy sources) as well as the supply side with the whole spectrum of innovative supply technologies and systems including innovative district heating and cooling solutions (lowexergy networks, fed from various renewable energy sources and/or waste heat, decentralised combined heat and power, etc.), smart grids and new storage possibilities.

‚ENERGY QUALITIES' OR 'ENERGY CRITERIA' means an energy specification such as the share of renewables used for supplying an area, the CO_2 emissions allowed for an area, etc.

'URBAN PLANNING' AND 'SPATIAL PLANNING' are used as synonyms.

FOTO MICHAEL CERVENY

CONSORTIUM DURING SITE-VISIT IN CLICHY-BATIGNOLLES, PARIS

CONSORTIUM

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FOTO: PID / VOTAVA MARTIN