Climate Neutral City Districts – the Smartest Form of a City's Districts?

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1 ABSTRACT

This article is about Climate Neutral Urban Districts. It builds upon the conclusions gained in the CLUE-project. The concept of climate neutral districts is a yound field of discourse and a new planning approach facing many challenges. Climate neutral districts can make a valuable contribution to the necessary transformation towards low carbon societies. However, ambitions and reality diverge. Decision-making and practice in cities are not ready yet for a full implementation of the big number of necessary measures.

2 INTRODUCTION TO CLIMATE NEUTRAL URBAN DISTRICTS

The project CLUE, Climate Neutral Urban Districts in Europe (www.clue-project.eu) illustrates the use of innovative and "smart" planning, participation and building concepts, new technologies and methodological approaches in order to reduce the urban carbon footprint to "zero" and at the same time considerably reduce energy and resource use i.e. making a city or an urban district "climate neutral". The guiding idea of the project is that climate neutral urban districts function as test beds for new integrated solutions which lead to a considerably lower carbon footprint or eventually even to a climate neutral level. In the CLUE project the examined districts are new development areas or mixed areas. However, for the sake of clarity it should be said right at the beginning of this article: the biggest challenge of transforming cities into climate neutral areas is the conversion of the existing urban fabrique, this is yet not the main focus of the CLUE project.

The main aim of this article is to highlight the methodological and practical challenges when trying to establish climate neutral urban districts, especially when it comes to:

- Defining of climate neutrality – stuck between ambition and reality
- Finding the scope of CLUEs in terms of being particular ecodistricts
- Evolving road maps for CLUEs from different starting points
- Necessary thinking when making urban policies

The material used and the evidence base of this article chiefly stems from the work of the CLUE-project, but also other related sources and similar projects' results have been used. A central question of this article is if CLUEs really are the best ways of developing sustainable, smart urban districts? The article is more a debate article than a paper delivering answers to the complex issues of CLUEs.

To make another matter clear from the beginning: at present there are neither standards nor a consensus on a definition of what climate neutrality should be or not be. There are no climate neutral urban districts today to be referred to, i.e. much of what the CLUE project produces is based on a patchwork of experiences and good examples which in their totality would leed to climate neutral districts. As a theoretical concept, climate neutrality aims towards a total elimination of green house gas/carbon emissions. The practical use of the concept today is dependent on how cities define system borders concerning time, activities/sectors and geographical areas. Current literature tends to offer different categorizations of concepts like "strictly zero carbon", "carbon neutral" and "low carbon", which is not exactly the same thing as "climate neutral".

3 CLIMATE NEUTRAL DISCTRICTS – AMBITION AND REALITY

There is a strong scientific consensus that greenhouse gas accumulations due to human activities are contributing to global warming with potentially catastrophic consequences (IPCC 2007/2013/2014). Climate change is not 'a problem' waiting for 'a solution'. It is an environmental, cultural and political phenomenon which is re-shaping the way of thinking and handling (Compston and Bailey, 2008; Hulme, 2009). It is seen as one of the most serious set of political challenges ever faced by human society. International and European climate policy discussions have the goal of limiting the global temperature rise to 2°C by cutting greenhouse gas emissions by 80 percent below 1990 levels until the year 2050. whether or not this goal is at all possible strongly depends on the development and mitigation efforts made in cities around the world.

The current generation must adopt strong precautionary principles in framing climate change policies in order to minimise the risks of serious harm from climate change imposed on future generations (McKinnon,

2011). Avoiding severe climate change means to set a determined agenda of mitigation and socially resilient mitigation applications. This requires that cities, where the big majority of the population will live in the future, understand and play their role as crucial forerunners as long as international institutions fail to set strong targets. In other words, urban development is both a key contributor to climate change and an essential factor in combating it (Ewing et.al, 2008).

The local dimension of urban climate governance, e.g. when aiming towards the creation of climate neutral cities and districts, has to deal with multi-level challenges both in terms of their urban legacy (e.g. existing building stock and technical infrastructure), planning laws and rules, institutional capacities, participation and co-generation possibilities, land ownership and financial potentials. Within these frameworks, cities can operate along different modes of climate governance such as self-governing, governing through enabling, governing by provision and governing by regulation (Newell and Bulkeley, 2010).

Cities are often laboring with their financial possibilities to fight climate change, replacing fossil fuels and saving energy. With a positive attitude, it can be claimed that carbon reduction strategies supported by far-reaching financial investments can have profound boosting implications for interurban competition and urban development itself as there are many positive co-effects of low carbon efforts (see below in chapter of eco-districts). The rise of a distinctive low-carbon urban development can therefore be seen as an important new environmental and social politics of urban development (Gibbs and While, 2011). But as a matter of course, different types of cities (industrial, service, university, port, etc.) must find their own way of making climate mitigation efforts to a success both for citizens, public institutions and business life.

It is however an indisputable fact, that cities have very different starting positions when it comes to mitigation and their striving for low carbon or climate neutral solutions. The European Union has emerged as a leading governing body in the international struggle to govern climate change. The transformation that has occurred in its policies and institutions has profoundly affected climate change politics at the international level, within its Member States and the European cities. But Europe comprises so many levels of government and governance, it has very differing political leadership forms and policy choices are wide spreading. This means that cities stand in front of very complex governance dilemmas associated with climate policy making (Jordan, 2011). In Europe there are cities where mitigation is hardly discussed, cities with business-as-usual ambitions at a level of their governments' regulations, and cities which have very high ambitions. The last mentioned cities often are organised in networks as Convenant of Mayors, ICLEI, C 40, Clinton Climate Initiativ, World Mayor Council of climate change, etc. It can be claimed that this type of cities is determined to considerably reduce their climate impact, but it is not evident that such cities also can become or really have the political determination to strive for CO_2 neutrality in a near future.

Thus, the outcome and relevance of the modes of mitigation policies depend on the governing power of a city, which ranges rom soft forms of influence to forms of strict public intervention. It seems that the development in many countries in Europe suggests that cities often do not fully exploit their authoritative powers and are reluctant to apply authoritative or resolute modes of governing through regulatory measures and strategic planning (Kern and Alber, 2008). In terms of establishing mitigation policies this means that often much more could be done in many cities, of course depending on their national legal framework settings. However, this reluctance can also mean that CLUEs as an appraoch to test new holistic solutions to fight climate change is not used due to hesitant attitudes of decision makers – both public and private.

Another principal problem regarding which there is a need to find a balanced relationship between political ambition and realistic efforts is the question of where to draw borders of the urban mitigation/low carbon efforts. "A large number of communities, new developments, and regions aim to lower their carbon footprint and aspire to become zero carbon or carbon neutral. Yet there are neither clear definitions for the scope of emissions that such a label would address on an urban scale, nor is there a process for qualifying the carbon reduction claims" (Kennedy and Sgouridis, 2011, p. 2559). One way of tackling this problem is to propose three levels of emission categories. This system of Kennedy and Sgouridis was also used in the CLUE project as a guiding principle and is illustrated in the figure below. The three levels, also called scopes, are:

- Internal Emissions based on the geographical boundary of a city/urban district (Scope 1)
- External emissions directly caused by core municipal activities (Scope 2), and
- Internal or external emissions due to non-core activities (Scope 3).
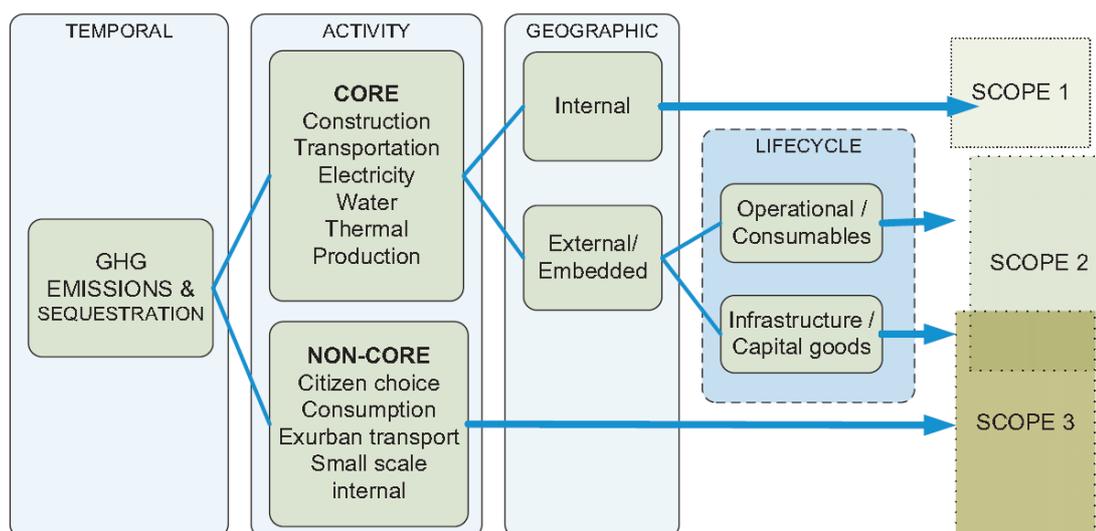
Fig. 1: Urban GHG emissions scoping and boundaries (Kennedy&Sgouridis, 2011).

Each of these levels implies its own carbon management strategy (reduce, eliminate, balance and offset) in order to meet a climate neutral status. However, and the CLUE project experiences prove this, there are many trade-offs and difficulties of implementing these CO_2 accounting and management systems. It can be claimed that no city so far has achieved such a rigorous label of accounting and related decision-making. It should be mentioned that no CLUE project city is using such a broad accounting system. Thus in theory this system could work fairly well but it must be broadly tested before being good enough to become a part of cities' decision and policy-making, benchmarking and implementation.

The boundary problem is probably one of the most important issues to be overcome before a city or an urban district can be defined as climate neutral. So far, the usual accounting schemes as e.g. Greenhouse Gases ISO 14064:2006, ICLEI's Community- Scale GHG Emissions Accounting and Reporting Protocol or ClearPath tool, Covenant of Mayors' emissions inventory guidelines, International Standard for Reporting Greenhouse Gas Emissions for Cities and Regions (by UNEP, UN-HABITAT and the World Bank), the Greenhouse Gas Regional Inventory Protocol (GRIP) developed by the Tyndall Centre, etc. normally only take into account what is happening inside a city, but leaves CO_2 footprints outside a city or an urban district (e.g. long distance travel, imported services, consumption goods, etc.) without significance. It would therefore be necessary to widen the scope and be honest in the accounting.

There has been a great deal of discussion of Kennedy and Sgouridis' proposal in the CLUE project. They suggest four system boundaries for green house gas emissions that go over temporal and geographic borders of a city or urban district. These boundaries are:

- Area's geographical boundaries that distinguish ''internal'' from ''external'' emissions
- Temporal boundaries within which emissions are tracked
- Activity boundary outlining the carbon emitting activities for which a city should be held responsible and that must be accounted for in the city's carbon balance for a given scope (e.g. CO_2-footprints)
- Lifecycle boundary i.e. the degree to which the production and disposal of capital goods required for any activity are included.

Emissions from each urban activity can accordingly be mapped onto the suitable scope according to its location inside or outside each of the four mentioned boundaries. Figure 2 shows a city's metobolism in terms of material, energy and CO_2 flows. For deeper understanding it is suggested to read the original article of Kennedy and Sgouridis. Figure 2 shows that many of the CO_2 and green house gas emissions occur outside a city's own borders. And this is of course outside a city's mandate and decision sphere i.e. cities cannot really influence what is happening outside except by clear climate oriented communication campaigns towards citizens and enterprises as well as of course through procurement of services and goods that take into account the CO_2 emissions in a life cycle perspective.
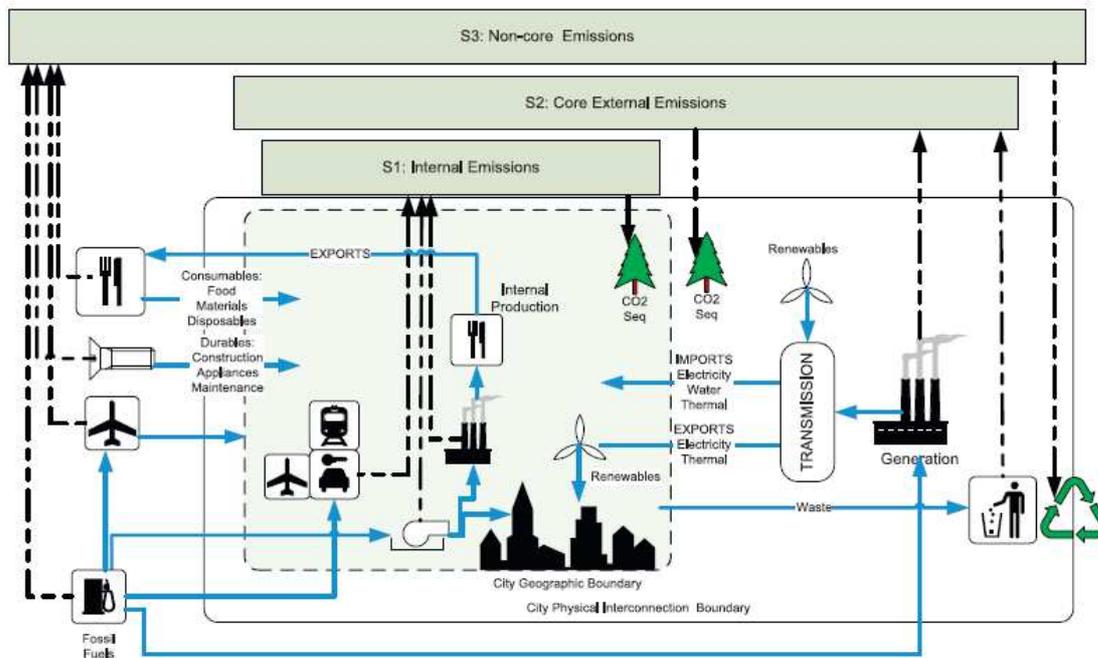
Fig. 2: Urban metabolism related to three scopes of emissions (Kennedy&Sgouridis, 2011).

Currently it is practically impossible for a city or urban district to entirely avoid all carbon emissions within scope 1 or 2. This means that no sufficient balancing or offsets can be made inside the system border. However, for reaching a workable approach to climate neutrality, it is possible to suggest an offset trade in a gradient from little to unlimited. Such a method is therefore crucial for the discussion of climate neutrality in practice. In the definition used by the UK Sustainable Development Commission (SDC 2006) the limitation on offsets are discussed as follows: "one that causes no net accumulation of CO_2 emissions to the atmosphere. Therefore carbon neutrality allows emissions to be netted off in some other location, a process which is called 'offsetting'. However the SDC would caution against a carbon neutrality policy which is focused solely on carbon offsetting. As the aim should be to reduce overall emissions over time, simply offsetting emissions without a carbon management strategy in place is at best misconceived, and at worst counter-productive." This means that cities have to work on their own mitigation strategies first of all and take the off-set possibilities as a way to balance their own emissions – and this not only for statistical and conceptual reasons of reaching climate neutrality.

In the CLUE project many discussions and conclusions found that climate neutral urban development approaches can have positive effects for establishing sustainable urban forms. This is also mentioned in a UNECE report from 2011 which connects climate neutrality to a more holistic view of development: "While climate neutrality is a strategy to be 'climate-smart', it is also a means to address other environmental, economic and social challenges" (UNECE 2011, p. 14). This is a central aspect and tends to reinforce the fundamental message that climate neutrality in cities or urban districts must be connected to the issues of sustainable urban development. This implies to secure participation from a wide range of different stakeholders, to avoid sub optimisation and to create synergetic effects as well as multifunctional solutions.

3.1 CLUEs as particular ecodistricts

Cities plan and work locally with their own approaches to climate mitigation because globally there is no systematic politics of climate change. However, it should be clear to everyone, that politics-as-usual and business-as-usual will not make it possible to deal properly properly with the threatening problems climate change entails (Giddens, 2011). Therefore many cities in Europe aim, based on their own local decisions, to become 100% free of fossil fuels, avoid unsustainable GHG emissions and become energy smart by 2050 or earlier. Similar approaches can be found across Europe. New or renewed urban districts, like the Stockholm Royal Seaport, Wilhemsburg in Hamburg (part of IBA Hamburg), Vienna's Aspern+ and the Vallbona district in Barcelona, are being planned to achieve such goals. They are all part of the CLUE project and will be the basis for the discussion oft he following chapter.

Fig. 3: Overview of Stockholm Royal Seaport, an eco-district with climate positive ambitions (www.stockholmroyalseaport.com).

These districts are thought to be in the technological forefront and a showcase for sustainable urban development with an emphasis on climate mitigation and climate neutral development – i.e. they shall offer many "smart city" solutions. But as a matter of fact and as mentioned above, there are no climate neutral urban districts yet in the world. However such showcases are highly needed in order to guide the enourmous investment decisions to be made in the light of climate change. A recent Bloomberg New Energy Finance report states that global investment in low-carbon clean energy and energy efficiency technologies was US$281 billion in 2013, down 12 percent from 2012, and far short of what is needed. The International Energy Agency believes that to keep the global temperature rise to under 2°C, the level deemed critical by scientists to avoid a global climate catastrophe, some US$36 trillion, or US$1 trillion annually, are needed in clean energy investment by 2050, foremost in cities. Green growth is thus a future key challenge.

What can be said about the "forerunner districts" as mentioned above? They are about smart urban solutions, but cities and their districts are above all about people i.e. daily life, exchange and socializing within a city. Smart solutions are therefore in any case not enough, as they are just one layer of a necessary holistic urban development. The resilient city of the 21st century is hence not only about technological innovations and solutions. The question is rather what institutional structure would be necessary in order to ensure legitimacy, political leadership, long-term commitment to climate change and the indispensable stable socio-economic fundament for transition towards climate neutrality? One way of getting this process started could be CLUEs, working as test beds for physical, economic and social change.

It can be argued that CLUEs are particular urban eco-districts as they stipulate climate neutrality and thereby have many other effects relating to sustainable urban struc¬tures. Such districts create many co-benefits including clever urban solu¬tions (Fitzgerald, 2013). The significance of CLUEs is therefore high, despite the limited geographical scope. This is due to the fact that such districts are investigational areas which in parallel comprise cohesive plan¬ning and system integration (technical and socioeconomic systems). They stand for high sustainable ambitions, especially in the area of environmental efforts. They are fields of experi¬mentation and innovation dissemination whose results can be applied to city overall or in other places. Last but not least such districts can considerably contribute to behavioural changes. These positive factors alone would be enough to motivate the necessary designated urban interventions and related investment costs. However there are risks that such districts also become islands of sustainability with very high standards and therefore high costs for housing (commercial uses are not as affected due to other payment capacities).

However and despite the advantages mentioned, a high-level analysis made in the framework of CLUE shows that the forerunner districts Stockholm Royal Seaport, Wilhemsburg in Hamburg, Vienna's Aspern+ and the Vallbona district in Barcelona are far from being capable to ensure climate neutrality in a mid-term future (2030). Although the CLUE project's urban districts have very high climate mitigation goals compared to ordinary districts or their respective nation states, the implementation of available new technologies, especially when regarding the transport sector, supporting the set climate goals is not enough to come close to very low/zero carbon levels or climate neutrality. The limited handling scope and mandate of cities are two major reasons why this does not work i.e. scopes 2 and 3 as explained above cannot really be influenced. Actually only a small part (20-30%) of all emissions made by households and enterprises can be planned or in certain cases regulated by a city's authorities. Thus there is a big dilemma when working with CLUEs: the biggest problems i.e. the biggest sources of GHG emissions are not really touched upon.

The CLUE project's gathering of good practice examples shows this problem. More than 80 examples were collected in the working areas' regulations, participation, planning strategies, building and transport concepts/technologies. There are many excellent examples of part-solutions. Together they deliver a great patchwork of necessary measures in order to move towards climate neutrality. But despite the high number of measures there are still many things missing. In other words, the huge number of efforts and measures needed in a CLUE make it difficult for any city to cover everything at the same time due to organisation, financial or simply personnel limitations.

3.2 Challenges of finding the right roadmap for CLUEs

It is said that the future has a long history. When it comes to CLUEs it is necessary to regard the legacy of a city and urban heritage both socially, culturally and physically in order to plan for a climate neutral future. One major concern to establish a CLUE is consequently the complexity of setting the right targets, making the right decision at the right time combined with the right measures in the right geographic borders including life cycle and system considerations. Taken together all this requires highly qualified methodological approaches, well reflected planning and foresighted decision-making processes which are not easy to reach for a city's stakeholder community. This multifaceted complex could also be called the challenge to find the right local roadmap for a CLUE.

Such a roadmap proposal is developed by the Clinton Climate Initiative (www.clintonfoundation.org) where the principal idea behind is to co-create socioeconomic values for public and private sector partners by fighting climate change. In the so called "Climate Positive Development Program" (CPDP) local models are created to reduce greenhouse gases and at the same time serve as urban laboratories. This program is linked to the Sustainable Communities Initiative of the C40 Cities Climate Leadership Group and has therefore a high significance in producing climate neutral or even positive urban development. This means that the 18 selected CPDP program cities (one of them is the CLUE partner Stockholm), seek to meet a very ambitious "climate positive" emissions target of net-negative on-site, operational greenhouse gas emissions. This climate positive result is accomplished by reducing emissions on-site and offsetting emissions in the surrounding community. Thus this is a similar approach compared to the model mentioned above. But again, every CPDP project has a unique profile, given their distinct socioeconomic, political and climate challenges.

A roadmap has a start and a finish. The start is to make the required analysis of where the challenges are and what has to be done in a city or an urban district to become climate neutral. The necessary data are collected and a baseline for the further process created. The roadmap isself contains the measures that are vital for the transformation process towards renewable energy use, energy savings and reduced GHG emissions and where to become active outside the city/urban district in order to get the indispensable credits (emission reductions through flexible Kyoto mechanisms such as CDM, JI and ETS are not allowed). In this work visioning processes, stakeholder participation processes with focus on behaviour change, scenario work including forecasting and back-casting as well as future studies can be used. An appropriate accounting tool with a suitable indicator and evaluation scheme has to be worked out. The connection to politics, planning and private investors has to be established. In the end (theoretically) a city or urban district will become climate positive. Figure 4 shows the single steps of such a logic step-by-step approach. As matter of course the roadmap has to be frequently reviewed as such a roadmap stretches over many years or even decades.

Fig. 4: Roadmap model to become climate positive (based on: Clinton climate initiative).

The Clinton Climate Initiative focuses on low energy use, a high degree of renewables, local energy generation and a system of credits. On an urban district level there are three main emission categories including energy, transportation and waste. It allows for technology and policy actions that reduce emissions in the surrounding areas or globally, called credits. But it excludes GHG emissions from construction etc. (i.e. no life cycle perspective) and consumption of goods and services as well as long distance travel which is a clear weakness.

Compared to many of the other tools, Clinton Climate Initiative has an extremely ambitious and explicit goal – climate positive. Strengths are its transparency which is a key for comparisons between other urban districts and valuable experiences and solutions to be communicated. The process of baseline, roadmap and credits offer a wide variety of different kinds of solutions and also allows a city or an urban district to test how far different actions will lead.

However, the disadvantage of the CCI model is that it does not take into account the important challenge of being people centred in order to function well over time. Demanding technological solutions strongly influence the life styles of people and companies in such districts and need the users' full integration and understanding. High investments and rental costs of CLUEs or even climate positive districts, due to high entailed standards, require careful consideration of social justice and equality.

The social part of CLUEs is as "big" as the economic and ecological parts. Some aspects are crucial whether a CLUE can become a success or not. It is necessary to have deliberative participatory processes and a broad collaboration among stakeholders, i.e. the use of peoples' and institutions' existing knowledge must be included in the transition process from the beginning. Building trust and building up social capital are vital. Social groups that usually are not partaking in dialogues must be reached. In terms of smart solutions, it is crucial to make users understand that the "project" i.e. often smart technologies cannot solve everything.

3.3 No single path to reach 100% climate neutrality in cities

To become climate neutral in a city or urban district, it is necessary to tackle many things in parallel, things that are interlinked with each other. Some important issues for cities to consider are having a coherent vision, sustaining a long-term political commitment, a functioning business plan, allowing long term public financial support, broad coalitions and co-creation (new partnership models are required) and using system thinking and life-cycle perspectives. On top of that it is necessary to proceed with dedicated communication over a long time.

When looking at this long list of necessary considerations and prerequisites, it becomes evident that there is no single path to reach climate neutrality. The cases analysed in CLUE show that being a forerunner costs a lot of time, money and engagement, but it also brings new knowledge, good publicity and substantial improvements in the urban fabrique. However, it also demonstrates that the ways which are able to work on climate neutrality today in cities are not sufficient. As shown above, cties are always dependent on a global interplay in terms of resources, energy and ecosystem services.

4   CONCLUSION – SOME OUTLINES FOR URBAN POLICY MAKING

There are a number of conclusions arising from the statements above that can be summarised as follows:

- It is a fact that there is a growing awareness of low carbon policies in discourses, strategies and struggles around urban development. Important however is that such low carbon and climate neutrality policy considerations are being mainstreamed in urban politics, planning and implementation in order to bring the necessary transformation.

- Climate neutrality is a concept under development – definitions, scopes and boundaries are to be found for each local project. And: there is no climate neutral (or positive) urban district or city in the world yet. This makes it difficult to become more specfic and give advice "how to do it".

- The often experienced gaps between a city's ambition and real world conditions are very hard to overcome. Cities in Europe have very differing starting points. Early adopters, as some of the CLUE partners, might come a faily long way in their transformation within the next decades, while other cities lacking behind have to face a very challenging and long starting phase.

- Eco-disctricts in the form of CLUEs can be very good test beds for new "smart" technological concepts and sustainable urban development, but they are not the only solution for reaching climate neutrality. For reaching such a goal in a city, much more is needed e.g. a supporting/ permitting national framework, sound embedding in regional/national/global systems and last but not least a strong local political commitment. System thinking in a broad sense is absolutely essential in order to avoid imperfect, isolated solutions and costly sub-optimisation.

- Roadmaps as a concept towards climate neutrality seem to be a promising way to achieve more transparency and support around the big number of measures to be undertaken in order to achieve climate neutrality. However, roadmaps in this field need longterm commitment, financial assets and a new way of including sustainable action.

- Cities and decision-makers must become learning organisations combined with new forms of dialogue and engagement. A city and its public institutions have to become open interfaces between citizens and stakeholders developing a city. Especially when working with CLUEs it is absolutely vital to regard social aspects and to bring people and enterprises to a fruitful co-generation of necessary transformative actions and behavioural changes.

- Time is running out, there is no other way than trying to avoid the unacceptable and to accept the unavoidable when it comes to climate change. CLUEs are parts of this important game…

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