Urban Development and the Environmental Challenges – “green” systems considerations

(by Professor (em.), Dr. Uno Svedin, Senior Research Fellow, The Stockholm Resilience Center, Stockholm University)

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1. **INTRODUCTION**

When considering the future development of the urban sphere, especially in its European and EU context, one very important key strategic aspect has to do with sustainability considerations, i.e. the systemic interplay between environmental/ecological, economic and socio-cultural (sometimes here together referred to as “green”) factors (in the sustainability context). Within this realm, you find challenges dealing with climate change, water availability and natural resource flows, including waste streams and their uses. When discussing “green” issues in connection with urban challenges, a starting point is the sustainability challenges connected with the urban space itself. However, you also find highly relevant considerations dealing with what the urban development implies for other activities distributed in geographical space as mirrored e.g. by the urban-rural connections in the form of the connection between urban space and its natural resources supporting “hinterland”. Thus the impacts of the urban activities on the surrounding world is here at heart - in all its different ecological dimensions, such as water quality and quantity, biodiversity erosion, implications of the chemical impact on the ecological systems of the hinterland - and in terms of the competition over land use among different functions.

The urban-rural connection is not always to be considered “negative” in character and the urban space as “intruder”, “eroder” and sometimes “destroyer”. Instead there is often an intricate interplay between functions in the urban space and those connected directly to the rural space that carries mutual benefits, e.g. in terms of distribution of functional responsibilities of implementation. The two different spaces may thus manifest themselves as symbiotically linked and mutually reinforcing not least the vitality for survival of both. This does not mean that there does not exist an ecological footprint from the urban space on the global “hinterland”. In addition, the social aspects of urban life (e.g. demographic, value orientation, preferences and issues around well being and human satisfaction) often have “green” connotations, e.g. how a climate change induced new water availability situation can strongly impinge on social life, and thus point at the issue of how societal priorities are allocated in such a situation. In earlier historical cases, desert towns provide vivid examples of such types of phenomena.

Many of the “green” types of challenges, e.g. climate change, are general phenomena (often planetary in scope) and not necessarily specifically connected to urban space. Their global and general features do not say anything about their specific impacts on urban phenomena. A scrutiny over a number of such general “grand challenges” thus has to indicate more precisely how such causal links to urban situations may be perceived in terms of what has already happened, but also exploring what could happen in the future. In order to do so, there is a need to first outline the general landscape of various “grand challenges” which also emerge as “drivers” of change in various systems, including the urban ones. Such a two-step outline of those relationships will be attempted in this text, in a form that will highlight a number of such phenomena and their potential nature. All this serves the increased capacity to explore various future options, including how to design criteria for the types of possible actions that may be entailed, and to make suggestions for incorporation in various policy packages at local, regional, national and EU levels respectively.
The current EU political context has several facets – some of very recent and some of older origin. The knowledge production side for sure has its roots in the Lisbon agreements. The urban aspects of EU “green” considerations have several threads, most of them over and above those that are directly oriented towards urban issues.

The economic crisis of 2008-10 has demonstrated the need for many fresh approaches to the economic problems at hand and those perceived at deeper level for the future. The ‘smart, sustainable and inclusive growth’ slogan at the centre of the Europe 2020 agenda, points at possible lines of action for socio-economic development over the next decade. Also, longer-term approaches to deeper transformations will have to be designed and implemented. This holds true not least for the urban challenges in their connections to green challenges for European policy, such as the need to shift to a low-carbon paradigm. This is only one example of the frame of drivers of a global kind that Europe is facing, and which sometimes are called the ‘grand challenges’. Specifically, the ‘smart’ component of the solution package is highlighted in the Europe 2020 agenda, with its connotation of ‘knowledge and innovation as drivers of future growth’. The urban area exemplifies this to a large extent. The need to confront all these challenges will also draw into the picture the coherence of policy approaches and avoidance of unnecessary overlaps.

2. THE CONTEXT OF THE GRAND CHALLENGES. ON DRIVERS AND THEIR IMPLICATIONS.

2.1. The world of 2025 and beyond. A European perspective

When dealing with large structural challenges facing not only Europe, but also the rest of the world – i.e. the grand challenges – it is important to both consider the priority pointers among various candidates of such challenges and deal with the time frames related to consider their emergence as well their solutions. This holds true not least for urban issues with their connection to large infrastructure investments needed for the future, and in connection to the time frame of the “historical momentum” that solutions from the past throw as their shadows into the future.

Many of the “grand challenges” have strong urban implications, such as:

- the crisis for the world economic system with its inbuilt instabilities and suggestions of a shift in leadership in the world political arena in the not so distant future (sometimes, as in the EU 2025 foresight, alluded to as “the Asian century” ahead),

- the demographic changes in the world, especially in terms of the age distribution and, in our European societies, the issues of “the aging society”, but also the social and cultural changes connected to immigration and emigration flows and due to other reasons including the global information technology revolution (e.g. as exemplified by the access, at micro level, to all sorts of global tendencies through the internet and similar technical innovations offering new forms for the future),
- the changes in the knowledge and innovation production “landscape” of the world (including shifting competitiveness situations between the major regions in the world i.e. including the changed position of Europe in the world, now facing much stronger competition in these areas than in the past).

In this report – as an important “green slice” of the broader set of urban challenges of many different sorts - the focus will be on the grand challenges connected to the environmental, energy and other natural resource related issues, all of which are embedded in the broader ecological, economical and social/cultural, i.e. sustainability considerations panorama. Before zooming in on these topics, and with a strong urban focus, it is important - before leaving the focus on the other types of grand challenges - to state that all the challenges are in one way or another interwoven systemically with each other.

Thus, the economics challenges of course set a frame of what could be invested and in which directions, thus providing boundary conditions to much of - but not all - what can be done to approach the "green challenges", e.g. of handling the effects on, but also the contributions from, urban spaces to the global climate change phenomena.

The demographic changes, including the 'aging of Europe' issue and the immigration panorama, set strategic frames to what should be needed to deliver, in terms of structures of towns, with regard to “green” living spaces, such as new forms of “close by” food production in the perimeters of towns. Social access issues in the urban sprawls concerned with e.g. the different age strata presence depending on where you are in the city space i.e. in different places, also relate to the more general urban-rural systemic connection issues. And the quick transfer of models and ideals of “the good life” that are transmitted in the new open and global communication culture will more and more provide ideas for solutions also with regard to the green structural issues, including political pressures for designs of the urban space.

In all these dimensions, the new knowledge production and innovation formation issues will have a profound influence on ways in which to transform society, including the “green” aspects of planning.

When we are thus speaking of “Europe 2020", or Europe 2025 or 2030 as in some of the foresights dealing with these issues, it is only intended to provide intermediary outlooks for the next one to two decades i.e. when large transformations have to start in order to match the speed of the pressures perceived as soon to manifest themselves as strong boundary conditions.

It could also be argued – not least for the urban challenges – that what the Stern Committee argued for early investments to combat climate change also holds true for a much broader set of challenges. By facing the challenges early on, the transformations needed can be handled in a proper time frame and the efforts will also boost the economic development side e.g. in terms of "green growth" and innovation mobilisation in Europe for such purposes as strong, positive, competitive potentialities on the world market for the future. What has here been stated in general terms holds very true for the urban development panorama.
2.2. *Specific implications for environment, sustainability and “green development”*

What then would be considered issues we should care about when dealing specifically with the “green” sustainability-oriented problem? The following domains of challenges immediately come to mind:

- Climate and energy considerations
- Natural cycles (including water) and their connected social processes
- The urban-rural nexus
- The urban footprint on the world outside the urban space
- Urban infrastructure and transport systems
- The future Green development and Growth and its economic impacts
- The directions needed for the knowledge production system to match these “green challenges”

Before zooming in on the specific urban connotations of these types of items, let us just make a few more general observations and reflections around the “green challenges” at global level which provide the context for whatever has to be handled in society – be it in the urban or the not so urban spheres.

We start with the climate issues, knowing full well that they are not all there is to these sustainability-oriented challenges, but that they are a very important starting point and a central concern in a nest of connected systemic challenges. We thus just start with alluding to the well known basis for many of the IPCC (Intergovernmental Panel of Climate Change) reflections on the climate change concerns. Here we take note of the gradual increase of the global mean temperature curve, also noting that the distinct increase over the last half a century also corresponds to an earlier unseen dramatic increase in the very much longer time perspective of thousands of years, even if you take into account earlier historical variations of the means between warmer and colder periods, including colder periods in the middle of the European medieval period or in the last few decades of the 17th century. (For the development over the last one and a half centuries, see Figure 1 below).
If we now consider the various scenarios for the future, these have been elaborated upon by the IPCC in the way Figure 2 expresses it. Here we see a continued and in some cases drastic further increase in temperature for the 21st century and beyond. The different scenarios correspond to various assumptions about the different types of combating strategies. For our purpose, it is sufficient to take note that we are speaking of global mean increases of at least between +2 and +4 degrees centigrade over the next century (for surface temperature means). If we are considering global regional distributions between different parts of the world, even stronger effects can be expected in some of these areas with regard to both mean temperature, but also connected precipitation patterns and related storm/hurricane/flooding frequency and intensity of events.

It is natural to expect, as with increasing temperatures of e.g. the surface of ocean waters, the energy provided for hurricane events will be even greater in the future, feeding the intensity and frequencies of these events. At the same time, already relatively dry areas will most probably become even dryer as the regional-type prognoses for Southern Europe indicate. (Compare also Figure 4 below). The different temperature scenarios correspond to different assumptions about the concentration of climate-impacting compounds in the atmosphere, of which the carbon dioxide component is the most important in terms of amount - but not the only one. All these greenhouse-influencing gases have somewhat different impacts, but also have different origins. Thus the mitigation efforts must explore a wide set of suggested solutions, in order to relate to the different types of challenges, all adding up to a total global impact - with regional differentiation.
The IPCC has also, in its 2007 version, probed into the relationship between the causal origin of these phenomena in terms of the balance between natural and human sources. This has been done to explore the size and global geographic distribution of the human influence factor in order to probe the question: to which extent will it be possible to design solutions combating the changes, especially those related to human origin factors? Figure 4 below
shows the IPCC world map illustrating the findings. In the bottom left of the figure we see the time distribution of the temperature anomaly (the empirical measured historical path 1900-2000 is given by the black line as an average measure). The lower band ("blue" in a coloured version of the figure) provides the prognosis based on natural factors only. The upper ("red") band provides the capacity to explain the temporal development when you use a combination of natural and societal (humanly origin) model explorations. As is seen in Figure 4, the black "line" expressing the empirically measured time development can only be understood after the mid-20\textsuperscript{th} century in terms of a combined natural and societal/human factor approach. Model systems only using natural factors cannot thus account for the development measured after that time. This is what Nobel prize winner Paul Crutzen and co-workers have called the emergence of the new global historical time period of the "anthropocene", i.e. the period starting just now in our generation when humankind has taken over as the prime mover of natural cycles through the influence by human actions (including its means in terms of industrial activities, technological means and size and distribution of operations).

Figure 4. The IPCC analysis of the relative influence of natural and human factors on the climate system

So far, we have only dealt with the time distribution of the global temperature (and alluded to its regional differentiation). We have also touched on the causal origin of these phenomena (natural/human) and noted the plurality of different contributions (different gases) to these effects. We have not yet dealt with the interpretation if these perceived
changes in the past and their projected alternative trajectories for the future are to be regarded as “good” or “bad” for humanity (disregarding at the moment other judgment outlook points for other life forms on the planet). This issue has also been investigated by the IPCC in several of its reports over time during the 2000s and especially 2007. (Some updated versions were also produced later by different actors showing even more worrying tendencies than what was published in 2007). The brief outline of this investigation is shown in Figure 5 below.

![Figure 5. Vulnerability of Key Sectors facing global warming (according to IPCC)](image)

Here we see a number of functional “sectors” from left to right (water security, coastal communities, etc). The degrees of impact from mean global warming increases (from 0 to 7
degrees centigrade) is shown in three categories (coping range/green colour in the lower part, adaptive capacity/yellow colour in the "in between part", vulnerability/red colour in the upper part of the figure). Here we see that, above 2 degrees, the coping capacity is quickly being reduced in most “sectors”, while after a 3-degree centigrade mean temperature rise globally, the high intensity of vulnerability (i.e. “red”) becomes increasingly stronger.

With regard to urban space, it is clearly understandable that most of the illustrated categories investigated for impacts have urban relevance. Temperature-driven water scarcity intensification (as we see it in the southern part of Europe, e.g. in Spain) in this scenario is expected to grown in intensity, with severe consequences also for urban spaces and not only for rural areas. Many of the large cities of the world are situated along coasts. Energy security is a relevant dimension for anybody, not least for urban activities. Major infrastructures are very often connected to urban spaces and are often expressions of it. Health-related deaths often have urban connotations as was tragically demonstrated just a few years ago in France when summer temperatures shot up to very unfamiliar and uncomfortable levels hitting both the poorest segments of society that could not afford to combat the heat through artificial means, and the segment of old and sick people in society being medically more vulnerable than individuals in other demographic segments. Tourism and food security have urban connotations and, as an expression of general environmentally oriented performance for sure “sustainability” indicators, are extremely important for urban activities.

But climate issues are not - as was stated above - the only phenomena we are dealing with in this set of “green challenges”. Many of these challenges are connected to the climate, but they also have their own features. In an international study published in September 2009 in the scientific journal Nature (and also at the same time associated broader material and analysis published elsewhere, see e.g. references in the Stockholm Resilience Center website/Rockstrom et.al.) nine other such challenges were explored and analysed in terms of their inherent problems with regard to “Planetary Boundaries”. These nine categories are shown below in Figure 6.
Figure 6. Examples of Planetary Boundaries distributed over a number of global change phenomena (see Rockstrom et. al. Nature, 2009)

The analysis of this exemplifying selective set of chosen cases where humankind is facing some sort of serious threat (a global planetary boundary) is further explored in Figure 7 where red coloured segments indicate which of these functional segments are specifically problematic (i.e. involve a high level of threat). They are climate change, the nitrogen cycle and biodiversity loss (see below).
These three highly problematic threat sectors all have urban connotations in a direct (climate change) or indirect way (biodiversity loss: capacity for food generation and long-term resilience challenges for environmental services including food and other renewable resource-based functions; nitrogen cycle challenges: land and marine pollution impacting the environmental quality but also food production capacity).

As we already touched upon with regard to climate change, all these other groups of phenomena - here exemplified by the analysis of Planetary Boundaries - also have regional specificities. All of them also interplay among each other in non-linear, systemic relation ways through different kinds of loops driving feedback and “feed forward”. This generates quite a degree of uncertainty and opens up for drastic surprises. Figure 8 shows a picture illustrating this grand regional feedback phenomenon. The picture shows the map of a part of north-western Africa (the Strait of Gibraltar on the top and the western part of the Mediterranean seen to the left of the Strait. Spain and Portugal are on top of the picture. Here we see a dust storm of grand magnitude sweeping material out from the Saharan area.
into the Atlantic Ocean. In the long history of this planet, such transfer of material to the oceans have seeded the biological life in the oceans, which in turn provide a feedback loop to climate as the biology of the sea influences the absorptive capacity of carbon dioxide gas and thus shifts the balance of what could be perceived to be “free carbon dioxide in the atmosphere to lower levels than what otherwise should have been the case”. This in turn changes the climatic conditions, which in turn influence the precipitation in this grand regional geographical space. Historically, the development path of the former green Saharan area has been connected to the development of such loops. These changed conditions in turn have influenced urban space and the way of life in southern Europe and in Africa over centuries.

Figure 8: Photo from space of a dust storm moving from the Sahara into the Atlantic

What has been said here is meant to illustrate how the various natural cycles (often of grand spatial extent) all relate to impacts in the societal sphere. Societal activities – as was alluded to above in connection to the mentioning of our probable emergence into the time period of the “antropocen” - also have strong effects on the natural cycles, in many cases in our historical time being the strongest causal factor of their appearances. A large part of the world population are now rather quickly looking to become city dwellers, or at least have
their life in urban conglomerates, or at least become, for survival, totally dependent on food and other products drawn from "aerially based" renewable resources.

Thus it would be a grave understatement to say that urban long-term planning only needs to have “soft” recognition of the connections to the above illustrated processes of change at planetary scale. Sometimes you can be tricked by imaging “cities” to be somewhat spatially limited as compared to the planetary level and to be a sort of entity with a life of its own and semi independent from life in the rest of the world. This has never really been so, considering the vast “hinterlands” always needed to feed and serve large cities in Europe and elsewhere such as London, Paris, Rome, Athens, Madrid, Budapest and Vienna (just to mention a few with archaeological remnants dating back more than 2 millennia. And today it is even less so considering the global character of flows of material and immaterial goods, waste, services and ideas and not only in the trade domain.

2.3. Implications for urban development, with special regard for Europe

What we have said about the development in general terms - and mostly at global level concerning the green types of global challenges - also have not only regional effects as illustrated above, but also more specifically strong urban connotations. Before moving into the issues about the future for urban European sites, and what the challenges are in these domains, we will now further reflect on the linkages between the green global challenges and urban life in general.

Some overriding considerations about urban activities in urbanised space, in their relation to “green” global challenges, have to be stated before we can go into a number of particulars. First of all, "urban space" is a very specific form of frame for human activities in terms of the character of functions performed there, e.g. in terms of the compactness of the space within which life is pursued, but also in terms of the sophisticated relationship to the outside that makes all these urban endeavours possible in terms of survival (food, natural resource provisions, etc.). This calls for specifically oriented analysis of and specifically oriented attention to the governance system that makes this all possible, including the institutions of the urban system as part of a broader governance system.

In this sense, urban functions with green connotations have to be scrutinised both in regard to the urban space itself and at the same time in relation to the world outside (i.e. the urban/rural nexus, the global trade pattern, etc.). The corresponding knowledge production system around urban phenomena has to have the interdisciplinary width to cover the essential systemic nature of most of the urban phenomena and their causalities.

The intensity and deep continuity between urban space and some of these “natural groups of phenomena” (that were expanded upon above when speaking about the grand challenges) could be illustrated by the development of the urbanised Mayan sites that,
suddenly in the 16th century, due to the historical arrival of the conquistadors, just stopped their societal functions and were rather quickly embedded in the regional jungle. Seen in other terms, the natural side of vegetation in these urbanised Mayan temple towns just totally (again) took over and continued to abide by the normal rules of ecological system development. The interesting point is that, in terms of species composition and biodiversity appearance, the Mayan civilization’s gardening and strong capacity to structure both urban and non-urban spaces - as well as their functional interplay - could still be traced today by experts e.g. in botany. Thus, after 500 years, the earlier strong human impact on the natural non-urban space is still there and is traceable! (see the photo in Figure 9).

Figure 9. Remnants of a Mayan temple in the jungle “invading” the former urban (temple) spaces

In a similar way, we will have to design the principles for the conflux of natural phenomena and those of humans (not least expressed in the creation of urban space). The IPCC has illustrated this systemic connectivity (see Figure 10) between humans and the natural systems’ parts and also pointed to their quickly emerging ability to be interwove in a grander system that could be called “integrated socio-ecological”. In such a system, specific issues of e.g. “resilience” emerge as important to handle in all its combinatorial features, and not only as a sum of features of partial systems of technical or social phenomena.
In Figure 10, this line of thought is elaborated upon. Here “Nature” is represented by the “Earth systems” and the human world by its various components of well-being. The indicated elements of security, basic material for good life, health, good social relations and freedom of choice of action - that to some extent emerge from these other functions - are further elaborated upon by the Millennium Ecosystem Assessment in Figure 11 where all sorts of typical ingredients of an urban life are present. (That is not to say that they are non-existent in non-urban lives as well, but for urban cities these functions take a special form. This form in turn is partially shaped by the embedding in the ecological “green” considerations as expressed in Figure 11 in the left-hand box. That box thus establishes a check list for sustainability considerations for urban planning for the future).
The dynamics of such complex systems we are now encountering as combined natural-socioeconomic systems, could be explained using Professor C. S. (Buz) Holling’s famous “figure eight” chart (Figure 12). It illustrates the time development for a complex system (of almost any kind – and thus also for the urban system weaving together the natural ecological components and the urban human components into a total system). Such systems have their “accumulation of resources” build-up phases. They also have the exploitation phase of all these gathered resources and the connected conservation phase. Suddenly the system cannot hold together any more. A trigger of one sort or another puts the total system in a state of collapse under which the resources are spread out in a big release until the resources can be reorganised again – often in new ways – for a new accumulative and systems “building up” phase. The history of urban systems (as large city development) points at the truth of this for urban realities also. It can either be the development of a demographic nature that finally cracks the system as an overload of constantly increasing populations, or it could be the reverse in terms of epidemic-driven death tolls as in earlier historical phases a few centuries ago in London or during the medieval period of Italian cities. The core driver for the collapse could also be “environmental” in nature e.g. in terms of not providing sufficient availability of clean drinking water (often connecting to the sickness panoramas in earlier history when the medical science antidote capacities were low).
The interactions between demography and environmental factors may also be the reason for collapsing and and “shrinking cities”, as in some semi-suburban, mid 20th century development of European cities, for example London, with a large number of poor immigrants from India and Pakistan living in areas of detrimental environmental conditions – not to mention connections to cultural or political factors of stratification (where e.g. large US cities have had total collapses of their city cores, as in Philadelphia - only recently under recovery). During the build-up phases (see the Holling chart) we see ample urban examples of growth and exuberant richness exposed in the high peaks of the upward phase. The current extremely important discussion and active planning to re-use old, worn-down previous industrial areas or harbour territories as “leftovers” from more successful periods (as in the Stockholm Hammarby case – see below) point towards the urban relevance of the images provided by the Holling development chart in Figure 12 below.

As most of these intertwined systems operate with non-linear connections, such phenomena of sudden drastic changes after reasonably long periods of consolidation may be more or less surprising. In their planning processes, urban structures also have to absorb the knowledge of these potential cyclic events, including the sudden surprising eruption features of collapses. In a framework of sustainability considerations, we are talking here about the need for not only careful designing of the “green” components of urban space (such as parks or green geographic connected “corridors” such as the green connectivity “fibre” space - as the Stockholm national park space is an expression of) but also seeing those as parts of a broader eco-social design pattern spatially, functionally and socially. Late 19th century visionary green town planning, e.g. in England, expresses this interest and importance in an earlier era of design of urban space both for social needs and for interconnections with nature, based on a number of reasons and visionary goals.
2.4. **Natural resources and the urban processes**

When we are further penetrating the various aspects of the combined eco-socio urban system, there are several interesting part-functions to look closer into, e.g. climate and energy phenomena (including efficiency gains), water (quality and quantity), marine connectivity aspects (for coastal cities), land use issues, ecological system issues and biodiversity, etc.

Here, a number of issues related to how we “measure” progress have to be considered, stressing the need to scrutinize the implicit views about the factors involved and how to balance those to match a clearly stated set of goals in some sort of multidimensional compromise between different types of needs. (Examples are measurements of “using less per function”, finding structurally better solutions given a “new” goal structure, ways of summing up “needs” of different kinds, e.g. in relation to consumption patterns, exploring different sets of norms for the future to be judged against labels such as “less is better”, etc). In the process of finding such systemically sound solutions the image of the “substitution ladder” (from changing technical modules, to changing subsystems in their technical performance, changing broader systems’ core ideas and finally changing value structures, e.g. reflections on geographical mobility issues as “public transport versus other means”, “the use of time by an individual” over a day, months, years or lives). In the end, such reflections often have to fall back to basic fundamentals such as the biosphere capacity to deliver functions (“ecosystem services”).

![Figure 12. Developments of complex systems over time according to C. S. Holling](image-url)
2.5. The urban – rural connection

One aspect of the systemic nature has to do with the connectivity between that which is inside the urban space and that which is outside. This has often been labelled as the urban-rural nexus. In Figure 13 below, an example is shown of the administrative and legal conditions under which agriculture was conducted in Sweden during the 18th century when the organisation of land was drastically reformed with a strong impact on social lives when farms were "outsourced" to combined pieces of land (due to efficiency considerations) and thus breaking up age-old village structures. In a similar way, new efficiency demands for the total resource handling systems in the urban-rural nexus could mean new spatial solutions for urban space as well, as the resources and waste flows related to the urban-rural combined system will call for new and "smarter" (to use the words of Europe 2020) sustainability-oriented solutions.

Figure 13. A Swedish map from around the end of the 18th century showing a village in the countryside in the centre of the picture and the sliced agricultural land pieces connected to the different farms in the village. This system was to be broken up around that time with farms in the new solution "outsourced" to new combined groups of land pieces to enhance the efficiency of the management of the land, faced with the need to produce food more efficiently.

Thus, the streamlining of different land use functions (including those that relate to the urban space in its connection to rural space), may have to induce new forms of compositions
in the network of urban sprawl structures, and with rural functions injected into these structures as “green spaces” with distinct features and roles. The systemic connection between urban space and the “hinterland” is also expressed through the “environmental shadow” that the urban activities exercise on not only nearby non-urban space, but also far beyond and from a global perspective. This environmental impact shadow stretches – depending on the type of flows we are talking about – to faraway places as the carbon cycle connectivity between the local injections of carbon dioxide (and also other greenhouse gases) and the global geography feed the climate change causally. Such varied impacts i.e. the “footprint” of the urban use could be illustrated by the photo in Figure 14 below providing an image of geographical space consisting of land and sea, urban agglomerations as well as agricultural and forestry production sites. The image illustrates this plurality within which the impacts of the various streams of elements show their characteristics in wanted and unwanted places (as the eutrophication impact is seen in the picture in the water body in the front part of the picture, i.e. showing unwanted biological “blooming” due to exaggerated nitrogen and phosphorus flows that have gone “astray”. In similar fashion, the ultra large urban spaces make impacts in their vast surroundings).

Figure 14. Example of hinterland impact space.
2.6. **Green Development and urban possibilities**

The use of the different flows will also provide urban possibilities, e.g. through “green growth” oriented technologies, mostly developed in urban societies and applied either in urban sites (as biological roof coverage as could be seen on sky scrapers in Tokyo and New York) or in more general terms as part of broader green developments based on high-tech solutions. Figure 15 indicates which type of technology could lie ahead, simulating the photo synthetic efficiencies demonstrated by a green leaf in providing very useful molecules.

![Image of a leaf](image-url)

**Figure 15.** The capacities of a green leaf as a sign of future technology possibilities of a high-tech nature

3. **GREEN URBAN PRINCIPLES AND GOALS IN CONTEMPORARY URBAN PLANNING - THE CASE OF HAMMARBY SJÖSTAD, Sweden (“Hammarby Sea City”)**

[www.Hammarbysjostad.se](http://www.Hammarbysjostad.se)

(For the photos in Figures 17-28 indicated in the section below from the Hammarby sjöstad, reference is made to the author’s presentation at the DG Regio June Conference 2010 in Brussels. All these photos – made by the author - can thus be seen by entering the EU website covering the June conference. The photos are not represented here due to technical reasons related to not making the file too large).
Many of the principles and ideas we raised earlier in this presentation at the general level should be compared to current examples of city planning in order to see what the principles may mean when they are implemented in “reality”.

The Hammarby case illustrates well many issues we have spoken about above, e.g.:

- OLD INDUSTRIAL–NEW RESIDENTIAL FUNCTIONS in combination
- SEA SCAPE – LANDSCAPE interactions
- TRANSPORT SYSTEM NETWORKS and new forms of transport combinations
- RESOURCE -WASTE FLOW handling in a new and sustainability oriented fashion
- HUMANS AND NATURE as a general approach also serving the inhabitants of the city with strong green qualities for their wellbeing
- HUMANS AND TECHNOLOGY in using combinations of ultra high-tech and not so high-tech in a deliberate fashion
- RICH AND NOT SO RICH in the population to be connected
- DESIGN TO SERVE SEVERAL GENERATIONS AT THE SAME TIME AND PLACE

The map in Figure 16 below shows these new parts of Stockholm

Figure 16. The map of Hammarby sjöstad.
Figure 17. The combination of several types of communications

Figure 18. Construction waste material provides new touristic value by providing ski slopes in a big city setting. (Here the ski slopes are shown in summer)

Figure 19. Handling of organic material waste in compost boxes

Figure 20. Selective waste handling system collection points placed all over the town

Figure 21. Central collection point for waste (almost unnoticed) positioned in the town (see the metal top cover at the front of the street)

Figures 22 and 23 below illustrate work performed to serve the town’s sustainability functions

Figure 24. Houses providing living quarters for elderly people

Figure 25 and 26 illustrate various street scapes of the town

Figure 27. Children are part of the new town

Figure 28. Illustration of the Hammarby living space and its qualities “for all”

Figure 28. Town scape for human well being

Figure 29. Old and new working together (site from Norrköping, Sweden)

Issues that a presentation of green urban challenges also need to include
- THE SOCIAL AND CULTURAL DIMENSIONS OF URBAN “GREEN” DEVELOPMENT
- “GREEN” GOVERNANCE AT LOCAL, REGIONAL AND GLOBAL LEVELS
- CONNECTION TO THE POLITICAL DEBATE ON THE STATE OF THE ENVIRONMENT GLOBALLY (see Figure 30)

Figure 30. From the Copenhagen climate summit 2009 (Photo Ingela Svedin)

Figure 31. Politicians get intense media coverage at the Copenhagen summit (see the web site presentation)

4. MOVING TOWARDS THE PERIOD OF THE ANTOPOCEN

For the future, when we are possibly moving towards the “gardening of the planet”, and the period of the antropocen is further stressed, this will mean:

- Calling for planetary management by humankind
- Better matching between knowledge and action in this new context
- Enhanced importance of responsibility and ethics
- Increased need for implementation capacity and drive
In the urban perspective, this all means being alert to the central and pivotal strategic role of the urban space and its development and its specificities in the new global context.

5. ANALYSIS IN TERMS OF PERSPECTIVES

There are several perspectives within which future outlines could be explored for urban space and activities and with a sustainability/green connotation in mind (there are definitely more perspectives when you explore the social, economic or cultural spheres - and the overriding cross-sectoral political and institutional embedding). But let us here restrict ourselves to some sort of sustainability focus, including the politics of it. Many of these we have touched upon earlier, so here we will systematise the arguments in a very forward-looking approach.

5.1 The resource flows – natural resources and waste flows

The resource flows have gradually expanded as seen from the kernels of urban space to include broader and broader “hinterlands”. The classic urban study of Hong Kong in terms of its flows was done several decades ago. But this perspective is still valid. What will happen more and more is that the hinterlands of very big cities will be planetary in kind. These centres of megacities and similar structures in the world will grow in number, but also in size. Thus they will be more and more global actors in themselves, operating from some sort of expanded “regionalness” to become central movers in their respective nations for larger countries. For smaller countries, they will to some extent have outgrown the nation states in terms of their patterns of flow characteristics which will call for strong collaborative efforts between the groups of nations that are involved, e.g. as large regional blocks in the EU, including wide stretches of transnational "geographical bands" as the Milano-Paris-Frankfurt, Rotterdam/Amsterdam-London band already indicates. This will call for new forms of balance between fierce competition and absolutely necessary cooperation. In the now quickly emerging more globalised world with its strong “antropocen” character, the competition for globally available resources, but also an interwoven need for readiness to adjust strategies to common global impacts, today mostly exemplified with the climate influencing gases, but later widened to access to drinking water, the control of nitrogen and phosphorous flows, etc. It might today come as somewhat of a surprise that urban leadership will also have to involve active participation in combating loss of biodiversity, although due to the changes not in the urban space itself but in the much broader space of influence that the urban space has on the
non-urban parts of the world, and including an increased responsibility for the food security for the citizens of large cities.

5.2 Climate and energy

The climate factor seems to be the first that demonstrates the globalness of the challenges at lower scale levels. But there will be others in turn. In focusing here on the specificities of just the climate (and its energy use correlation, e.g. as the very quick growth of Shanghai demonstrates with strong support level for energy coming from fossil coal), it is obvious that the parts of the world warming up and thus for some already dry, including the Mediterranean basin, will have a profound effect on these urban spaces. There will be a big call for increased efficiency of energy use and also for mastering the approaches from earlier parts of history in designing cooling ways of using architecture for passive cooling (including the use of green space). In other geographical spots e.g. for coastal cities, especially on the lowland plains, or, as in the Netherlands, even below the sea surface, it may not be the heat but rather the larger heat-generated storms, and, in a few decades, gradually rising sea levels (due to both the expansion of water bodies due to the temperature, and also the melting in the Arctic/Antarctica). The different risk scenarios highlighted by the IPCC and others in this regard will probably call for solidarity efforts between members of the EU in order to even out the burdens of different kinds that will make impacts on different parts of Europe. It may also be the case that not only will technical and infrastructural approaches for the most vulnerable parts (e.g. for the Netherlands in terms of storms and high water) be needed, but also long-term planning of restraint for further expansion into areas with growing vulnerability to these factors (such as further use of low land coastal areas).

5.3 Housing involving the architectural, green, sustainability oriented technology

Within this perspective, you can find a vast number of now emerging possibilities for low carbon flow designs, efficiency of flows, keeping buildings sufficiently warm in wintertime through delicate computer controls of ventilation systems, new materials for insulation and the use of solar energy. It is here you already see the advances to more sustainable solutions at micro (individual buildings) level and it is expected that this will be a very important line of further explorations and advancements.
5.4 Technological systems solutions

This includes green growth innovation in the infrastructure, transports fields and urban sprawl.

Systemic designs of larger complexes, such as large parts of cities or urban sprawls - including smart transport solutions - may also start to make their contributions to the total resources and environmentally benign solutions necessary, building on an array of partial contributions.

5.5 Socio-ecological resilience systems and their time developments

When we are dealing with the broader systemic solutions in cities and urban sprawls, it always has to be kept in mind that we are not any longer operating either a technical system or a social system based on cultural preferences, but a combined system of these. This has of course always been the case for city builders, but the increased pressures of new levels of conditions we will be facing in the next few decades will add much more stress for the designers who will need to find skilful and smart ways to handle these not only interconnected systems but enmeshed and to some extent integrated systems. This situation is severe enough for the time span of the next few decades and adds pressure to start transforming the urban space as fast as possible due to the long lag times and the investment patterns involved. But the situation might be even worse further on into this century i.e. within the time of a generation which has already been born.

Thus the time development factor for these system changes might be a pivotal point. The sequence in which these steps present themselves, but also how they are reacted to, may create strong path dependence characteristics (certain steps are more possible in one sequence of events than in others) with special roles with regard to urban leadership as the fraction of functions in the world being traditionally “urban” may increase in relative importance. This might be reinforced by a more widespread “urban-ness” in the mindset of the population at large as the fraction of people moving into town-like conditions, in relative terms, increases very quickly. This may also hold true for Europe. There is a distinct “green” perception aspect for the urban space that is connected to this.

5.6 Geographical scaling perspectives

This relates to the connections between scales (local-regional-national-global), including
urban-rural nexus considerations and further on systemic approaches to match the “Grand challenges” for entire societies.

By moving the urban decision-makers’ attention and responsibility perception onto the need to face a broader picture than the regional space provides - that now often is the case - new phenomena for these decision-makers and planners will emerge that will call for a widened type of consideration and the corresponding knowledge structure and experience. This relates not least to the very coming need to integrate the designs of the urban and the rural space – not as similar in functional terms, but as taken as a joint concern about two parts of an inseparable system design. This will happen quite soon and will, within already operating generations of decision-makers and professionals, call for changes in perceptions, daring spirits and a widened sense of responsibilities to the new areas of consideration that a world in the period of the anthropocen will call for. The further connectivity to global issues and relationships between the major urban nodal spaces – including those in poor parts of the world – will also call for quite new efforts and political attention.

In the future, even more integrated types of solutions will need to be developed (and incorporate the grand challenges for the world not only as something known in principle but now directly impinging on the planning efforts), including in terms of changes in the inhabitants willingness to promote and accept certain measures (exemplified in recent history by the pressure on individuals to sort waste).

5.7 The politics and institutions that will provide the “governance” capacities, including responses to surprises

Some of these tendencies we have already seen growing quickly in the last few years when climate change and other issues have come more clearly on the table. Environmental considerations have over the last century been of importance for urban planning considering the classical industrialisation impacts e.g. on local water and air conditions. This has been taken care of (as in the case of the old “London smog” that is not there any longer. The empirically observed change in disappearing fish in many urban areas of inland character - but also of course in many coastal waters - due to environmental stress, has in many cases over the last few decades been reversed, for example the Stockholm waters turning to much more healthy environmental conditions due to strong policies under public support and corresponding investments to remedy these historical problems.

So what could the surprises in these fields be? Maybe the time development. unforeseen events and new pressures may emerge at a faster rate than was
earlier perceived (i.e. through some sort of flip flop phenomena in the combined socio-ecological systems). There might be surprises on the behavioural side, e.g. what people in general may be ready politically to agree with. Or the surprise might be that the political systems are not able to transform to match the need for change due to resistance in the population at large to accept sufficiently strong measures. Solidarity between different parts of Europe may - as a positive surprise - be stronger than could be perceived today, or it may be the opposite i.e. emerge as a surprise in terms of e.g. resisting measures and costs for the broad agreements and connected common designs needed (as we have seen recently at world level in the lack of capacity to combat climate change through sufficient and common strategies and responsibilities). Under such a scenario, different local conditions would be seen as providing differences in responsibilities to pool resources for a common good, to boost an “only local caring” position. This is all difficult to provide trustworthy guesses for, and even less predictions. And what happens if the flows of global environmental refugees emerge quite soon and in much larger groupings than what could be expected? At the same time, this could then be connected to a quickly deteriorating situation globally which in turn might change the perceptions of what is needed in order to face the crisis, involving global leadership initiatives and public support for this to an extent not yet seen.

6. ANALYSIS IN TERMS OF SOME ISSUES OF IMPORTANCE
   (as raised in the debate on the green factors for urban development, including points that have been raised in the DG Regio Urban Work Shop nr 1, June 2010)

a. The increased importance of green areal spaces within the city space.

This issue is not just about the still highly valid traditional importance of parks for social recreation and as cultural space. It is also about more ecologically oriented arguments dealing with biodiversity argumentations related to green strings of connected green areas and with climate adaptation arguments in terms of more green absorbing and modifying areas such as roof tops (as has become an increased and deliberate practice in cities such as Tokyo).

Connected to these “green spaces” arguments is also the emerging debate on increased food production inside the urban space (perhaps in the beginning mostly oriented towards fresh vegetables).

b. The importance of developing new and more sustainability oriented (both mid-term and long-term oriented) indicators for urban space, i.e. more relevant “metrics”
In order to achieve a development that will match the sustainability types of criteria, still more effort has to be invested in finding appropriate “metrics” to make the green facet of this development sufficiently transparent. Future benchmarkings of European cities will have even more than today to consider how green policies and implementation shall be made visible in the accounting systems, in parallel to a reformed GDP type of measures.

c. The innovation aspect of urban “green growth”

Both technological and social innovation schemes have to be designed and implemented in relationship to the development of European urban space. On the technological side, the elements of eco-efficiency and the vast number of green technical innovations needed have to be further promoted. This is needed in order to build up the new bio-based economy that lies ahead as an emerging possibility, especially as an expression of strong European competitive mobilisation at world level. For this to succeed, there is a need for strong and deliberate policies and investment schemes at regional (including cities), national and European levels. The social innovation approaches should, in parallel to this, be vigorously mobilised for similar purposes. The overall support for these innovation efforts has to lie in a strengthened knowledge-based society that is apt, ready and interested in addressing the grand challenges in an interdisciplinary and cross-sectoral way and addressing the corresponding needs at the solutions implementation level.

d. The role of the economic crises for urban “green development”

The discussion has shifted from the argument of the economic crisis being a burden for the possibilities of making long-term investments in the implementation of green policies, to the argument of seeing the crisis as the time for more long-term strategic changes and boosting new vigorous and “smart” policies and implementation of green character, not least for the urban sphere, and with a strong world competitive connotation. This is a rather new link to traditional cohesion policy.

e. Vulnerability and resilience considerations of systems’ nature

The issues of current and future vulnerabilities in urban settings certainly have a strong sustainability/green connotation. The natural and socio-economic systems connected with urban connotations have to be analysed facing the future in terms of their capacities to be resilient in periods of constant change and greater stresses on the total system. The stresses could be of ecological/environmental kinds, but also come from the side of
demography and other issues. One aspect of these systemic issues is the interplay between the urban and the surrounding regional rural space.

f. Time and development aspects

Issues around the sequence of steps needed are coming from not only the economic or social planning domains but also with regard to the green connotations. It relates to the priority setting over time, including the steps for infrastructure investments and transport system design within the urban space, but also as connection patterns between urban spaces/cities in urban sprawls (if that is how the “urbaneness” expresses itself). The time aspect also involves various perceived intensities of urgency to act and the related risk panoramas.

g. Norms and values

The basis for a possible stronger green urban direction is the strengthening of the connected values at large that would support such a development. Without such common and public support, it will be difficult to mobilise the resources needed and also to face some of the risks that the larger environmental challenges will most probably provide (e.g. a stress on a low carbon agenda due to climate change, water availability, etc.). At the practical everyday life level, the issue of sustainable consumption may emerge as a very important factor. A complex of importance with regard to norms relates to the approach to global issues and the responsibility to address those – also from a more local/regional urban starting point. One unsettled issue is to what extent the green agenda and the global connotations will also call for drastic value changes; or are the basic value fundamentals in European society still able to harbour an adequate response to the challenges.

7. SCENARIO REFLECTION ON EUROPEAN URBAN FUTURES

Several of the thought lines explored above could be illustrated through a scenario approach. The choice of key variables is of course very subjective. But if you start by assuming that the urban aspects of society (and the corresponding geographical space) will continue to increase both in Europe and around the world at large, the increase does not in itself constitute an interesting variable. We just assume the increase to be a given assumption for all scenarios. It is rather the way in which this expansion will take place in terms of policy emphasis (green/or less green; technological/economic or
socio/cultural emphasis respectively). The timeframe is set to 2025 to indicate that we are speaking about a timeframe of one and a half to two decades i.e. a medium-term perspective. For the planning purpose, this study is aimed at time profiles up to 2050 – as interesting these may be for more visionary purposes – this is not the chosen frame. All the scenarios aim at exploring urban futures as their focus.

The horizontal dimension explores more green emphasis (left) versus less green policy emphasis. For the vertical dimension, at the top, an Economic/technical approach is stressed; at the bottom, the Social/cultural one. The emerging 2 times 2 matrix dimensions looks like this.

<table>
<thead>
<tr>
<th>ECONOMIC/ TECHNICAL emphasis</th>
<th>GREEN focus</th>
<th>LESS GREEN focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIAL/ CULTURAL emphasis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Within this 2 times 2 matrix, we now find four scenarios (see below) A, B, C and D.

<table>
<thead>
<tr>
<th>GREEN TECHNOLOGY BASED BIO-ECONOMY A.</th>
<th>TRADITIONAL INDUSTRIAL GROWTH C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALUE ORIENTED NEW GREEN SOCIETY B.</td>
<td>TACKLING ACUTE SOCIETAL PRESSURES D.</td>
</tr>
<tr>
<td>GREEN</td>
<td>LESS GREEN</td>
</tr>
</tbody>
</table>
We will now explore each of these four.

A. GREEN TECHNOLOGY BASED BIO-ECONOMY
Path and characteristics:
In this scenario the full emphasis is on a new technology led bio-innovation and green-growth line. The aim is to boost the economy by using the transformation of society to match the green grand challenges as a vehicle not only to solve the problems (e.g. climate change impacts) but also to do it in a way that also creates European added value and competitiveness at world level. In this scenario, fully-fledged, urban technology-led designs, both at systems and part systems level matching the sustainability criteria, are seen both to solve the problems and to be an export-led economic success.

Bonuses and problems:
The advantage is that if all this succeeds, this scenario reflects a venue of economic growth for Europe. It would also help contribute to the matching of the green challenges. But there is competition from other parts of the world, not least from Asia or the USA wanting to do the same. The trick is to do it in a European way, using the European value system and design traditions, and to mobilise the innovation capacity needed as investment. In this technology driven scenario, it might - if not complemented by other elements - be somewhat of a technical fix, disregarding the downside of such solutions in terms of differentiation of economic gains, and also a preference for technological solutions to social problems. This will also drive big projects and the corresponding institutional forms of solutions. But it is a very green urban solution.

European policy demands:
Innovation investments based on strong, knowledge-based capacity development boosting e.g. the Lisbon strategy line. Strong common endeavours at European level: more cooperation in Europe than internal competition. Strong collaboration between the major cities of Europe to demonstrate the European way of creating “green urban solutions to global problems considering a plurality of conditions and historical experiences”.

B. VALUE ORIENTED NEW GREEN SOCIETY
Path and characteristics
In this scenario, several technical supports are similar to the situation described in scenario A. However, here the “new society” normative outlook is at the centre. Here, the issue is not to get a set of technical solutions to serious sustainability issues. It is rather the reverse:
Sustainability demands calls for a very in-depth transformation of society that is much needed due to the challenges of going green (according to this scenario). Thus the social and cultural aspects are very much more important here in this scenario. That also means that the diversity needed to reflect the plurality of European experiences will be more at the front. Cooperation between European cities is needed, but not to the extent that the specificity mirroring local conditions in different parts of Europe will be neglected.

Bonuses and problems
In this scenario, a fuller width of the complexity of the joint built human environment and the natural system is taken as the starting point. Green technological solutions are welcome - but not at any price - as the overriding vision is the creation of a broad societal solution for future life in a varied set of European urban settings. Thus the complexity of this endeavour may add more stress to the political process, rather than a more management-oriented innovative industrial pathway. This may somewhat limit the speed of economic export expansion as the solutions here are not only technical but also social and cultural. But for the long-term stability of European political futures and a stronger sense of participation, this might in this scenario be given preference in situations where there may be a goal conflict between technological boom and societal consolidation in the grand change of societal conditions and normative transformations.

European policy demands
Here, the political leadership is stratified and also needs a very interesting combination of policy-making at several scalar levels simultaneously. The combination of boosting common policies that should streamline strong European experiments in the urban domain at the same time as mobilising the innovation stakeholders regarding solutions around particulars must be at the centre of such a two-pronged strategy in this scenario. Here, the encouragement of participatory process must have a broader connotation of civil society but of course including all sorts of industrial stakeholders in the mobilisation of common green solutions under a diversity of European expressions.

C. TRADITIONAL INDUSTRIAL GROWTH
Path and characteristics
In this scenario, the strong, green face of economic growth has not taken hold sufficiently. It turned out that the transformation of the European industry into new types of new technological green solutions was not such an easy path as was earlier perceived. One reason was that the green
solutions entailed new types of industrial – and political – stakeholders and that the green markets were weaker than perceived although the needs for the solutions were definitely still there in a major way. What remained was a continuity of the economic growth, but in more traditional sectors and with more traditional means and more traditional customers. The risk perceptions about very large investments also changed as the economic crises continued which also exposed emerging inner inconsistencies between the visionary perceptions of possible green transformations and a more “realistic” continuation under problematic economic conditions. The support from the European population for more “risky” and new (and green) endeavours cooled also to some extent when daily life was hurt by the harsh economic conditions. “Safety first” became a more pronounced strategy where “business as usual” was even considered as a “doing the best under these conditions” approach.

Bonuses and problems
In this scenario, the strategy of a milder form of green mobilisation has been connected to a continued difficult economic period over the decade. This is not to say that the continued elaboration of the green long-term needs for change in society has gone away. But the somewhat lower global economic activity also brought down some of the emission indicators for the energy sector-related greenhouse gas emissions. And the similar conditions all over the world also made it less important to run the green competitive technological race. All regions around the world have, in the economic situation, contracted to more core issues of more short-term concerns. One of the problems is that the green investments needed have not been mobilised, nor the technological grand systems solutions.

European policy demands
This scenario exposes the strategic dilemma which arises under a prolonged period of economic global turbulence. This alerts European economic policy not to withdraw from the long-term green investments needed even under harsher economic conditions in line with e.g. the Stern Commission advice in the climate change domain. It also points to the responsibilities to do what is possible at many political levels – even under harsh conditions – as at the level of the cities of Europe.

D. TACKLING ACUTE SOCIETAL PRESSURES
Path and characteristics
In this scenario, the tackling of the deteriorating social and economic situation in Europe has called for much focused attention on social unrest, poverty challenges and the trickle down of these source problems to other
cascading problems of a social nature. This means that other issues, important as they may be, including the “green agenda”, have thus been to some extent “postponed”. The positive feedback that other situations could have opened-up for has not happened in this “emergency” case.

**Bonuses and problems**

This scenario mirrors a Europe “going down the drain” and how it tries to survive under these conditions by postponing most long-term types of issues in order to fix immediate emergencies. The degree to which some elements of green attention could be supported under such conditions is up for discussion within the scenario and points to the possible window of some actions especially at more local and regional levels. It also points to the importance, despite the situation, of giving cultural and political signals to indicate that the policy spectrum cannot be contracted in a downward spiral without injecting antidotes to it. Here, there are distinct EU responsibilities. This will also help individual cities to maintain green policy elements wherever that is locally seen to be possible, and even as a potential way out of the downward spiral of economic and social unrest and cultural deterioration.

**European policy demands**

A special EU crisis task force appointed with sub-branches in all member countries and involving a very broad number of stakeholders all over Europe to define and start “the way out”, e.g. by highlighting good examples even under miserable conditions. This is also a scenario for the mobilisation of civil society. Here, it is the EU role to give that potential visibility and credibility. The key platform for action will be at local and regional level but backed by all European policies to encourage and point again to the need to address green challenges, even during these circumstances.

8. **SOME STRATEGIC ISSUES TO BE CONSIDERED**

Having now in the scenarios mirrored some of the green challenges explored earlier and connected issues, it is time to round up with a reflection on a few selected strategic issues for further elaboration and discussion in Europe. Which issues are to be picked up depends on the perspectives we have already touched upon in the segment on “Perspectives”. There, it became very evident that which questions you chose to highlight depends on the context of interest – “the perspective”. However, there is a sort of stratification of generality of considerations. Some concerns are operating at a very high general and “generic” issue,
while others are more specific. The exploration of both of these classes of concern is important. Especially in the design of solutions to specific problems, the latter group of concerns comes strongly into play e.g. concerning new ways of making buildings resource-efficient or how waste streams should be designed to encompass flows far beyond a city. Having said this, we now focus on a few of the first types of generic issues alluded to above. What could these be?

- **A. RIGHT MIND SET (connect the local and the global)**

In earlier periods and up until quite recently, urban planning has been very – and understandably so – local and regional. It has all, even up until the last decade, been about how to handle a vast and complex object involving several hundred thousand up to several million people. But the global connotations have not been very evident. The matter has been rather regional and oriented towards functions in the nearby area. But there has been an upscaling tendency as is demonstrated by e.g. the broader regional concern, such as the Öresund area combining Denmark’s larger Copenhagen area with similar urban structures in the South of Sweden (“Örestad”). Still, it has not had strong global connotations. This period is now quickly waning. The panorama of the drivers is in most cases global in character, with impact zones as large as South East Asia or Europe. So the urban policy ambitions must rise to this level without losing the fairly local concern of how to arrange a most useful living space for people living in a specific part of – in our case – Europe. The mindset has to be global for urban planning, to a greater extent than before.

- **B. URBAN POLICY AS SEEN FROM THE INSIDE OUT BY CITIES – AND FROM THE OUTSIDE IN**

This first point above demonstrates the new, appropriate “zooming in” character of urban policy in Europe, from the widest possible global one down to the different cities and agglomerations of cities in terms of urban sprawls and the like. And we also have the further development of an urban policy for the individual cities as before. In a certain way, we are facing a new situation where there is a need for urban policy at two levels simultaneously – a general European one (see the tendencies in all the four scenarios) and a more regional one with the political and managerial centres in the key urban nodes in Europe, the ones already existing and those being quickly developed and established. The content of these two levels of policy of course has to be similar, but not necessarily identical as they serve different purposes. Both have to transform under the pressures of the challenges. In the case of the European-level urban policy, it has to be generated and be given reasonable, constructive, innovative institutional forms given the overall EU collaborative format of political cooperation at that level. This would involve a common European urban-rural policy field of the European geographical space, to some extent coloured by the regional-ness of its political orchestration and management. Certain problems connected to the global green agenda e.g. of climate change may seem more or less important to various
geographical parts of Europe. But as seen from an “outside of a certain city” perspective, this variety does not mean that there could not be policy processes to orchestrate the understandable diversity in facing the common challenges – rather the contrary.

At the same time, the connectivity between the specific “grand city” nodes will have to move along the scale from strong competition to more balanced competition/collaboration positions and strategies, considering the nature of the common challenges. And the “grand cities” themselves have to explore even further the global phenomena connotations of the ever-increasing complexity of their mandates. This then no longer only relates to the important classic green city agendas of clean air and safe waters - and mostly these days successfully handled. The historical situation has now pushed the challenges further and the transboundary flow characteristics now point to the importance of addressing the responsibility structure in Europe for these wider concerns and how the various policy levels at different scales shall be harmonised and in some cases activated for new functions.

• C. NEW GOVERNANCE STRUCTURES  (and capacities to match the grand challenges)
In the specific functional cases where new forms of governance will need to be further explored at all European levels, this has to be further investigated in the near future. This will probably call not only for the orchestration of already existing and more regional entities in institutional terms – and to be built upon these – but also new institutional functions might be needed for new functions that the grand challenges call for.

• D. NEED FOR CHANGES IN THE KNOWLEDGE PRODUCTION SYSTEM  (towards more system thinking)
The need to address new challenges in a new time and moving towards the period of the antropocen will call for both a deeper basis of understanding and corresponding innovation structures, i.e. what could be referred to as the upgrading of the knowledge production system with even more capacities to address issues about large complex systems in a multidisciplinary, interdisciplinary and transdisciplinary way, and doing this by mobilising European talent, capacity, expertise and institutional momentum in the knowledge production sector – in this case addressing the large urban challenges of Europe.

• E. ALERTNESS TO DEMOGRAPHIC AND SOCIAL CHALLENGES
These endeavours addressing the increasing importance of the urban development issues in Europe will also call for increased participatory processes in the democratic tradition and increased transparency for the public at large. This holds true especially as the ability of these phenomena to interweave will more or less concern everybody in one way or another. This is especially relevant for the green dimension of the
urban challenges. The appropriate institutional processes will have to be creatively considered and implemented and provide adequate resources.

- **F. NOT FORGETTING CULTURE AND NORMS**
  As has to some extent been explored through the scenarios above, it is evident that in the development of norms (including some need for transforming some current values e.g. in the direction of a more conscious, sustainability oriented consumption) it is important in the handling of the urban challenges and their green connotations to take account of a long cultural history in Europe and to make that a foundation of the reform work needed under the new and quickly changing conditions.

- **G. DOMAINS OF POSSIBLE SURPRISES**
  What should we then expect of the unexpected after having elaborated upon many issues that we already see coming, but in relation to which we have to mobilise effort, innovative capacity, resources and political courage and implementation strengths. The unexpected may come in various forms.

  The *time profile* of the challenges may be different than how we perceive them at the moment. The climate threats may go faster than perceived (but could also be slower due to unforeseen counteracting forces). It is due to the non-linearity in the coupled and integrated systems that the surprises may appear. If the time profile e.g. in the climate domain makes changes slower than feared, that is all very good (e.g. the temperature rises in Southern Europe summer time and connected water shortage), but could definitely not be relied on or even expected. Especially the now through careful model simulations investigated scenarios of tipping points are hanging unsolved for the future (e.g. the speed by which Greenland ice might melt and the consequences of that in terms of climate change and sea level rise and the time distribution for this). Thus surprises are more likely to appear in terms of a faster than expected development of threats.

  The *seriousness of the changes* may be a surprise through cascading effects and other unforeseen phenomena. The IPCC investigation of vulnerabilities for various assumptions of world (and regional) impacts with regard to various sectors provides interesting material for such reflections (see above in the beginning of this article on vulnerabilities connected to temperature scenarios).

  The *social response* to the changes may be a surprise (e.g. in terms of global migratory environmental refugee flows ) but also in terms of capacity in time to mobilise counteracting forces to the threats politically, knowledge-wise, innovation-wise and in terms of resources.
9. SUMMARY -
SPECIFIC EU CONCERNS AND POSSIBILITIES IN RELATION TO GREEN URBAN CHALLENGES

In rounding up this article, a few points related to EU possibilities should be extracted, (although several of the points have already been touched upon at different occasions in the text).

a. The further need for improved integration of functions and policies at European level (in addition to already existing regional functions).

b. The need for further political considerations about the time sequence by which urban challenges with sustainability connotations should be met. This should be seen as an investigation of the wanted priority profile and design of policy development and corresponding institutional build up.

Climate change here provides a good example (as does the issue of demographic pattern changes), being at the starting point of the path of possible sequences. “Green innovation boosts” in research, innovation and implementation policies have to connect to more traditional policies aimed at e.g. changes in job compositions and new possibilities for green job creation.

The priority setting schedule needed has to treat both overall ambitions for Europe (as has already been done in the more general climate change policy in defining certain reductions of emissions to be completed at a certain time) as well as a differentiated timetable across Europe e.g. regarding efforts in a specific geographic zone or specific types of cities. Such schemes should be developed as a next step by specially invited EU expert groups and by reporting to specifically defined EU structures of political nature for political scrutiny, discussion and adaptation as common European policy in the field.

A first step could be to identify which items should be on such an EU list for urban consideration. Relationship to climate, water availability/drought potentials and counter measures, storm and flooding issues (perhaps in relation to re-evaluation of risk assessments for certain territories) and land use. An important part of what could be explored is the type of insurability attached to such phenomena in terms of state (and EU) or private insurance responsibilities and capacities. Another important part is the complexity of knowledge production and innovation structures. Still another domain for elaboration could be a further progression of EU approaches as those already performed in the water directives. But these are only tentative suggestions to indicate the type of further steps to make the needs more visibly operational).
c. The overall strengthened European cooperation with regard to urban sustainability challenges and its relation to a global context and improved big city connectivity to other major urban areas in the world.