# Chapter 2
# Motivation for action

# Chapter 2.1
# Communities, Mitigation and Adaptation

**Maryke van Staden**

**Abstract** With scientific evidence showing an unprecedented rate of climate change – a rate much faster than anticipated a few years ago – more active climate protection engagement is needed around the globe. In this context individuals and the community level play a vital role, and there are also considerable expectations by citizens that national governments will take the lead. Yet engagement is slow, and this raises questions regarding the motivation for action and how to get widespread engagement, particularly at the local level. Some issues that have motivated action include experiencing the local impact of climate change and a realisation that it has a security impact (from many different perspectives – from climate migration to socio-economic impacts). Studies that address the cost of action and inaction have placed climate change on the political map, and community leaders that have engaged from various angles such as improving air quality have gained multiple benefits for the community and the environment, as an indirect approach to local climate action. This chapter explores why the local level urgently needs to engage, and what its representatives – political leaders, staff and citizens – need to know about what they are dealing with, and why they should deal with it.

**Keywords:** Carbon dioxide ($CO_2$) • Global warming potential (GWP) • Inter national Panel on Climate Change (IPCC) • local governments • 'local to global' • mandate • methane ($CH_4$) • responsibility • society

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M. van Staden and F. Musco (eds.), *Local Governments and Climate Change*, Advances in Global Change Research 39, DOI 10.1007/978-1-4020-9531-3_2,

### 2.1.1 Facing the Reality of Climate Change

Climate change occurs at a global scale, and has an impact on the whole world – humans and nature alike. The main characteristics of climate change include rising temperatures, changes in rainfall patterns, melting of glaciers and sea ice, sea level rise and an increased intensity and/or frequency of extreme weather events. These changes in physical processes have impacts on biological and socio-economic factors, for example, shifts in crop growing seasons; changes in disease vectors, increased rates of extinction for many species, severe water shortages, and heavy deluges and flooding. In addition, rising sea levels will increase the risk of storm surges, inundations and wave damage to coastlines (Joint Liaison Group 2008).

When considering the last time an event or occurrence which affected all of humanity and nature, the previous ice age comes to mind. There have been (and are) devastating wars, economic recessions and depressions, ecological devastation caused by humans (e.g. the Chernobyl nuclear disaster), and natural disasters (e.g. floods, droughts, volcanic eruptions), but these usually only affect a relatively 'small' area and/or 'limited' numbers of people compared to the possible implications of global climate change.

Yet, this time the global phenomena – the climate that is again changing – will affect many more humans, as we number in the billions today. The impact is also already visible around the globe to a larger or lesser extent. In addition to this reality, there is also the possibility (albeit not yet a 'likelihood', according to the International Panel on Climate Change – IPCC) of abrupt climate change – meaning another ice age could happen quite suddenly should certain preconditions be met, such as a change in the ocean currents circulating around the earth.

Climate change can be a natural phenomenon, but humans are clearly impacting the process, according to scientists. We now know that climate change is being accelerated by humans through the way we live and use energy, releasing vast amounts of additional greenhouse gas emissions (GHGs) into the atmosphere and thereby changing natural processes. Reputable climate scientists, economists, politicians, oceanologists, and many others around the globe have concurred that this is the case.

For the first time, in 2007, scientific agreement at the international level was attained and presented in the most recent IPCC report, namely the Fourth Assessment Report (4AR).[1] In addition to the IPCC extensive report there is also a useful summary for policy makers (IPCC 2007a), which is also relevant to local policy and decision-makers. There are also newer scientific studies that confirm the ever-increasing tempo of climate change, with new developments showing that changes are moving in the upper ranges of the scenarios presented by the IPCC. The IPCC reports are of interest as these are consensus agreements, meaning that there is a general unstated recognition that there have been political influences on the contents, which in turn means the substance was 'watered down'. Only in 2007 was there so much overwhelming evidence that could not be disputed

[1] http://www.ipcc.ch/ipccreports/ar4-wg1.htm – consisting of three working group reports and a Synthesis Report

(by 'rogue' scientists and people with a different political-economic agenda) and a consensus could be reached. In general, what a layperson should know is that the message is very grave, the timeframe for an appropriate response is shrinking, and the global response has thus far not been adequate – to put it mildly.

A basic reality is that climate change remains a rather abstract concept for many people, leading to a 'not-my-responsibility' attitude. Citizens tend to leave it to their national governments to solve. The confusion created by the long and often deliberately misleading debates on whether it is a real problem or not, has added to the effectively delay in addressing it as a global challenge. Today the challenge is considerably more substantial, and addressing it will be more difficult.

The response to climate change requires climate protection, and quite extensive action in many different fields. Climate protection can be defined as the range of direct and indirect policies that address climate change mitigation and adaptation, and the purposeful implementation of measures and technologies to achieve results that minimise the impact 'on' climate change (mitigation) and 'of' climate change (adaptation) on people and the environment we live in. The more mitigation is handled, the less there is a need to adapt. More extensive and faster mitigation efforts are required from today onwards, and there is also a need to respond to existing and anticipated changes by adapting to a changing climate.

### 2.1.2 Now Is a Good Time to Change Our Impact

Climate change is clearly relevant to the community level. This is where people conglomerate. It is also where people jointly contribute to the release of vast amounts of greenhouse gases (GHGs), thereby contributing to the acceleration of climate change. This is also where the impact of climate change is visible – higher temperatures, changing rainfall patterns, more intense storms – with infrastructure, people, fauna and flora more often not coping with these changes. Humans are not the only contributors to climate change, but play a major role and through this can cause catastrophic change if there is not a significant change in releasing human caused GHGs.

The aim identified by many industrialised nations is to limit global warming to 2°C above pre-industrial average temperature levels. This is said to be the 'tipping point' – a threshold identified beyond which climate change will reach dangerous levels. Beyond this point scientists predict that a 'snow-ball effect' is achieved and the changing system can no longer be stopped. Yet already with temperature changes seen today, there are already impacts on the environment, and with every new degree of change there is a larger corresponding natural change that could well have a devastating snow-ball effect. For example, higher temperatures have already led to the increased escape of methane released from melting ice-fields in the tundras of Russia and Canada – this is a very high-impact development that is unstoppable, except through lower temperatures that would cause the permafrost to solidify again. Such natural processes are accelerated by the human impact on the system. So now is a good time to change that human impact to try and save the system.

### 2.1.2.1 Climate Change Mitigation

How do humans contribute to the release of greenhouse gases? Every day we use energy (mostly generated from fossil fuels or nuclear) for electricity to light our homes, cook food and cool our rooms, or we use oil or gas for heating and cooking. Energy is used for cleaning and pumping water to buildings, and for waste management. Industrial processes require energy to make products and materials – to mention but a few actions. When looking at our daily energy needs and current behaviour we have a huge impact on climate change, every day. It is clearly time to seriously consider – and to reconsider – how we live and to make appropriate changes to reduce our impact on the climate and environment, moving towards a more sustainable approach.

In the urban area, two major GHGs that are released – carbon dioxide and methane – are highlighted here.

Carbon dioxide ($CO_2$) is emitted when fossil fuel-based energy (including electricity derived from the burning of fossil fuels) is used by households, institutional and commercial buildings, vehicle transportation, and industry. This gas is relatively easy to monitor, contributes to a high percentage of urban GHGs, and is the GHG that probably receives the most visibility in the media (people tend to refer to a 'low carbon lifestyle' or 'carbon neutral buildings'). $CO_2e$ is an abbreviation of 'carbon dioxide equivalent' and is the internationally recognised measure of greenhouse emissions. Each GHG has a different capacity to heat the atmosphere, which is referred to as their global warming potential (GWP). $CO_2$ is the standard for GWP – it has been assigned a GWP = 1.

Moving to the next GHG, methane (CH4) is a gas with a very high GWP. It is emitted in urban areas as waste decomposes in landfills and from wastewater and sewage treatment processes. Methane is also linked to agriculture and the way we grow food crops and the animals we maintain, so again linked to choices and lifestyle. As it is a very potent gas, reducing it is crucial – something that can very effectively be done at community level by moving away from landfills, use existing landfill to capture leaking methane for 'waste-to-energy' and by changing our diets in particular to avoid high emissions contributed by food production.

### 2.1.2.2 People Power

When considering empowerment, one aspect that tends to be neglected is that many people on this planet can contribute to climate change mitigation. This is linked to choice and behaviour. This aspect does not exclude people in developing countries, where energy is also wasted or not optimised in terms of efficiency. The concept of climate justice will not be explored here, but climate change mitigation is certainly a global solution that requires all able people to respond. Energy is valuable and should be valued as such. We can wield the 'power for change' on an individual

basis, in the context where we live, work or study. It is also a power for change that we can apply to the community scale where energy is generated, distributed and used.

The challenge is to move to a more sustainable manner of living as a daily priority, which requires some effort to analyse own actions and (re)consider the choices we make (or do not make) from a mitigation perspective. To become empowered one needs to know what the problems and the solutions are. There are many tools available to identify where personal emissions come from, and tools that support local governments in identifying community-wide emissions. The use of these needs to become the norm. There are already discussions on allocating personal $CO_2$ allotments to each individual per year. We need to see where these discussions take us, but the direction is towards a system that addresses equality and responsibility.

### *2.1.2.3 Climate Change Adaptation*

Mitigation is not the 'only' problem we must respond to. Climate change adaptation is also essential. Adaptation does not mean 'giving up' on climate change mitigation. Rather it is our response to unavoidable climate change and as such goes hand in hand with climate protection. We need to be realistic about inevitable change – the climate has already started to change and will continue to do so. Thus adaptation should become a co-priority, together with mitigation. Where possible, efforts to address mitigation and adaptation should be combined or at least integrated, to gain double or multiple benefits.

According to the IPCC (2007b) adaptation means the 'Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation'. A range of inter-sectoral response is needed, often also requiring cross-border and integrated approaches. This is a very complex issue when viewed from a macro perspective. Adaptation can include different strategies designed and operated by different levels of government. It should also be considered by other actors that will be impacted, but government is highlighted as the actor responsible for the welfare of its citizens and geographical area, and developments impacting on both. National governments need to develop a national adaptation plan, preferably with input by key actors, including local governments that will need to deal with the local impacts of a changing climate.

Considering that climate change is non-linear in character it means impacts are delayed. We are already today observing the impacts of our actions of 'yesterday', and will witness the impact of our current lifestyles over the next few decades. The GHGs we release today will certainly up the ante in terms of 'levels of aggression', with increasingly intensive changes in temperature, storms, floods, droughts, etc. expected. Our children and their descendants will have to cope with the majority of

the impacts – in part also based on what decisions we take from now on. We now also need to start adapting. Responding to climate impacts is a complex field of action, requiring first an idea about the expected impact of climate change (developing scenarios), then to make decisions based on the most likely estimates, and plan accordingly (e.g. higher temperatures need different building styles and standards), also thinking in terms of decades. This is needed at the community level, where the impacts of climate change are manifesting.

## 2.1.3 Local Communities in the Spotlight

### *2.1.3.1 Top-Down or Bottom-Up?*

The increasing challenges in the energy sector (fossil fuel depletion, rising costs, energy security concerns) and the acceleration of climate change with its impact, require a response. Having to become active in climate change mitigation is the price we pay for our current lifestyle. By adapting our energy systems and mode of living we can ameliorate our impact on climate change, and we will incur costs. These costs are offset in the middle to long term by significant economic, environmental and energy security benefits. We will also have to change our definition of 'quality of life', as the current high standard many of us are living in can no longer be maintained, and is in fact unsustainable.

Typically challenges of this dimension require national governments to engage, yet there has been a very slow response to date. The Kyoto Protocol is the main international instrument guiding GHG reductions until 2012, with targets set for those countries that have ratified the Protocol (it does not include major GHG emitters such as the USA and China). Many national climate change plans – commonly developed around the time the Kyoto Protocol was adopted (1997) and finally entered into force (2005) – do not yet reflect the urgency of the climate and energy situation, which increases year by year. The pressure is rather noted at community level, where the impact of climate change is increasingly becoming visible. National frameworks need to be 'translated' into and implemented at the local level, as explored by Lundqvist and Biel (2007) in *From Kyoto to the Town Hall.* Yet in most cases the national framework does not specifically support the local level despite developing pressures that are emerging here.

Time is ripe for a growing distributed bottom-up system to achieve effective GHG emissions reductions and climate change adaptation. This 'local to global' approach would mean the involvement of communities, but also enterprises and institutions. These are starting to engage (many started as early as the 1990s, especially cities – see Chapter 3), and in some cases take the lead in exploring new territory. To address this challenge a joint effort by all is needed, with as many existing ideas, technologies and measures implemented, combined with new, untested concepts that have a high impact potential – to make a major impact in a short time.

### *2.1.3.2 Local Governments as Key Actors*

In communities, basic conditions are created for living, working and commuting. Bearing in mind the large percentage of GHGs generated and energy needed here, this is where change can and has to take place. Communities are led by local governments, as the political and/or administrative bodies that have a responsibility to ensure a healthy, safe environment and functioning society. When considering the question of what would motivate local governments to act, some interesting answers were found, also looking at the above mentioned issues as key aspects when considering local climate action. A liveable community, with high quality of life is what many local governments strive for – to keep their populations and make their cities or towns attractive places to live and work in.

When considering the role of local government in local climate action, these can broadly be grouped into three categories:

- Guiding the community: Depending on the legal mandate or authority of the local government, this could include developing and implementing local policy and regulations, as well as developing and maintaining structures that support planning and implementation processes. A local government can also, for example, set standards that move beyond the national standards, or challenge target groups in a community to engage in a particular manner (e.g. school energy competitions).
- Acting as service provider and manager and/or owner of infrastructure: Acting by example in many different areas where the municipality has an influence, such as improving energy efficiency in buildings (municipal offices, health clinics, etc.), vehicle fleets (waste trucks, public transport, etc.), electricity grids and utilities, waste facilities, etc., as well as in areas where services are provided or administration is handled. The range of services provided to local inhabitants differs from country to country, but can include policing, health services, education, social -, energy -, transport -, water – and sanitation services).
- Providing leadership: Not only through its own exemplary action, but also by sharing information on experiences and examples (either good or bad) with others, – both in and outside the community – can local governments help to raise awareness, improve the level of knowledge (options, pitfalls to avoid, and what make actions replicable), motivate and encourage others – thereby leading a change of direction. Bringing together the concept of culture, climate protection and sustainable energy is a key element resorting under this category.

The local government, or municipality, is in turn led by a Council comprised of local leaders – in a democratic society these tend to be elected leaders (there are exceptions to this with political appointments also possible). Local climate action implies the need for local leaders who are courageous. Why courageous? They need to look beyond their political tenure and take decisions that can be uncomfortable, as change tends to be uncomfortable. Leaders are needed who will really direct their communities and guide change as needed, potentially even drastic change which could be required when addressing climate protection.

Intrinsic to a democratic system dramatic change is not wanted as it means instability. But as climate change will also lead to uncontrolled instability, controlled change should be preferable.

Citizens – especially voters in a democratic society – can influence direction by making choices when electing the 'right' local leaders. Typically climate protection is not yet on the agenda of many local elections, but this could change in the near future. Yet, ideally climate protection should be a topic that is above party politics, recognised by all as a priority (Sadly, only in the fewest cases this has been done – but these are the good examples). City councils, municipal staff, citizens, businesses and industry – all can help to shape developments in their local communities. They can wield power to empower the right kind of leadership, with leaders to take decisions that will benefit of the community as a whole and positively impacting on the global dimension. This could mean a new era of local politics is due.

### *2.1.3.3 Motivations for Local Climate Action*

In most countries local climate protection remains a voluntary activity. In many cases where local climate action was started, it was the result of one person or a few key people in the community realising there is a need to act – i.e. to take on responsibility to reduce local GHGs and/or to protect the community, often the combination of idealism and realism. Here the potential impact of local action was not seen as insignificant, regardless of the size of the community, as the 'local to global' approach refers to the multitude pooling resources and achieving a major impact. With the growing number of communities engaging, this hypothesis is validated (Fig. 2.1.1).

However, in many cases often other benefits, such as sustainable urban development or job creation, were the starting point, with some level of climate protection achieved and then seen as an 'added benefit'. For example in cities with a severe air quality problem, the improvement of air quality and subsequent reduced GHGs also addressed climate protection, as there restrictions were placed on the use of polluting vehicles. The entry point a community or local government chooses, is to some extent irrelevant. What is essential is to act. The best results will be achieved by acting in a well considered, coherent manner – and this would be real climate protection action. Ad hoc actions can be useful, but the impact is likely to be nominal if it is not part of a larger plan such as a Local Action Plan (e.g. a climate, energy or transport plan), and maintained over a longer period. Several examples presented in Chapter 6 illustrate starting points, plans, actions and benefits for different communities.

In a number of cases the potential to save money by being less wasteful with energy and materials is often a starting point, triggering other actions once savings have been made – energy savings leading to financial savings, which in turn frees up funds that can be reinvested into other energy efficient measures and clean technologies. The entry point through energy makes sense, and the term

**Fig. 2.1.1** Adaptation measure: a rainwater infiltration area below a building in Tilburg. A wadi *(Arabic word meaning dry riverbed that contains water only during times of heavy rain*) offers a way to deal with heavy rainfalls by buffering overflowing water and reducing the risk of flooding. In addition the wadi cools the area and offers a nice environment for plants, animals and insects (Photographer: Maartje Ansems) (see *Color Plates*)

'sustainable energy' is used to portray a three-pronged concept. Sustainable energy can be defined as energy, in the production or consumption of electricity, heating and cooling, which has no or limited impacts – compared to fossil fuels or nuclear energy – on human health, the functioning of local and global ecological systems and the environment. Sustainable energy is the combination of energy savings, energy efficiency measures and technologies, as well as the use of renewable energy sources, such as solar energy (passive and active use, e.g. solar thermal, photovoltaics), wind -, bio-energy, geothermal energy, small hydro power, wave and tidal power, as well as hybrid systems. Its objective is to provide energy security (sufficient, safe, affordable) for the present and future generations.[2]

Moving into a more specific energy approach that is very relevant to the community level, is the term Local Renewables. As used by ICLEI, Local Renewables means the use of local renewable energy resources, in combination with energy efficiency, for the community. The short-sightedness of importing energy at ever increasing costs, the lack of information and awareness about the potentials of renewables, and the wide range of co-benefits when addressing Local Renewables, led to the development of eight brief arguments (ICLEI 2007) to encourage communities to change to local renewables:

[2]As used by ICLEI Europe in its energy-related projects.

(i) Renewable energy sources (RES) are mature, available and ready for use today. There is a continuing misconception that RE technologies (RETs) are untested, 'too new', and not yet ready for large-scale roll-out. Many communities using RES and RETs are proving this wrong, and some are even successfully moving into the 100% RE range to cover their energy needs. There is a vast untapped potential still to be explored by communities in most countries.

(ii) Using local resources to produce energy locally establishes a solid foundation for decentralised, secure energy supply – thereby making communities more resilient. The local generation and local use of energy means reducing dependency on others for energy (e.g. oil or gas imports). Energy independence and keeping cash in the community are increasingly recognised as important issues by Councils, and will me a major motivating factor for action in the near future.

(iii) Financial benefits are inherent – both in terms of saving money and generating an income over the short to long term. By reducing energy demand (saving energy) costs can be saved, and by producing RES locally, for own use and potentially expanding it to sell energy to other communities in the region, an income can be generated. Countries with good feed-in tariffs provide ideal enabling framework conditions for communities that switch to local renewables.

(iv) A steady transition from fossil fuels to Local Renewables will reduce $CO_2$ emissions and contribute to climate protection. This can be valuable both for mitigation and adaptation, with the latter meaning adapting energy supply and demand, as well as improving the resilience of energy infrastructure.

(v) Switching to Local Renewables supports local job creation and stimulates the economy. Renewables are of particular for the small and medium-sized enterprise sector, with smaller companies providing locally needed services and materials. Here the focus is also on keeping local money paid for services in the local economy.

(vi) Local Renewables give an impulse to sustainable urban development, and encourage technical and social innovation. The integration of RES and EE into the community building, energy, transport, waste and water sectors leads to the application of innovative technologies and measures, often with positive socio-economic impacts – especially as seen from examples in renovating rundown areas. The improvement of quality of life is certainly a benefit citizens are interested in.

(vii) Local action is critical in achieving national and international targets on sustainable energy and climate protection. In each country there are many different actors that need to engage to reach the national climate targets, made up of people living in communities. It is clear that without communities, nations will not be able to reach their targets, and without communities around the globe engaging in this challenge, a global solution will not be achieved.

(viii) Local Renewables imply the involvement of local stakeholders, using synergies to create change. Proven success examples show that many different

community actors need to be on board, from the planning to the implementation phase, to achieve success. These include citizens, non-profit organisations, chambers of business, etc. All have a stake in the local community, and a role to play in Local Renewables.

What is interesting is to see how actors can influence one another at the local level. A municipality can act as a good example and run 100% on green electricity and reduce energy demand by switching to energy efficient appliances, thereby inspiring citizens as energy users to change their own behaviour. A change here will also force a change from the side of energy utilities (e.g. responding to an increasing demand for green electricity). The 'responsibility' trigger will usually not work in isolation. People tend to need more than one reason to change with the idealistic motivation not a strong one in many cases. So there is a need to continuously highlight different reasons and options, repeatedly reinforcing messages, using easy language and ideas that capture the imagination. We need to 'market' climate protection better.

Motivation for local action – some benefits for communities:

- *Save money by saving energy and using energy more efficiently:* By reducing the use of electricity (e.g. switching off lights that are not needed or using a movement sensor in corridors or garages) and the need to heat or cool space (e.g. through well-insulated walls, roofs and windows) – one can significantly reduce GHGs and save on skyrocketing energy costs.
- *Build the local economy and create jobs:* Decreased energy costs and the provision of new energy services and technologies (e.g. energy efficiency and renewable energy) give local government and private firms a competitive edge. Demand for energy efficient products and services and for new or alternative energy technologies expands local business and creates local jobs. It is a sector that in particular supports the development of small and medium sized enterprises (SMEs).
- *Improve air quality and public health:* Reducing global warming pollutants also helps cities comply with federal air quality regulations and preserves federal funding for local projects. These strategies ultimately create less air pollution, which results in fewer air quality-related public health impacts, such as asthma and other respiratory ailments.
- *Improve community liveability:* Cutting global warming pollution includes measures that also reduce auto dependency and traffic congestion, clean the air, and contribute to more efficient land use patterns and walkable neighbourhoods. In combination, these types of measures can help build a more liveable community.
- *Connect cities and towns with national, European and international leaders:* The expanding CCP network of communities committed to advancing climate protection and the Covenant of Mayors, as well as the World Mayors Agreement provide a valuable framework for action. By joining these, local governments unify and so strengthen their position.

– *Create a legacy of leadership:* Taking action on climate change provides tangible benefits for citizens today – and ensures that future generations will have access to the resources that support healthy, prosperous, and liveable communities.

### 2.1.4 Summary

In conclusion, people can and need to change, especially in the way they generate, distribute and use energy, but also in the way they use natural resources in general. There are no unlimited resources. Efficiency is a keyword that needs to become part of daily life. Less polluting fuels are also needed, with the use of natural local resources, such as solar, wind, and water, but a few of the more logical solutions available. By harnessing RES and using the energy locally – Local Renewables – a community can improve its resilience and gain socio-economic benefits that would make it a liveable community, increasing the quality of life.

Leaders and citizens are increasingly seeing the need to improve the resilience of their community against a changing climate, with more frequent storms, heavy rainfall, longer droughts, and many other phenomena impacting on their lives, environment and infrastructure. With more than half the global population now living in urban areas, and more migrating towards these, this is where the climate challenges will manifest. People want a secure environment to live in. They will look to their leaders to provide this.

Climate change mitigation and adaptation need to be co-priorities for all levels of governments. They must find ways to motivate and engage citizens in the short transition process. Local government, as the level of government closest to citizens, have to take the lead in this process at community level – shaping regulations, developing policy, guiding change, acting by example, changing the way they provide municipal services, and motivating others to follow suit. The primary motivation for them to act is clear – providing a safe, healthy and viable environment for their citizens, making sure the community is 'liveable'. Without people there is no community and no need for a local government.

Engaging in local climate action, communities can gain multiple benefits. Motivating a whole community to act, means moving beyond the purely idealistic point of view to one that is 'closer at home' – talk about money, talk about the cost of action and of inaction. There are short to long-term investments that are worthwhile to make in this field. And these will be done in many communities around the globe, working to their own benefit, as well as for the global common good. The starting point is often to reduce expenses – saving money by reducing energy use. There are many examples of where local governments and other actors have started to use energy more efficiently, by applying a combination of energy efficiency (EE) products and measures, and by changing to renewable energy sources to avoid steadily increasing prices of fossil fuels (oil, coal, natural gas). From here it is a logical step to generating energy locally from local resources, and to become more

efficient by reducing the need for (and cost of) extensive energy transmission and distribution networks that have extensive associated waste. It boils down to regarding energy as a valuable resource.

With increasing public awareness on the need to reduce harmful GHGs, rising fossil fuel prices, and with more options to improve energy consumption behaviour, the transition to a sustainable energy future has started. What is needed are climate neutral and climate resilient communities, which are nice to live in. Now the question remains, can we achieve this in time?

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# Chapter 2.2
# Global Action: The Case for Rapid Mitigation in the Stern Review and the More Recent Evidence from the IPCC AR4*

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**Abstract** The scientific evidence of climate change, among others presented by the International Panel on Climate Change (IPCC), has drawn attention of policy makers and, among others, led to economic studies being conducted. One of the most influential and comprehensive was the 2006 Stern Review which considered the economics of climate change, and the cost of immediate action and delayed action. It had a major impact on the policy debate, not only in the UK, but internationally.

**Keywords:** Climate stabilisation • economic argument • policy debate • Stern Review (SR) • transition to a low carbon economy

## 2.2.1 Introduction

The Stern Review (SR) (Stern 2007) reported in October 2006 and had a major impact on the policy debate on how to respond to the threat posed by climate change. The SR called for early and decisive action to reduce emissions of greenhouse gases, but the main novelty it brought to the debate was that this key conclusion was explicitly based on an economic argument, i.e. the finding that investing now to achieve an early, deep reduction in global emissions could avoid much

* The views expressed in the paper are those of the author and do not necessarily reflect those of the Committee on Climate Change.

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M. van Staden and F. Musco (eds.), *Local Governments and Climate Change*, Advances in Global Change Research 39, DOI 10.1007/978-1-4020-9531-3_2,

greater damage costs from unmitigated climate change as well as curbing the risk of facing truly catastrophic impacts. The Stern case for action has been reinforced by the broader evidence base summarised in the IPCC Fourth Assessment Report (AR4) (IPCC 2007a). The latter pointed to the risks of unmitigated climate change while also showing that climate stabilisation at the levels recommended by the SR is feasible and achievable at comparable costs. This contribution to the ICLEI publication reflects material presented at the ICLEI conference Rovigo 2008. It quickly reviews the SR arguments for early action on climate change and the extent to which they are supported by the IPCC findings and other evidence. Moving from the international to the national level, it then summarises recent UK analyses showing that the transition to a low carbon economy is challenging but feasible provided the policy framework is right. Finally, the paper addresses possible links between action at a global and national level and action at the level of individuals and communities, suggesting that this has an important role to play as part of an effective and efficient policy framework.

### 2.2.2 The Economic Case for Early Action in the Stern Review and Further Evidence from the IPCC Fourth Assessment Report

The Stern Review (SR) was commissioned by the United Kingdom (UK) Chancellor of the Exchequer in 2006 with the remit to assess the evidence and build an understanding of the economics of climate change. The science was the starting point of the SR, reflecting the view that the scientific understanding of climate change – a global, long term environmental problem involving risks and uncertainties and potentially major and irreversible change – ought to shape the economics.

One of the first steps in the Stern narrative was to characterise the risks that the world would face if global mean temperatures were allowed to increase above certain thresholds. The conclusion reached by the SR was that adverse climate change impacts in a number of domains should be expected even for moderate degrees of warming and over relatively short time scales. Furthermore, the risks would intensify as temperature rises. The AR4 essentially reinforced this message. According to its review of impacts global mean temperature increases of about 2.5°C above pre-industrial times would be accompanied by an increasing number of key impacts, such as widespread losses in biodiversity, decreasing global agricultural productivity, and commitment to widespread deglaciation of Greenland and West Antarctic ice sheets, while changes greater 4.5°C would lead to major increases in vulnerability exceeding the adaptive capacity of many systems (IPCC 2007b). Global mean temperature has already increased by about 0.6°C compared to pre-industrial times and should any further warming in excess of 2–3°C occur we would be experiencing climate change on a scale that is unprecedented in the course of human history.

The SR then moved on to set out a case for early action based on an economic and risk assessment of the potential major risks from climate change and the feasibility and costs of mitigation. The approach involved assessing what could happen to concentrations of greenhouse gases (GHGs), temperature and impacts on a business as usual emissions scenarios and then looking at the implications for eventual temperature increases of different levels of stabilised stocks of GHGs.

At present GHG concentrations are at around 430 parts per million (ppm) and raising at 2 ppm/year. Business as usual would see this rate of growth increase further could result in around or well beyond 750 ppm by the end of the century. Despite the uncertainty that characterise the relationship between amounts of greenhouse gases in the atmosphere and global mean temperature, according the SR it was clear that if no action was taken to reduce emissions the global climate would be entering very dangerous territory. Furthermore, the SR pointed to the risks associated to delaying action. Stabilising GHG concentrations above 550 ppm would virtually commit the world to a temperature increase of 2°C above pre-industrial times and imply a greater than 50% probability of exceeding an ultimate temperature increase of 4–5°C, with a significant share of this increase (about 2–4°C) to occur by the end of this century or early in the next century.

By contrast, the SR emphasised that stabilising GHG concentrations between 450 and 550 ppm or below would considerably reduce the risk of witnessing truly catastrophic climate changes. The scientific evidence on these relationships keeps evolving but if anything points to greater climate change risks for similar levels of concentration. For instance it is now widely accepted that stabilising at 550 ppm would not be sufficient to produce a reasonable probability of meeting the EU aspiration of limiting the increase in global mean temperature to 2°C above pre-industrial times.

If one accepts that in principle there are very large benefits from early action aimed at keeping GHG concentrations at 550 ppm or below, the next consideration ought to be the feasibility of emission reduction scenarios consistent with this objective. Both the SR and the AR4 that stabilising at between 450 and 550 ppm would involve strong and early action, with global emissions peaking in the next 10–20 years and then falling at a significant rate thereafter. Stern concluded that global emissions of GHGs should be at least 25% below current levels by 2050 to stabilise below 550 ppm, while depending on the scenario the AR4 points to a level of $CO_2$ emission reductions of about 30–50% on 2000 levels by 2050 as consistent with GHG stabilisation at around 500 ppm. Both Stern and the AR4 (the latter with 'high agreement and much evidence') also suggest that these stabilisation objectives can be achieved by deploying a portfolio of technologies that are either currently available or could become commercially available in the coming decades, provided that appropriate policies are in place. The size of the technological challenge and policy shift required cannot be underestimated. The International Energy Agency (IEA) Energy Technology Perspectives 2008 (IEA 2008) suggests that targeting a 50% reduction in global emissions by the middle of the century would need to be supported by far reaching new policies and by investment in research and development (R&D) and deployment of low carbon technology equivalent to

about US$1 trillion or 1.1% of global Gross Domestic Product (GDP) per year between now and 2050. But while the policy and technological challenge of stabilisation cannot be underestimated, the overall message of the IEA is consistent with the SR and the AR4 in arguing that achieving deep cuts in emissions by the middle of the century is feasible.

Stern also tried to quantify the costs and benefits of action through various modelling approaches. The damages from business-as-usual were estimated to be equivalent to at least 5 and up to 20% of consumption a year, depending on the types of risks and effects included in the estimates. By contrast the costs of removing most of that risk, getting to 550 ppm or below, are around 1% of GDP per year, within a range of ±3/cent. These costs are not insignificant in absolute terms, but would not undermine long-term economic growth. The SR's findings on the global costs of mitigation are broadly consistent with the conclusions of the AR4, but both reports also point to the fact that delaying emission reductions will significantly constrain the opportunities to achieve lower stabilisation levels.

In presenting a summary of the SR conclusions on the case for early action one has to mention that the cost benefit analysis undertaken by the SR proved to be rather controversial in economist circles. A key criticism of the SR calculations related to the choice of discount rate that Stern used in his analysis, i.e. the rate at which current and future costs and benefits should be traded against each other. This was regarded by many of Stern's peers as being too low, thereby lending artificial support to the SR case for early mitigation, which would involve investing resources in the next few decades to pre-empt impact spanning several decades if not centuries. The debate is complex and it cannot be properly summarised here, though it is worth mentioning that Stern and his team have responded to their critics from the pages of World Economics (Dietz et al. 2007). Notwithstanding disagreement on the SR approach to the cost benefit analysis the evidence put forward by the SR and supported by the AR4 and other analyses points to the existing but rapidly fading opportunity to buy a significant reduction in the risk of facing very large, unpredictable climate change impacts for a relatively small price. Against this background those advocating a slow global policy response to the climate change threat should be upfront about the risks this strategy would imply, even if the main bearers of those risks are likely to belong to future generations. The strong ethical dimension associated implied by different choices around discounting and other elements of cost benefit analysis (e.g., approach chosen for valuing human life) would then become explicit.

### 2.2.3 Country-Level Action: Highlights from a UK Analysis of the Costs of Transition to a Low Carbon Economy

If global scenario analysis points to GHG stabilisation at low levels as being challenging but feasible, various analyses carried out for the UK also suggest that a rapid and cost-effective transition to a low carbon economy is a realistic aim

provided the policy framework is right, that emissions reductions are delivered from those sectors of the economy where it is most cost-effective to do so and that government, business and individuals each play their part. In particular, modelling work in support of the Energy White Paper 2007 and of the draft Climate Change Bill suggests that the long-term costs of meeting reduction in UK $CO_2$ emissions by between 60% and 80% on 1990 levels by 2050 are not prohibitive, well within the Stern range of global costs.

Analysis for the Energy White Paper 2007 based on the UK MARKAL-Macro model (BERR 2007) pointed to long-run costs of a 60% $CO_2$ reduction by 2050 of about 0.3–1.5% of UK GDP, while additional analysis for the draft Climate Change Bill (Defra 2007) found costs in the region of 1.1–2.6% of UK GDP in 2050 for an 80% $CO_2$ reduction.

But the fact that these long-term costs are a small percentage of future GDP should not be taken to imply that decarbonisation is somehow easy – it's not, it is a major departure from the business-as-usual (BAU) scenario in terms of how we produce, transport and use energy, and will also involve action on waste and land and land use changes. If we look at the technological scenarios for the UK transition to a low-carbon economy we see for example that by 2050 all sectors contribute (fairly equally) to emission reductions although relative timings of contribution differs. The electricity sector is a key sector for realising emission reduction targets, almost fully decarbonising by 2050 through a combination of carbon capture and storage, nuclear and renewables. In the 80% reduction scenarios surface transport is also largely decarbonised, with second generation biofuels playing a significant role. The recent King Review of low-carbon cars pointed to electric vehicle technologies (King 2008) relying on near zero carbon power generation as playing a major role in decarbonising the transport sector given constraints on the sustainable supply of biofuels. Essentially however it confirmed that in the long term the transport sector needs to shift away from dependency on fossil fuels and become essentially carbon-free if deep cuts in emissions are to be achieved.

It is also worth mentioning that while long-term costs are likely to be a very small proportion of GDP in the short and medium term (up to 2020), costs could be higher. For example macroeconomic modelling for the Energy White Paper shows that costs up to 2020 could be 0.8–1.6% of GDP (Oxford Economics 2007). But such costs are highly dependent on the choice of transition path and policy mix. In the short term the capital stock is less malleable and mitigation policy can bite harder if it is not efficient or if it is introducing major shocks to the system. Continued emphasis on trading within the EU and internationally is key to mitigate short-medium costs and risks. But in order to achieve these goals it is also essential tat all opportunities for cost-effective energy savings within the economy are taken up.

Different studies looking at building marginal abatement cost curves for the UK economy (relating incremental units of GHG abatement to incremental unit costs per tonne abated) have consistently shown that there is significant potential to reduce emissions through relatively inexpensive measures. For instance, analysis by consultants McKinsey for the Confederation of British Industry (CBI) Climate

Change Taskforce report (CBI 2007) has suggested that there are just over 40 Mt $CO_2$e of emission reductions that could be achieved by 2020 at negative cost, largely from increases in the energy efficiency buildings and appliances but with contributions from other sectors (e.g., with fuel economy improvements in commercial vehicles). In other words, significant savings could be achieved through measures that require an upfront investment but over time can more than pay back the initial outlay, thereby saving money as well as reduce emissions. Some cost elements (e.g., hassle factor, disruption or other transactional costs such as costs of management time) are not explicitly included in these calculations, as the CBI acknowledges in its report, but even so unlocking the potential for negative or low cost measures to deliver emission reductions should be a policy priority.

Tapping into the significant potential for low cost emission reductions requires addressing a complex mix of market failures and barriers that have so far prevented this potential from being realised. These essentially range from genuine market failures (e.g. restricted access to capital, lack of information and split incentives between landlords and tenants) to barriers that are of a predominantly behavioural nature. The latter include bounded rationality (i.e. the inability of individuals and organisations to adequately process information and make the right investment decision) but also simple inertia and gaps between individual attitudes towards the environment and actual adoption of pro-environmental behaviours.

### 2.2.4 Action at the Level of Individual and Community: How It Fits Within the Picture

If global and national level analyses support the message that deep cuts in emissions are feasible at costs that are not prohibitive, they also consistently agree on the message that policy matters if this goal is to be achieved.

The SR argues that effective action on reducing GHG emissions must include three elements:

- Pricing of carbon implemented through tax, trading or regulation
- Policy to support innovation and the deployment of low-carbon technologies
- Remove barriers to energy efficiency and to inform, educate and persuade individuals about what they can do to respond to climate change

Taking for granted that no significant progress is going to be possible without a satisfactory global deal and clear commitment of key national states and groups of states, is there a role for individual and communities in pursuing this policy agenda? Or is it entirely up to central governments and big business to deliver, respectively by designing and implementing effective policy levers and by responding through investment and innovation?

To answer this question it is useful to consider SR policy pillars in turn. The first pillar, carbon pricing, is likely to remain the realm of international agreements and regulatory interventions at the level of national states or supranational organisations such as the European Union. Proposals to bring carbon pricing and emission trading to a household or individual level through personal trading schemes have been put forward for consideration and could see communities engaging in piloting the concept. Such schemes are not technically unfeasible and may present some attractive features in terms of engagement, but public acceptability and implementation costs mean they are unlikely to represent viable option (Defra 2008).

In terms of innovation – the second pillar in the SR framework - action at the level of communities and local authorities can often offer very useful case studies of diffusion of niche low carbon technologies (e.g. photovoltaics [PV], biomass-fuelled district heating schemes, carbon neutral buildings, waste-derived biofuels, etc.) and more generally of planning for sustainable energy and transport infrastructure at the municipal scale.

But arguably it is the third of these pillars – removal of barriers, awareness and persuasion - where community action can really help making a difference. A starting consideration is that in developed countries the amount of emissions that individuals control tends to be a significant share of the total. The CBI Taskforce report (ibid.) highlights that individuals and households directly control as consumers more than one third of emissions through personal decisions about how they heat and light their homes, the electrical appliances they use and the transport choices they make (the report also notes that combining the emissions that individual and households directly control with those that they influence through their purchasing choices, they can affect around 60% of UK emissions). Furthermore, analyses based on marginal abatement cost curves suggest that there are significant abatement opportunities associated to everyday individual decisions: simple things such as turning down thermostats by one degree, choosing more efficient appliances and fuel efficient vehicles, insulating homes better. At the same there are entrenched barriers that need to be overcome in order to unlock behavioural changes and hence tap into this potential for low cost emission reductions. Individuals are often not aware of the links between their everyday choices and climate change, and even when they are they may lack the necessary information (or the ability to process information) to choose the most efficient technologies and adopt behaviours that are consistent with pro-environmental attitudes.

Against this background, leadership at the community level can not only increase awareness about causes and the scale of the climate change challenge (thereby increasing the level of general consensus on the need for action), but more importantly it can put forward simple and positive messages on everyday actions and choices that can help make a difference in terms of emissions and achieve financial and other benefits.

In summary (and quoting the SR), “dangerous climate change cannot be avoided solely through high-level international agreements; it will take behavioural change by individuals and communities, particularly in relation to their housing, transport and food consumption decisions”.

### 2.2.5 Summary

The economics of risk underpins the Stern conclusion that we should aim to stabilise atmospheric concentrations of GHG somewhere between 450 and 550 ppm to achieve a significant reduction in the risk of witnessing truly catastrophic climate change impacts, and technology scenarios point to the required deep cuts in emissions as being feasible if challenging. While the AR4 did not provide explicit recommendations on stabilisation targets that would be needed to avoid dangerous climate change (in recognition that defining these thresholds would require value judgements and would go beyond its scientific remit) the evidence it gathered lends further support to the evidence on which Stern based its conclusions.

UK analyses show that a rapid and cost effective transition to a low carbon economy is feasible provided the policy framework is right, and that the significant potential for low or even negative costs emission reductions (predominantly through improvements in energy efficiency) is fully realised. This however requires addressing entrenched barriers to pro-environmental behavioural change.

Individuals and households directly or indirectly control a significant share of emissions in developing countries. As part of a global solution, there is a key role to play for individuals and communities, particularly in tackling barriers to behavioural change. Leadership at the community level can put forward simple and positive messages on everyday actions and choices that can help make a difference on emissions and achieve financial and other benefits.

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*The Committee on Climate Change (CCC) is an independent body established under the Climate Change Act to advise the UK Government on setting carbon budgets – legally binding ceilings on the level of allowed UK emissions over 5-year periods – and to report to Parliament on the progress made in reducing greenhouse gas emissions. The 2008CCC report 'Building a Low Carbon Economy' recommended that the UK should aim for an 80% reduction in GHG emissions on 1990 levels by 2050 and advised on the level of the budgets for 2008–2012, 2013–2017, and 2018–2022. The analysis supporting the Committee recommendations updates in several respects the analysis summarised in this paper. It covers climate change policy targets, technology scenarios and assessment of macroeconomic costs and other impacts of emission reduction targets. It also identifies opportunities to cut emissions across different sectors of the economy – transport, residential homes, aviation, industry and electricity – and provides further evidence on the importance of tackling barriers to behavioural change from households and individuals in order to unlock potential for cost effective emission reductions. To download the CCC's 2008 report, subsequent annual reports and special reports, go to their website at:* www.theccc.org.uk.

# Chapter 2.3
# Urban Energy Security

**Rian van Staden**

**Abstract** The realisation of a sustainable energy regimen in the urban environment requires a compelling understanding of the energy balance, environmental modalities and socioeconomic realities of the area in question. Cities are complex: communities offer manageable abstractions in homogeneity and purpose that serve as excellent starting points for understanding the greater complexity of cities. However, the introduction of such a sustainable energy regimen into communities also requires a profound understanding of the potential and impact of available technological, social and economic solutions. Only with both sides of the coin do we achieve a currency with which we may buy a better future for coming generations.

**Keywords:** Energy security versus secure energy • energy sufficiency • ethics • external energy demand • geopolitics • unpredictable prices • value chain

## 2.3.1 Introduction

We have an instinctive feeling for what is meant by energy security. It is a multilateral, geopolitical issue, thorny and uncomfortable, encumbering relations between sovereign nations, far away and with some luck, somebody else's problem. Unfortunately, from a human settlement perspective, this comfortable position holds little water.

It turns out – much to our chagrin, for those of us working on the issue of ensuring that our cities and settlements keep functioning for the next several generations – that energy security is something that involves us intimately, and further calls out for a redefinition that finally integrates the demands of international, national and local politics.

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M. van Staden and F. Musco (eds.), *Local Governments and Climate Change*, Advances in Global Change Research 39, DOI 10.1007/978-1-4020-9531-3_2,

‘Energy Security’ is often reduced to that most basic tenet – security of supply. Interestingly, even in its geopolitical context, it is much, much more than that. At an urban level, it fills the horizon, touches everything we do, and becomes a basic principle, which dictates our policy, our economics, and ultimately our lives.

#### *2.3.1.1 Topsy-Turvy*

In the urban context, the innate relevance of energy security can best – perhaps most comfortably – be redefined if we recast it as ‘Secure Energy’. Surely this would represent our most basic need, encompassing concepts like sufficiency (having enough – which dominates reality and in return determines our economic health), as well as safety (of which we all strive for in our energy regimen, for the sakes of ourselves and our children) and, at its most fundamental level, sustainability, in the sense of bitter, bared-teeth survival.

Secure energy means, far more transparently than a term such as ‘Energy Security’, that we have what we need, that it does not conspire to kill or harm us, and that it remains available over time. Energy Security, in the urban context – indeed, the human settlement context – becomes secure energy. Secure energy is energy we understand, energy we command, energy we control, energy we can guarantee, energy we can afford, and energy we can live with. At heart, this is the truer – and more immediate – definition.

The application of this definition becomes most harsh when we hold it up against what passes for energy supply in the current paradigm. Conventional energy is energy we only temporarily had enough of, which we never controlled, which we can no longer afford, and which we find increasingly morally and ethically difficult to live with, much less guarantee.

#### *2.3.1.2 Complexity*

As with most real-world issues, this idea of secure energy is more complex than we might comfortably believe. Perhaps this is the key reality in the area of urban energy supply, as it promises to become uncomfortable from today onwards.

It touches on social issues, economics, peaceful co-existence, growth, the social contract that cities have with their inhabitants, and the promise politicians claim to represent to their constituencies. It becomes, at heart, an urban issue, and one we can no longer comfortably ignore.

#### *2.3.1.3 In a Nutshell*

In short, the challenge of servicing the needs of an urban populace is one of resources, daubed with a dose of fairness and a veneer of civilisation. While many resources may, could or should become scarcer, one scarcity is of foremost

importance – that of energy. We have grown our cities, from the early days of the industrial revolution, on the premise of cheap energy. We have paid a heavy price for it, environmentally, socially, and economically. For the economic high, we have paid with dependence, an argument we would never countenance if the issue was substance abuse on a personal level, but one we stomached gaily because the cost seemed distant and the high immediate and universal.

The time has come for an accounting, and the price to pay is the world as we know it. A down no amount of uppers in the traditional sense can alleviate.

In what follows, we examine the urban aspect – the urban pathology, if you will – of what we have done, and the remedial actions that are required to ensure the survival of that mechanism most at stake – urban civilisation. We will do so in terms of those aspects most familiar to those of us who deal with urban ills, ailments and alleviates on a daily basis – economics, social issues, comfort, persistence, and growth.

### *2.3.1.4 Foremost*

Let us begin by examining that core issue that we currently understand under the concept of energy security – sufficiency. We most widely discuss energy efficiency, but we live by sufficiency – our ability to supply enough energy to fuel our urban economies and lifestyles, and maintain acceptable levels of growth.

If we tend to think of energy security as a national issue, let us cast it in that context. What happens, in real terms, if security of supply can not be guaranteed at a national level? A significant threat to "Energy Security", in the traditional context, is the monopoly held over supply by a minority of countries and organisations. Russia's Gazprom in its (massive) area of influence, for example, decides, based on issues that have little foundation in rationality and responsibility, who gets how much energy and why. Typically, it supplies a country with a need – indeed, an organic dependency – of $N$ units of gas, with $N$ units of gas. What happens if it decides to supply only $N$-$M$ units (where $M$ is some unpredictable amount)?

The answer is complex, and has to do with those two key aspects of economic reality: money and power. But let us (democratically) assume that where each citizen had access to $n = N/$population units, we now have a per-capita availability of $(n\text{-}m) = (N\text{-}M)/$population units. What does this mean in the urban, rather than the individual, context?

The answer lies in the demand. If, in our particular urban context, we have a per-capita need of $x$ units, where $x$ is larger than $n$-$m$ ($x>(n\text{-}m)$, in mathematical terms) we have significant problems of sufficiency. On the other hand, if in our city, we have a per-capita need of $y$ units, where $y$ is smaller than $n$-$m$ ($n$ being a national average), thus a situation where $y < (n\text{-}m)$, we have a theoretical maintenance of sufficiency. Even in a more real-world situation, where we calculate an additional loss of $q$ units to those with greater power to effect their demand, if $y < (n\text{-}m\text{-}q)$, we are still able to maintain sufficiency within the urban context, and remain unaffected.

The key outcome of the above is that not all cities are equal. But of course, we know that. The question is, how does that inequality come about, and how do I ensure that I am in the latter, rather than the former, type of city?

#### *2.3.1.5 Supply and Demand*

Winners – cities that can weather this most basic of impact from the "Energy Security" equation – are those that are able to best manage the demand. Not, specifically, energy demand as a whole, but rather external energy demand – the demand for energy from outside resources.

In the past, a heavy external energy demand did not tax cities to any great extent, as the energy was cheap and supply exceeded demand. In times where prices are volatile, tending to be high, and supply is beginning to fall behind demand (and yes, the two are obviously, though incompletely related), cities become net exporters of money (not to mention jobs, and a certain degree of autonomy). This is the price for being a net importer of energy in the new world reality we all face. Unless you have a coal mine in your municipal park, an oil platform in the municipal lake or an oil well in your municipal parking lot, you are pretty much an energy importer in the conventional energy mix model.

There are ways out of this (potentially catastrophic) cycle of dependence. Some are directly energy related (generating your own from local resources, or reducing your net energy demand). Others are more indirect. But they exist, and they exist today, as is explored below.

### 2.3.2 Issues to Consider

#### *2.3.2.1 A New Philosophy of Measurement*

To make matters worse, cities and communities generally seriously underestimate their actual energy footprint. Is it enough to measure how much electricity, gas and oil you import? (in case you're unsure, the answer is "no"). As such, having methodologies in place that allow you to measure your dependence (both real and ethical) on external energy sources is a key requirement on getting to terms with your addiction – but more on this later. For the moment, let it suffice to say that if you buy a refrigerator from China, your responsibility extends to the way the power was produced that went into manufacturing that refrigerator.

#### 2.3.2.2 The Human Aspect

In the urban context – a context that has at its source the agglomeration of large numbers of people in one place – there is a pronounced human aspect to the whole energy issue. Primarily, it is one of expectations. The broader populace in the polis has a set of expectations that those who manage – either as elected or appointed officials – would do well to adhere to. In addition to the obvious one – fulfilling the basic need for energy sufficiency – there are several others that inform our response to the new energy challenges we face. They include expectations about the environment (that it will not go completely hostile just so that I can have enough energy), health (that my energy sources will not try their best to kill me, my family and my community), that of price (especially business use requires a degree of stability and predictability to facilitate budgeting that we can no longer guarantee), and many others. There are ways of fulfilling these requirements. None of them involve adhering to the energy status quo.

#### 2.3.2.3 The Benefit of Inequality

The expectations of people also drive the benefit of being different. Being better than other cities – being in the latter group of cities as outlined above – is a valuable characteristic that fuels economic and social growth.

Take the possibility of attracting business. Where energy supply is assured, and pricing guaranteed, business feels far more at home than in a context of insufficiency and price volatility. On average, businesses are happy to pay more for energy if the price can be guaranteed over time, rather than less today and a lot more (unpredictably more!) tomorrow. Cities that are able to provide such an environment perform better economically over the long term than those that cannot.

On the level of the individual, nothing makes for an uncertain social environment like the uncertainty of services, especially those taken for granted, such as electricity, heating, water and the like. In South Africa, where electricity has been cheap and plentiful for decades, no topic currently provides for as many (generally unfavourable) headlines as the discontinuous energy service provision (energy outages) that plagues that country. If such a situation can be avoided – and it can (and in the case of South Africa, it could have) – it certainly should be.

#### 2.3.2.4 Climate Change

We all contribute to the anthropomorphic $CO_2$ emissions that are the driving force speeding up natural climate change. Where people conglomerate, emissions do as well. Hence cities are focal points in the battle to ameliorate climate change, even

if rarely acknowledged as such. Slowly but surely, the message that cities are key players in realising national targets in $CO_2$ reductions are being absorbed by – on the whole – reticent national authorities. It is clear that urban $CO_2$ emissions targets, while connected to national targets in convoluted ways, are becoming necessary, even unavoidable.

Interestingly, the measures needed to de-couple ourselves from external energy dependence align nicely with those needed to ameliorate climate change. It therefore follows that national resources will increasingly become available at a local government level to implement such measures. It is rare that local and national policy requirements – $CO_2$ reduction at a national level, and increasing the independence from imported energy sources – align so perfectly. This will play a key role when we consider the cost of secure energy.

### *2.3.2.5 The Direct and the Indirect*

In terms of directly influencing the amount of "foreign" energy required (and yes, your neighbouring city qualifies as foreign in this context), the measures that can be applied tend to fall into two broad categories – energy efficiency and local renewable energy sources. If these sound expensive, in terms of requiring the real expenditure of budget, they certainly are. But, as with any investment, the net benefit should be seen as a whole, both in terms of direct and indirect benefits.

Every kilowatt-hour produced locally, and every kilowatt-hour of use avoided locally, benefits both directly through avoided cost of imported energy at unpredictable prices, and indirectly through a number of indirect benefits that in many cases manage to overshadow direct benefits. Such a statement needs examples. Let us compare a kilowatt-hour of electricity provided by a power plant somewhere else, using fuel imported from, say, another country blessed with more natural petrochemical resources than you are, with a kilowatt-hour produced from photovoltaic (PV) panels locally manufactured from locally produced cells (but with, for the sake of argument, imported silicon), installed by local installers on a local roof.

The net benefit of the former is that it required no up-front investment. In every other way – the flow of value, job creation, control, guaranteed supply, emissions for which you are responsible, and so on – it has negative impacts, known as externalities.

The latter, where a significant portion of the value chain lies within your back yard, the fuel cost is nil, and the up-front investment is recouped as the energy is used to fuel your local economy, has mainly positive externalities – guaranteed price, job creation, value flow within the local economy, your ability to export both product and know-how. Is it more expensive? In terms of the actual generation cost, for the moment, yes. In terms of the value of all externalities? Hardly. Add to that your ability to leverage local investment with national measures now generally in place, and it becomes a very compelling proposition.

The time has come to look beyond the now.

### 2.3.2.6 Responsibility

Public administration is largely about responsibility – cost plays a role, but only as enabler. The population places upon its administration – note the choice of words – the task of providing the infrastructural and administrative requirements it demands for the execution of everyday life – social and economic – in return for following certain rules and providing the financial resources to do so through levies, taxation and other financial mechanisms.

What are the responsibilities so conferred? They obviously go beyond the immediate need for infrastructure and order (tactical issues) to those strategic issues that ensure that those services can be maintained over time. This includes education, strategic action (action with a long-term benefit, generally longer than a 4-year elected term) and the maintenance of the moral and ethical norms of the community, all according to the community's expectations.

When we compare the expectations we examined earlier with the promise of a business-as-usual energy approach as modelled by the International Energy Agency (IEA) and others, it becomes rather graphically clear that it is not possible, by any stretch of the imagination, to wait and see (a normative piece of public policy more common than one would like to imagine). Rather, following those scenarios that lead to and fulfil public expectations demand the implementation of a transitional path – one away from dependence and conventional energy policies. That transitional path is described clearly in documents as varied as the Stern Report, the reports of the International Panel on Climate Change (IPCC), and elsewhere, and they all have one thing in common – the fact that that transitional path starts today (well, technically yesterday, but in case we didn't manage …). The movement demanded is uniformly one towards energy efficiency and local, sustainable energy sources.

The prime strategic responsibility of city officials then is the immediate initiation of a transition path that incorporates the elements discussed above. It supersedes all others, as all others – continued provision of services, maintenance of the environment and the economy – are dependant on this prime responsibility.

Is it possible to be aware of this and act otherwise, within an acceptable ethical framework? No.

### 2.3.2.7 Payback

Such an undertaking represents perceived risk, mainly to the political fortitude of officials who are concerned that not all agree, that costs may be high, that technologies are not mature.

Here one word to the wise – the technologies needed are here today. Yes, they will get better. But they are in most cases more than mature enough. What is missing is the political will to implement against ingrained lobbies, and numbers – the

economies of scale. Scale that can only be achieved through implementation. What are in place are the policy measures and methodologies to move forward, boldly.

What is also clear is the enormous payback timely implementation of such policies bring with them. Some immediate, some long-term – but all-in-all, the payback overshadows investment by a significant amount. That payback – in terms also of fulfilling the long term needs and expectations of the citizenry – conforms fully to the strategic responsibility of officials.

### *2.3.2.8 Options and Actions, Costs and Benefits*

What are our options? How do we implement secure energy, that urban interpretation of energy security? Let us break the challenge down into specific elements, examine the challenges they pose, the measures we can use to address them, and some of the benefits we gain.

We have already split the challenge into two parts, energy efficiency and local renewable energy sources. This provides a natural overall framework.

Energy efficiency is a complex topic. It has to do with more than "just use less". It can be usefully divided into end-use efficiency, and economic efficiency. In the former, the focus is on the point of use – light or heat in the private household, for example. In the latter, it has to do with the units of energy needed to produce a unit of national product – energy use in manufacturing, transport in industry, and related areas.

End-use energy efficiency has everything to do with personal values, the ability of an urban unit to influence those values in its citizens, and the technologies and legislative guidelines made available to make it possible. Education and price represent two excellent tools in managing the position of the individual to his or her energy use.

Education is a key tool. It can take time to reach its full potential, sometimes a generation or more, but in combination with other tools is the most effective long-term approach. Leading the young to an inborn energy frugality is a wonderful investment that produces many times its cost in benefits. Making end-users aware of the measures and technologies they can employ to reduce their own energy footprint (and hence cost) must be the number one social responsibility of any urban administration. At the same time, protecting the consumer from the consequences of their actions by buffering against price increases is decidedly contra-indicated. The principle of the carrot and the stick – however politically incorrect in modern educational thinking – holds true in this instance.

Of course, it is important to prevent an excessive burden on those least able to carry it – the poor, the elderly, and so on. But even here, there are mechanisms to ensure that any financial support serves its intended purpose. As an example, rather than a cash rebate (which might be spent on something else), or lower energy prices that discourage frugality, supplying low-income households with low-energy appliances (energy-intensive refrigerators are a prime target here) lowers the energy-cost

burden while at the same time ensuring lower energy use. At the same time, measures like this can support a local industry, ensuring (that) value stays within the community (make your refrigerators in our city, and we will buy N per year off you to give to the poor). The avoided cost more than compensates for the expenditure, and the externalities can be very positive indeed.

In other measures, the same applies – make sure that any subsidisation strikes home. Cheap loans to put solar hot water systems (a wonderful peak-energy-use-shaver) on rooftops should be combined with legislation making it mandatory to have such a system on a house if you wish to sell it, or on a new building if it is built. The result is a willingness to spend money for something that facilitates a windfall, easing the pain. Combined with an incentive scheme, all opposition tends to fade – and a healthy local installer industry is created. Economic incentives (now affordable due to avoided cost for the most expensive kind of energy) for a solar hot water system manufacturer to set up shop in town, makes the equation perfect.

An energy-efficient industry makes it possible to compete well in international circles, while at the same time making possible a whole host of additional measures. Germany – a generally expensive industrial location – is world leader in exporting high-added-value manufactured goods – cars, machines and the like. This is only possible because the amount of energy required to manufacture such a product in Germany is less than elsewhere, because industry in Germany is highly efficient in its use of expensive energy. Making available energy at stable prices – process heat as a by-product of co-generation based on local biofuels, for example – means that the energy can be a bit more expensive, as industry is ingenious at finding more efficient ways of doing things, given stability and the time to do so. Being able, on the world market, to use less energy per unit of gross domestic product – and having those units of energy come from local sources – is a recipe for successful competition in this age of globalisation.

At an urban level, it attracts industry, and facilitates the development of local energy sources. Which is a smooth transition to our second topic, using local sustainable energy sources. Cities are all different, and the local energy sources they have differ considerably. Yet most cities have an entire palette to choose from. Here, the need to see urban, per-urban and rural areas immediately adjacent to cities as a unit in dealing with energy issues informs the way we think about issues such as land-use and forest management, and the legislation that govern those issues.

In Freiburg, Germany, we have the pernicious situation that the decision to allocate land immediately surrounding the city for wind-energy development rests with the federal state of Baden-Wuerttemberg, and not with the city itself. State politicians have little or no understanding of local issues and the local political climate, and are based in a city that is both far away and that faces a completely different set of energy challenges. The legitimate wishes of the citizenry in Freiburg to develop the wind-energy resources in their immediate peri-urban environment, is blocked by the inability of state politicians to understand the issues that face Freiburg. This sort of impasse must bow to the pragmatic need to see the city and its surrounding forests and agricultural resources as part of an integrated energy plan.

Energy crops can, for example, if well managed and sensibly nurtured, add value to the agricultural potential of areas surrounding cities, contribute significantly to reducing energy dependence in the cities they serve, and avoid excessive urbanisation from an impoverished countryside. Once again, this requires a unified model of energy management that extends the energy cycle of the city into the surrounding countryside in a constructive and well-managed way.

A city surrounded by forests has a strong energy interest in those forests as a source of, for example, waste wood for local conversion into wood-pellets used to heat homes and other buildings in a sustainable manner. To facilitate this, however, the city needs a direct say in how those forests are used and managed – often not the case today, and a reason why sustainable forestry as being discussed as part of the post-2012 framework is also an important issue for local governments.

Other resources require a re-think of direct urban legislation. For effective, ubiquitous use of solar energy in the urban context, it is key that suitable roofs of public buildings be developed in a way that benefits the citizenry – if a good feed-in tariff exists, for example, it behoves the city government to exploit the available roof space through communal photovoltaic installations that everyone can buy shares in, as not everyone owns a roof, or owns a suitable roof, to install PV on the own residences. Also, it is key to ensure that solid solar access regulations are in place, and that national support programmes are known and familiar to its citizens to leverage local measures.

An active programme of evaluating the potential of such technologies as require larger institutional support – geothermal, for example – should have a high priority.

In this way, ensuring that the legislative, financial and practical mechanisms are in place can ensure the successful utilisation of local resources. For every single kilowatt-hour so produced, the avoided import cost and beneficial externalities accumulate to create an energy regime that is safe in every sense of the word – true energy security in the urban context.

## 2.3.3 The Old, and the Whole

### *2.3.3.1 Dealing with the Old World*

Of course, the shift in focus outlined above does not alleviate the immediate need of fulfilling the demands of the urban populace for energy using conventional resources during the period of transition.

As with most elements of governance, control plays a key role, and we see a trend towards ownership of or influence in local and regional utilities by cities – the reverse of what happened in the seventies and eighties. Increasingly cities see benefit in a higher degree of control in the utilities that service them, both in terms of influencing pricing and procurement strategies, but also in guiding and influencing the transition to sustainability.

Influence in or ownership of the local or regional utility also implies input into deciding what is an acceptable bottom line. While the only good bottom line for the average major utility is much profit at the expense of the consumer, and to the benefit of its shareholders, this need not be the case where cities can demand a socially responsible pricing regimen during the period of transition that we find ourselves in, freeing capacity for the end-user to invest in alternative technologies and energy efficiency. Such a strategy also keeps money in the region – another key benefit.

#### *2.3.3.2 Systemics*

Within the city as a system, energy underpins the majority of processes, but is seldom seen as a critical component. As such, the building, gardening or public order departments rarely think or see energy in what they do. It is key to ensure that energy runs like golden thread through the thinking of all parts of the system, and that systemic inefficiencies be eliminated in this way.

'Waste' heat from incineration by the refuse department should never be wasted, and organic 'waste' is too valuable ever to throw away.

Gardening is a cost, and an effort, but one that produces organic waste as a side effect that is not waste but an important energy commodity for any city.

Administration is a cost centre and an energy sink, but it often generates hot air (in the literal sense) through the cooling of server farms and related equipment. That heat can be used to drive anything from cooling rooms to heating water – no waste here.

In these and dozens of other ways, the systemic flow of energy touches everyone and must be chained in ways that achieve maximum systemic efficiency in that greatest system of all – the modern city.

### 2.3.4 Conclusion

The transition to a sustainable, efficient, locally-fuelled (as far as possible) energy system in the urban context simultaneously leads to a large set of positive externalities that align perfectly with the responsibilities city administrators have to their populations. Ergo, doing everything to facilitate that transition means you're doing the right thing.

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# Chapter 2.4
# Rational and Efficient People? Sometimes We Are

**Nils Borg**

**Abstract** People, choices and energy are a complicated mix in today's society. The article below briefly highlights aspects that are important in decision-making, yet not always considered when addressing the transition to a sustainable energy future. A key element in this is the perception of financial cost in deploying energy efficiency measures versus what are called 'synergy effects', i.e. having a wider perspective on additional issues beyond the cost of single measures.

**Keywords:** Cost efficiency and synergy effects • energy efficiency • energy policy • energy security and security of supply

## 2.4.1 Introduction

This article is written in the early 2009 when Europe just faced – and came through – yet another energy crunch. The flow of Russian gas suddenly stopped in the middle of winter and energy security was on everyone's lips, again. Often, energy security and security of supply are used as synonyms. In fact, they are not. Although related, 'energy security' is much wider than 'security of supply' and it is much more important to worry about the broader term. Why?

We can apply the analysis on several energy policy, energy security and climate related areas, and it is really quite simple. The less energy we use for a given service, the greater our freedom will be to choose what energy to use and where from. With less energy use, the cost per unit of energy gets less significant.

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M. van Staden and F. Musco (eds.), *Local Governments and Climate Change*,
Advances in Global Change Research 39, DOI 10.1007/978-1-4020-9531-3_2,

The thinking applies just as well to gas and oil from Russia or Iran as it does to investments in renewables. We need to build a future based on renewable energy supply. But that doesn't mean that we should put all efforts into renewables, on the contrary. If we keep wasting energy, the additional renewable energy supply will just be fed into wasteful energy use and the economics of renewable energy supply really depends on efficient use. This may seem obvious, but even with the relatively limited resources that have been channelled to so-called sustainable energy, energy efficiency has traditionally not been the focus. The same is true when we ask ourselves what to do about Russian gas. Some European Union (EU) countries were less affected in January 2009 because of their larger strategic gas storage. But storage is costly, and some couldn't afford it. With less energy use, they could also have afforded to store more.

So why does this not happen? One of the tragic truths is that we keep making the wrong decisions, based on wrong assumptions. Economists (most of them anyway) believe that we are rational, and policy is based on this. In reality, we are not. Instead, our society and regulators must act rationally for us, taking a broader national or regional perspective. This is sometimes hard to accept but in fact, this is just what minimum energy performance standards are all about. If we can not make good decisions, for whatever reason, someone else has to.

Let us take the car as an example: The US car industry would probably have been in much better shape if they had built fuel efficient cars. But consumers have not asked for this, and the industry builds what consumers want. In part this consumer preference was due to the low fuel price. However, by regulating the fuel efficiency (rather than just adding sufficient taxes to the fuel price), the society as a whole would have forced industry and consumer to adjust in time to a changing reality.

Standards are needed elsewhere, but it is not a fix for all things bad. There is no 'template' solution. Standards for 'stand by' should be the most sensible way to get forward – to believe that a label will change people's behaviour here is just silly when all we care for is what the products deliver. In other areas, such as refrigerators, a combination of standards and labels is the best way forward. For many years, the EU has been falling behind when it comes to energy efficiency! Luckily, for all of us, priorities are changing, and have changed already. European Commissioner for Energy, Mr. Andris Piebalgs, realised this when he took office. He dubbed energy efficiency the "fifth fuel". This very well reflects that energy efficiency indeed can and should be compared with various forms of supply.

**The Energy End-Use Efficiency and Energy Services Directive**

The purpose of this Directive 2006/32/EC is to encourage energy efficiency through the development of a market for energy services and the delivery of energy efficiency programmes and measures to end users. The Directive covers most forms of energy sold to end users, including transport fuels.

This Directive on energy end-use efficiency and energy services (ESD) is a welcome addition to the family of European Directives dealing with the use of energy, and it is often referred to as the Energy Services Directive and sometimes as the Energy Efficiency Directive.

Rather than focusing on specific technologies or measures, the new Directive addresses actors and institutions and the way markets for energy and services function. It will thus complement and improve the implementation of existing EU energy efficiency legislation, including the Directives on Energy Performance of Buildings, on Combined Heat & Power and on Energy labelling of appliances.

The End-use Efficiency and Energy Services Directive was adopted by the European Council on 14 March and formally entered into force on 17 May 2006. Member States have 2 years to transpose the Directive into national law.

The Directive defines and sets savings targets on a national level, and will require action by each Member State of the European Union. Member States must achieve a minimum annual energy savings target of 9% by the ninth year in the period from 2008 to 2016. In line with this, each national government will have to produce energy efficiency action plans (EEAPs) in 2007, 2011 and 2014.

Extracted from http://www.eceee.org/EEES/

A couple of years ago, the International Energy Agency (IEA) published a review of 30 years of energy policy.[1] The report shows that energy efficiency alone has contributed more to delivering energy services than any single source of energy supply. Similar newer studies show the same thing. In the McKinsey report[2] on mitigating climate change, a host of energy efficiency measures come out as the cheapest, most cost-effective measures to reduce carbon emissions (admittedly, a few are also expensive, this is clear, but on average, energy efficiency is cheapest).

However, one problem with many such studies is their strong focus on cost efficiency of each measure. Cost efficiency is important, but very often an analysis will miss the synergy effects by focusing on the cost efficiency of each single measure. One good example is energy efficient windows: the prime reason for installing them may not be energy efficiency at all, but the need for sound proofing. Sound proof windows can be installed that are not particularly energy efficient, but the energy efficiency features often come at a low additional cost if the first cost is

[1] http://www.iea.org/textbase/nppdf/free/2004/30years.pdf

[2] http://www.mckinsey.com/clientservice/ccsi/pathways_low_carbon_economy.asp

already borne. One typical example is a listed house in Stockholm that was renovated a few years ago. The city demanded that the original windows were kept. The windows were taken to a workshop and fixed. Had the building owners chosen to replace one glass pane with low emission glass at that time, the payback would have been fairly short: now, the next window of opportunity will not open for another 30 years or so.

### 2.4.2 Summer Studies

Luckily enough, energy efficiency is more and more becoming a mainstream activity. One sensor for this is the Summer Studies on energy efficiency, organised by eceee, the European Council for an Energy Efficiency Economy,[3] in the early summer of every odd year. Since 1993, the eceee Summer Studies have advanced the frontiers in energy efficiency policy, research and implementation. The Summer Study is Europe's premier, interdisciplinary event on energy efficiency. The event provides a full working week of formal, yet straightforward sessions and informal meetings. Here, more than 300 participants exchange ideas in a relaxed but intensely intellectual atmosphere, have lively discussions and come up with creative ideas.

The heart of the Summer Study is the presentation and discussion of peer-reviewed papers in parallel panel sessions. Posters are presented in a session attended by all participants. Keynote speakers address plenary sessions and participants can organise informal sessions in the afternoons. The 2007 Summer Study proved that energy efficiency really has become a mainstream activity. We, as an energy efficiency community, are now beyond the discussion whether there really is a savings potential and if it is cost-effective (Fig. 2.4.1).

Today, the discussion has come focus much more on how the possible energy savings should be realised:

- There is a shift in the focus from efficiency to total consumption (already in 2003, the theme of the Summer Study was "Time to turn down energy demand").
- There is a much stronger focus on government regulation today and the fact that both industry and government have separate, distinct but supporting roles in the implementation.
- There are three major Directives in place in Europe – the Buildings Directive, the Eco-design Directive on Energy-using Products, and the Energy Services and End-use Efficiency Directive – on which everybody needs to take action, which has further raised the interest for efficiency. In addition, the labelling Directive is being revitalised and the Energy Performance in Buildings is up for review.

[3] www.eceee.org

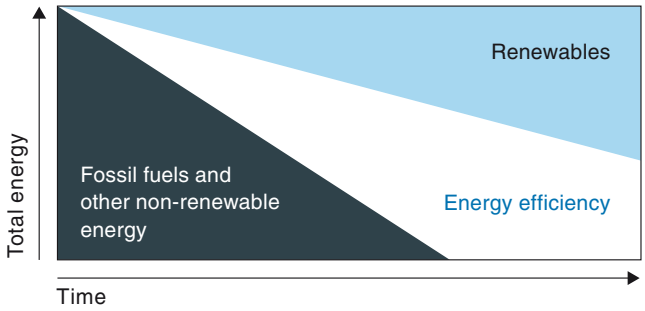


**Fig. 2.4.1** Energy efficiency provides us with the time needed to replace fossil fuels and other non-sustainable energy sources with renewables in an ecological, economic and socially responsible manner (Image source: eceee) (see *Color Plates*)

There is, however, still a risk that this remains a political and rhetoric figure if the insights are not transformed into knowledge and actions (the theme of the 2005 Summer Study was "What works and who delivers?"). In other words, we have to go through the "tipping point" – the time when ideas, such as the need to pursue energy-saving measures more aggressively, become the accepted norm.

We, as the energy efficiency community, need to move our focus from justifying energy efficiency and examining the barriers to activities focussed on deployment of energy efficiency measures accompanied with a cultural change to attitudes on sustainable energy in all sectors. We also need to repeat, over and over again, our story that new supply, even if from renewable sources, does not serve any purpose if it is feeding wasteful use. Energy efficiency is the cornerstone of a sustainable society. The 2009 edition of the Summer Study will have the theme *Act! Innovate! Deliver!* This theme will be as valid in 2019 as it is in 2009.

***Nils Borg*** *is an energy efficiency consultant based in Stockholm, Sweden. He has a background in social sciences and languages, and worked as a journalist a few years before he started consulting on energy efficiency in the early 1990s. Mr Borg main focus is the institutional issues of energy efficiency and he has been very involved in technology procurement and later public sector energy efficiency. His favourite energy end-use technology is lighting, and he edited the newsletter of the International Association for Energy-Efficiency Lighting for 9 years during the 1990s. Currently Mr. Borg spends most of his working days as the Executive Director for eceee, the European Council for an Energy Efficiency Economy.*

*European Council for an Energy Efficient Economy (eceee) – eceee is a non-profit, membership-based European NGO. The goal of eceee is to stimulate energy efficiency through information exchange and co-operation, and to promote the understanding and application of energy efficiency in the energy research, policy and commercial organisations. eceee provides an information service through its*

*website and e-mail newsletter, arranges workshops and conferences, and takes active part in the European policy making process. One of eceee's principal events is the Summer Study, held for 5 days every odd year in the early summer. The Summer Study attracts more than 350 participants and offer governments, industry, research institutes and citizen organisations a unique resource of evidence-based knowledge and access to reliable information. For more information, please see* www.eceee.org

# Chapter 2.5
# Policy Design for Sustainable Integrated Planning: From Local Agenda 21 to Climate Protection

**Francesco Musco**

**Abstract** Recent history of town and city planning shows growing attention is given to environmental policies in this field, despite many apparent contradictions when comparing theory and actual practices. Sustainabilty issues and new systems of public governance, based on participatory and inclusive schemes, particularly characterise the last decade of urban planning culture. Many experts are indicating that local dimensions of sustainability have a prominent role to play in planning systems – a perspective supported by the United Nations (UN) since 1992 with the recognition of the Local Agenda 21 (LA21) concept. This article underlines that know-how introduced by LA21 at the local government level can be a useful start-up point for climate protection planning and, in particular in terms of changing peoples' attitude, can play a defining role in developing effective policies for climate change mitigation and adaptation in the urban context.

**Keywords:** Bottom-up approach • climate protection planning • Energy Descend Action Plan (EDAP) • governance • indicators • lifestyle • Local Agenda 21 (LA21) • planning instruments • policies • sustainable city • urban planning

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M. van Staden and F. Musco (eds.), *Local Governments and Climate Change*, Advances in Global Change Research 39, DOI 10.1007/978-1-4020-9531-3_2,

### 2.5.1 Designing Policies for a Sustainable City

What will our cities look like in 50 years' time? And in a century? Will urban planning have provided urban structures that are compatible with the new climate scenario? Which adaptation and mitigation strategies will characterise planning and management of urban areas? For about 2 decades the 'sustainable city' idea has played a relevant part in the scientific debate, but strategies developed for urban areas continue to ignore the growing scarcity of natural resources and the impact of human activities on eco-systems and the climate.

'Planet fever', as climate change is sometimes called, implies that cities have become the most relevant place where change and conflict is likely to occur, as most people now live in cities and the influx of new citizens continues. Competition for resources is unavoidable at this rate and systems will become overburdened. By 2025 there will be more than five billion people living in urban areas – in 135 metropolitan areas the number of residents is expected to exceed four million inhabitants per city. Cities are responsible for 75–80% of global greenhouse gas (GHG) emissions (Satterthwaite 2008). For this reason GHG inventories are required, to identify where emissions come from and to define proper policy for reduction and compensation (Willson and Brown 2008).

Even if the debate on the 'best' sustainable urban model remains controversial, it is possible to for an improved general public awareness to ensure change in the characteristics of urban life quickly. The comprehensive concept of sustainability has attracted policy makers and citizens alike, from a wide range of backgrounds and disciplines. The concept has evolved over time, and many of the meanings today are quite different from those of 2 decades ago. The possibility to achieve sustainability in the urban context is still controversial. Lee (2006) considers the transition to sustainable cities to be 'unimaginable'. Yet, Local Agenda 21 (LA21) and other instruments related with environmentally responsible actions are moving into the direction of sustainability: these aim to protect the ability of future generations to satisfy their needs, while permitting those who live now to also meet their needs. This seems to be an oxymoron.

Without offering a final definition of a 'sustainable city', it is important to state that it should include the approach in a city to work hard at promoting some operational version of sustainability. A sustainable city is holistic, outlined as a complex unity and not just the sum of separate parts (neighbourhoods, services, infrastructure, public spaces, etc.). Any urban activity can not be considered as sustainable if it satisfies only one area of sustainability (environment, economy, society). An environmentally friendly and technological advanced project is not sustainable if it needs high costs and access is limited to only a part of population that can afford to use the new facility. Many new neighbourhoods in European cities – built from a sustainable perspective – use the most advanced building techniques, but are often unaffordable for the 'normal' citizen. From this perspective an intersectoral approach to urban policy is a *sine qua no* condition to guarantee sustainability. The sustainable city is participatory based, defines new scenarios of development and shares them with its inhabitants. Implementing a sustainable urban policy requires

permanent strategies to take decisions with the local community – a permanent shared decision process, not to be confused with any form of periodical information meetings, campaigns, and so on.

Public actors have to redefine their role, because anyone involved in the process of climate change mitigation, including inhabitans, is called on to take up responsibilities towards themselves, others and future generations. Different behaviour and lifestyles, leading to much reduced carbon dioxide ($CO_2$) emissions, must be developed in cities, and the urban context should be prepared to encourage this. Here planners and systems architects (should) play a fundamental role in defining and monitoring climate protection policies for the built environment. The idea of a sustainable community implies an understanding of the importance of individual human behaviour, and of the local context in which that behaviour takes place (Portney 2003).

But what does it take for a city to become sustainable? A few elements are mentioned: peoples' desire to make their city sustainable, and a strong commitment to reorient policies by the local government. Other elements that support this tendency, such as social, economic and physical resources, will follow. Even the 'political will' to support sustainability – which may be quite elusive and difficult to obtain – can be supported if a popular desire for sustainability is present and evident. Indeed, those who control 'political will' in a city are strategically placed in providing leadership necessary to maintain the broad-based desire necessary to achieve and retain a city's sustainability.

LA21 has played a prominent role in European cities outlining sustainable planning and environmental policies over the last 15 years. In fact, during the course of the 1990s many governments produced national reports on sustainable development, often supported by an Agenda 21 strategy at the national level – also indicating a new way of government for towns and cities. In this sense the bottom-up approach introduced by the LA21 processes encouraged local authorities to define more participatory and holistic policies, especially in the European context. According to one of the first definitions, Local Agenda 21 is a participatory, multi-sectoral process to achieve the goals of Agenda 21 at the local level through the preparation and implementation of a long-term, strategic action plan that addresses priority local sustainable development concerns (ICLEI 1996).

Evident connections appear between actions previously taken locally towards sustainability and forthcoming polices to be implemented towards a new climate scenario. Cities and towns play a key role in governance that can be much more effective when considered from a long term perspective and with a strategic approach. Innovation in policy design, introduced within local governments by the LA21 process, represents a valuable heritage for policy-makers. This is clear when one sees that the presence of previously established LA21 or similar strategic planning initiatives have had in general positive influences on the successful implementation of climate protection initiatives. At the same time, innovation has provided a growing autonomy of local governments in defining policies for urban sustainability, and has given a prominent role to policy design to city government. It has provided a perspective of greater authonomy from the upper levels of government.

During the mid-1990s the concept of sustainability indicators has been introduced as a measure to establish some kind of rigour within the evaluation process of sustainability achievements. The results have not been always positive. The outcome tended to fragment the overall focus through a technical exercise that attempted to assess the state of the environment without a clear reference to the practical steps taken.

The challenge of achieving sustainability is demanding new styles, even systems, of participatory governance and civic engagements accross all spatial scales. LA21, which had a great influence on education systems, also inside school systems (Musco et al. 2000), can contribute to this. It calls for action across all sectors of governance, including the international arena, but with a particular emphasis on the local or subnational level. A further element introduced by LA21 is the need for involvement and partnerships between a range of stakeholders and community groups in the development and implementation of any decision process. The experiences of these areas can add value to further developing styles and systems.

The 10 Aalborg Commitments, signed by a number of European local governments since 2004, support moving towards European community sustainability. It guides this self-activity of local governments, but also highlights a relevant gap between local action and the failure or absence of effective supporting national frameworks. At the beginning of 2009 approximately 6,000 local governments accross Europe had started some form of sustainable development process, more than 2,500 had signed the Aalborg Charter and around 600 included the Aalborg Committments in their policy-making processes.[1]

Since the start of LA21, the urban roll-out of 'sustainability' has created difficulties for policy makers. This can be explained as a twofold problem: on the one side there are protection and improvement needs required by the environment and human society; on the other hand there are limited public budgets in terms of expediture to support the costs of sustainable development, which requires a potential higher investment than 'normal' development, especially in early phases. This is related with the need to improve skills and know-how of public authorities, and to provide proper investments in terms of built environment (e.g. the beginning higher costs to realise fossil free buildings).

The differences between the number of theories on sustainable development and actual practices according to which cities are planning are relevant. The monitoring of the actual impact of sustainability declarations – e.g. in terms of saved resources or $CO_2$ emissions avoided – has been quite weak in many cases, especially in southern Europe. Many European cities can be regarded as essentially unsustainable at this stage. Yet one can determine that the introduction of the climate issue in sustainability policy development is supporting efforts of both local and other levels of government. In a certain sense the definition of the scope of initiatives for local sustainability – protecting the climate in this case – puts at the forefront the real

[1] A complete list of the Aalborg Commitments Signatores is available on www.aalborgplus10.dk

issue (sustainability). In other words, where the general aim to reach sustainable development remains vague and open to infinite interpretations, a sustainable policy for climate protection is clear to the policy maker as it has a (perceived) final scope. The general purpose to reach sustainability, is often a concept public decision-makers regard as equivalent to 'environmental protection' or simply'environmental attention' – and not in any positive sense.

### 2.5.2 Climate Protection and Cities: From Global Issue to Local Governments Commitment

The most recent report of the Intergovenmental Panel on Climate Change (IPCC) (2007) concluded that the warming of climate system is taking place, as is evident by empirical observation, such as increasing average temparatures of the air and oceans, as well as melting snow and glaciers, in turn with consequences on rising sea levels.

Climate protection is a controversal concept. The climate can not be protected, at least with direct actions. It is not possibile to activate any strategy to stop a sudden and violent atmospheric phenomenon; no technology is available to avoid glaciers melting or rstore them when they disappear. In fact the role of technology in this field is limited to specific sector of action (refer Table 2.5.1 below). Climate protection can be defined as the group of indirect policies of adaptation and mitigation finalised to reduce impacts of climate change on natural and anthropic systems on the one hand; and the reduction of all environmental externalities contributing to climate mutations in the medium to long term on the other. It can be referred to as a range of policies already used by public bodies at all levels, with the additionality needed for improving these, coordination and joint implementation of mitigation and adaptation policies, according to a strategic approach able to relate different levels of management, sectors as well as actions and actors.

The impacts will be seen in events, environmental conditions connected to climate change manifesting in damage of infrastructure and housing, stress on public facilities and emergency services, increasing incidence of diseases, and damage to agriculure (IPCC 1998). In some cases it will also be difficult to distinguish between the impacts of climate change and adaptation to climate change. For example, the abandonment of coastal areas because of a rising sea level, or the increase of health care expenses related to certain changes in weather and temperature could be considered both an impact of and adaptation to climate change – reactions of people and the environment to the new climate scenario (EEA 2008).

Climate mitigation policies (as presented in Fig. 2.5.1) may promote sustainable development when these are consistent with broader societal objectives. Some mitigation actions could also favour extensive benefits in areas outside of climate change, for example actions could reduce health problems; increase employment opportunities; reduce negative environmental impacts (e.g. air pollution); protect forests, soil and watershed; reduce subsidies and raise taxes on actions which cause

**Table 2.5.1** Main technologies for climate change mitigation (Adapted from IPCC 2007)

| Sector | Key mitigation technologies and practices currently commercially available | Key mitigation technologies and practices projected to be commercialised before 2030 |
|---|---|---|
| Energy supply | Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of CCS (e.g. storage of removed $CO_2$ from natural gas). | Carbon capture and storage (CCS) for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and wave energy, concentrating solar and solar PV. |
| Transport | More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorised transport (cycling, walking); land-use and transport planning. | Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries. |
| Buildings and built environment | Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases. | Integrated design of commercial buildings including technologies, such as intelligent meters that provide feedback and control; solar PV integrated in buildings. |
| Industry | More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-$CO_2$ gas emissions; and a wide array of process-specific technologies. | Advanced energy efficiency; CCS for cement, ammonia, and iron manufacture; inert electrodes for aluminium manufacture. |
| Agriculture | Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce $CH_4$ emissions; improved nitrogen fertilizer application techniques to reduce $N_2O$ emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency. | Improvements of crop yields. |

(continued)

**Table 2.5.1** (continued)

| Sector | Key mitigation technologies and practices currently commercially available | Key mitigation technologies and practices projected to be commercialised before 2030 |
|---|---|---|
| Forestry/forests | Afforestation; reforestation; forest management; reduced deforestation; harvested wood product management; use of forestry products for bio-energy to replace fossil fuel use. | Tree species improvement to increase biomass productivity and carbon sequestration. Improved remote sensing technologies for analysis of vegetation/ soil carbon sequestration potential and mapping land use change. |
| Waste | Landfill methane recovery; waste incineration with energy recovery; composting of organic waste; controlled waste water treatment; recycling and waste minimisation. | Biocovers and biofilters to optimize $CH_4$ oxidation. |

GHGs; and induce technological change and diffusion. These could also contribute to the wider goals of sustainable development. Similarly, development paths that meet sustainable development objectives may result in lower levels of GHGs, and the synergies are worthwhile exploring.

A small number of impact assessments have now been completed for scenarios in which future atmospheric concentrations of GHGs are stabilised. Although these studies do not take full account of uncertainties in projected climate under stabilisation, they nevertheless provide indications of damages avoided or vulnerabilities and risks reduced for different amounts of emissions reduction.

To introduce the concept of adaptation it can be useful to refer to the definition of ecosystem resilience. Ecosystem resilience is defined by the Resilience Alliance[2] as 'the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Resilience in social systems has the added capacity of humans to anticipate and plan for the future'. According to Folke (2006), the concept of resilience in relation to social-ecological systems therefore incorporates the idea of adaptation, learning and self-organisation, in addition to the general ability to contrast disturbance.

In the climate change discourse, adaptation policies permit the management of inevitable (foreseen) impacts. Both in natural than in human systems, adaptation has the aim to increase the resilience of these systems in relation to future impacts of climate change. According to the IPCC (2007) adaptation consist of an 'adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation'. It is a range of trans-sectoral and cross-border policies requiring integrated

[2] www.resalliance.org

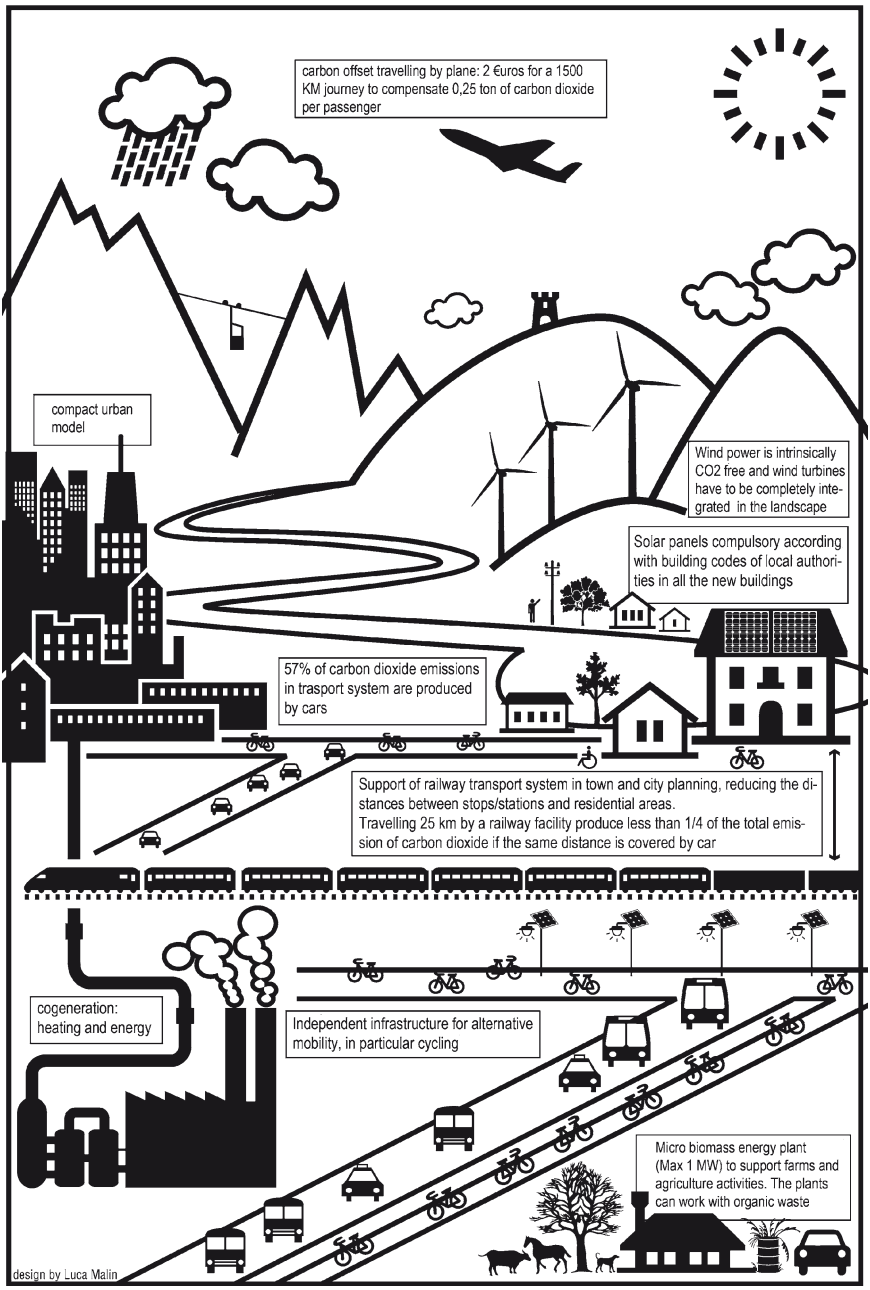


**Fig. 2.5.1** Mitigation policies are oriented to reduce the future impact of climate change. These are mainly based on the limitation of $CO_2$ emissions from any possible source, or, alternatively, determine proper compensation procedures (elaboration of the author, design Luca Malin)

approaches. Integration of such policies represent a fundamental point to reduce vulnerability of ecosystems, economic sectors, landscapes and local communities.

The potential of adaptive responses available to human societies is quite large, ranging from purely technological (e.g. sea defences), through behavioural (e.g. altered food and recreational choices) to managerial (e.g. altered farm practices), to applied policy (e.g. planning regulation systems). While most technologies and strategies are known and developed in some countries, the assessed literature does not indicate how effective various options are to fully reduce risks, particularly at higher levels of warming and related impacts, and for vulnerable groups. In addition, there are formidable environmental, economic, informational, social, attitudinal and behavioural barriers to implementation of adaptation.

Impacts can be divided into two groups: the atmospheric events and related consequences. Atmospheric events can be differentiated according with the kind of effect on thermal condition (increase of average temperature) and changing frequency and/or intensity of extreme events (such as storms or hurricanes). Indirect impacts are directly connected to these two categories. Sea level rise or prolonged middle seasons result from changing average temperature. Increased flooding frequency is directly caused by more intensity rainfalls. Then, if both processes are put together, it might increase the impacts. Increased storm frequency on a certain coastline, together with a higher sea level increases the risk of coastal flooding, that in certain condition can become also permanent. Climate change has accelerated during the past decade and one can reasonably assume that it has already caused important damage in European regions and current evolutions are potentially threatening territorial and environmental balance. The most damaging impacts of climate change are flooding, drought and storms/hurricanes all events that can modify radically the live in urban areas (IPCC 2007).

The costs of the impact of climate change on the built environment are immense, but more relevant is the cost of delays to define proper adaptation policies, both globally and locally (EEA 2008). Usually the attention of scientists and academics in relation to climate change is focussed on global impacts and economic costs at the macro scale. Yet the effects of new climate tendencies are experienced ‘locally’, meaning often in a built environment setting, which is relevant role both for people in everyday life and for policy makers and public administrators.

Local governments often have relevant control and responsibilities on the main sources of pollution in their communities:

– Energy generation, distribution and use
– Buildings
– Transportation
– Waste management
– Water management

Often local governments directly produce or are (co-)owners of energy plants, and operators/shareholders of transport and waste service provider companies. They own a large number of buildings and offices, and can manage social housing and educational facilties – either directly or through a management agency. These areas can usually directly be influenced from a corporate (municipal) sector perspective. In the case of

small municipalities there tends to be a more limited means, be it legal, financial or due to a lack of own infrastructure, but they can increase their options for action significantly through strategic climate cooperation. Local governments often control or influence many of the day-to-day activities in their communities that determine the amount of energy used and waste generated. This could include land use and zoning decisions, control over building codes and licenses, infrastructure investments, municipal service delivery and management of schools, parks and recreation areas. These decisions can help to drive and regulate change among citizens, businesses and industry.

Local governments are usually responsible for primary and, in some countries, secondary education, where influence on attitudes and behaviour of inhabitants is quite relevant. They can play an active role in raising awareness on the need to reduce GHG emissions, positively influence change and encourage citizen behaviour that directly affects climate change such as choosing less polluting transportation options, changing energy consumption patterns and general consumer decisions. Again in these cases, where many smaller municipalities cooperate, they can be as prepared and efficient as larger towns and cities, and can also motivate and guide the regional government level (province or state) to have a widespread impact. A large number of government reports have indicated the planning system as the crucial part of public policies to forestall consequences of climate change in the built environment. Including climate mitigation and adaptation aspects into planning procedures, permits early action which can be more cost-effective than any solution applied after changes have already happened (Wilson 2006).

There is a growing movement of local governments working to permanently include climate change in local agenda, facilitated by the creation of three transnational networks namely Climate Alliance and Energie-Cités with members concentrated in Europe, as well as the international organisation ICLEI – Local Governments for Sustainability with its Cities for Climate Protection™ (CCP) Campaign. In Italy a similar action is promoted by the Italian Coordination Local Agenda 21,[3] a non-profit association created by a voluntary network of local governments involved in LA21 processes, both municipalities and provinces. The Italian situation is still controversial because the efforts of public authorities to define policies for climate protection are not in proportion to the outcomes. At the national level there is no comprehensive national adaptation strategy as yet, and initiatives of local authorities remain separate from the national government – this lack of integration and coherency leads to inefficiency.

From the side of the European Union (EU), the commitment in terms of sustainability and quality of urban enviornment started in 1990 with the Green Paper on the Urban Environment, and continued during the 1990s with different documents produced. Among these also by the EU Expert Group on the Urban Environment, drawing attention of policy makers towards integrated visions for sustainability in the built environment. The main steps, adoped after 2000, provide operative indications to Member States to integrate different policies for the urban and natural environment (see Table 2.5.2 below).

[3] www.a21italy.it

**Table 2.5.2** Main steps of EU policy for sustainable development and climate protection (http://eur-lex.europa.eu 2009)

| Year | Document/strategy | Main contents |
|---|---|---|
| 2001 | A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development (Commission's proposal to the Gothenburg European Council) – COM(2001) 264 | Cross-cutting proposals and recommendations to improve the effectiveness of policy and make sustainable development happen. This means making sure that different policies reinforce one another rather than pulling in opposite directions. Steps to implement the strategy and review its progress. |
| 2002 | Towards a global partnership for sustainable development – COM(2002) 82 | Ensure that globalisation contributes to sustainable development, providing incentives for environmentally and socially sustainable production and trade. Renewable energy resources, as well as energy savings and improved energy efficiency play an important potential in terms of sustainable development. |
| 2004 | Towards a Thematic Strategy on the Urban Environment – COM(2004)60 | |
| 2005 | Review of the Sustainable Development Strategy – A platform for action – COM (2005) 0658 | The EU will seek commitments to cut greenhouse gas emissions further, beyond the end of existing commitments in 2012, by developing proposals and working towards broader international agreements that cover all greenhouse gases and sectors, encourage innovation and include measures for adaptation. The EU will develop future climate policy through the second phase of the European Climate Change Programme, working with stakeholders to develop new actions to systematically exploit cost-effective options, covering for example cars, aviation, technology development and adaptation |
| 2006 | Communication from the Commission to the Council and the European Parliament on Thematic Strategy on the Urban Environment – COM (2006) 16 | Adopting an integrated approach to the management of the urban environment helps avoid conflicts between the range of policies and initiatives that apply in urban areas and helps achieve a long-term vision for the development of the city. In addition to the voluntary initiatives Local Agenda 21 and Aalborg Commitments several Member States have legislated or put mechanisms in place to require integrated management of the urban environment. |
| 2007 | Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – Adapting to climate change in Europe – options for EU action – COM (2007) 849 | Green Paper examines climate change impacts in Europe, the case for action and policy responses in the EU. It focuses on the role of the EU, but takes account of the prominent role of Member State, regional and local authorities in any efficient adaptation strategy. As the adaptation challenge is global by its very nature, the Green Paper also raises the external dimension and looks at adaptation measures in Europe that could also apply to other parts of the world, and the opportunity for the EU to provide international leadership in this area |

(continued)

**Table 2.5.2** (continued)

| Year | Document/strategy | Main contents |
|---|---|---|
| 2009 | White Paper_ Adapting to climate change: Towards framework for action – COM (2009) draft document | It represents the first operative policy document dedicated exclusively on climate protection initiatives. The document set out a framework to reduce EU's vulnerability to the impact of climate change on the base of the discussion and consultation launched with the Green Paper in 2007. |

In 1997 sustainable development became a basic objective of the EU with its inclusion in the Treaty of Amsterdam as a general objective of all EU policies. After the Gothenburg Summit in June 2001, EU leaders proposed the first EU sustainable development strategy based on a proposal from the European Commission (EC). This first complete strategy was composed of two main parts. In the first it policy measures and instruments were proposed to tackle a number of key unsustainable trends; in the second part, definitely more ambitious, a new approach to policy-making was called for to ensure the EU's economic, social and environmental policies mutually reinforce each other. The central instrument developed for this purpose was the obligation for the Commission to submit each new major policy proposal to an Impact Assessment. The EU added a third, environmental dimension to the Lisbon Strategy of economic and social renewal. These two strategies are complementary.

The Gothenburg declaration formed the core of the EU's policies towards sustainable development. But these also encompassed other programmes and commitments, such as the Millennium Development Goals (MDGs) agreed on in 2000 and the commitments made at the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg, as well as global pledges to increase official development aid and to take account of the needs of developing countries in international trade. The strategy sets overall objectives and concrete actions for seven key priority challenges for the coming period until 2010, many of which are predominantly environmental:

– Climate change and clean energy
– Sustainable transport
– Sustainable consumption and production
– Conservation and management of natural resources
– Public health
– Social inclusion, demography and migration
– Global poverty and sustainable development challenges

Recently the EU (2009) published the White Paper, Adapting to Climate Change: Towards an European Framework for Action. The document identifies the main aspects of vulnerability in European areas to the impact of climate change and indicates the reasons to define urgenly an adaptation strategy at EU level. The

White Paper outlines the main sectors suffering from forecast impacts of climate change in the continent, including:

- Human health and well-being because Europe is experiencing more extreme climate events, and weather related diseases could increase
- Water: the quality and amount of water resources is a basic issue in the context of a changing climate
- Agriculture: the impact on crop yields, livestock management and the location of production will be relevant
- Energy: supply and demand will be affected by the new climate scenario, especially because of the increase of energy need for cooling during warmer summer periods, and the possibility of damage to the electricity distribution network because of intensive storm and other atmospheric phenomena
- Infrastructure: possible damage to public infrastructures and facilities may affect economic and social development of EU countries.

The EU is working on an online knowledge management tool (EU Clearing House Mechanism) to share and manage information on climate change impacts, vulnerabilities and best practices on adaptation, introduced by the White Paper on adapting to climate change. This will be an important knowledge source for cities to tap into. Some countries have developed national adaptation plans, and all EU-27 Member States are now required to do so. These will also provide valuable guidance also for cities, although this level of government is in most cases excluded from deliberations in developing the actual plans. The advantage of being part of the EU is that cities not so experienced in terms of knowledge and resources for climate protection can gain support. At this stage, improvement in the exchange of experiences and best practices among cities would be very valuable to improve continuoius support and guidance.

At the urban scale, burdens and benefits of climate change are not equally distributed (EEA 2008). For example the type and location of threats will lead to significant economic loss, as some cities will suffer extensive negative impacts while others will benfit from more positive effects. In the built environment climate change will contribute to social differentiation, as in the most cases poor people live in less favourable areas with an accompanying higher threat potential (e.g. closer to rivers with a larger danger of flooding). They also do not have the resources to adapt their situation according to the (expected) effects of climate change, or to handle impacts.

Climate change is expected to increase the occurence of the urban heat island (UHI) effect – where air temperature in cities rises disproportionately to the surrounding areas and results in locally acute adverse impacts on human health, as well as economic and environmental impacts (Cobyrn 2009). The UHI can create differences of temperatures up to 7 degrees Celsius (°C) between centers of large urban areas and surrounging urban areas – a phenomenon that will surely increase with expected heatwaves during the summer. The consequences include more deaths during heat waves, as well as increased health problems as a result of additional particle emissions during droughts, increased ozone and decreased air quality.

An intensification of the distribution and spread of infectious diseases has also been demonstrated and will intensify. The other consequence is that to the economy. The Stern Review (2006) argues that if no action is taken, the general costs and risks of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year worldwide. In contrast, the costs of action – reducing GHGs to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.

The current consumption framework and lifestyles contribute to climate change, threating the ecological, economic and social basis of our quality of life. Different European cities have started programmes to support the orientation of their citizens towards behaviour characterised by lower carbon dioxide emissions.[4] A similar bottom-up initiative has been promoted by the movement of *Transition towns*. Based in UK – now with many members around Europe, USA, Australia and New Zeland – the movement developed its approach from the fact that the world has been reached the peak oil point. This means that oil and oil derivates will be available in a reduced quantity and at a higher price per unit from now on. The only alternative is the progressive increase of independance from fossil fuels and the reduction of our ecological footprint (Chamberlin 2009). The working program of a transition community is based on an Energy Descend Action Plan (EDAP)[5] – often called a pathway or vision. This is a document starting from a complete analysis of resources in the area, including agriculture fields, transport systems, health, renewable energy sources, and building techniques. Transition is implemented through a new relationship between different levels of government and the definition of environmental policies to transit towards an 'oil independent' society.

Generally speaking climate change provides an opportunity to accellerate 'green economy' implementation and create new opportunities for stimulating the local and regional economy, wirh new jobs linked to the market development for energy efficiency and renewable energy technologies and measures. The vulnerability of cities and increasing awareness on this, are driving forces to find alternative solutions for adaptation to climate change, and at the same time ensure good quality of life. Financial benefits from a shift towards the development of new technologies could, at least in part, compensate for the costs of necessary changes in production and consumption (EEA 2009).

[4]For example, the City of Venice promoted an experiment in 2005 called 'Cambieresti? Consumption, environment and lifestyle' involving 1,000 families in a project that was part of the Local Agenda 21 process to analyse and modify their behaviour in term of consumption, mobility, food habits. The initiative has been implemented by a number of small and medium sized local authorities in Italy, and was promoted at the European level through the Intelligent Energy Europe project Echoaction. An article on Cambieresti? developed by the municipality of Casalecchio di Reno, in the Bologna area is part of this publication.

[5]Not only towns have developed an EDAP and instruments for a comprehensive policy for fossil fuel independence, for example, Portland in Oregon recently published an EDAP for all the sectors of the city administration.

### 2.5.3 From Government to Governance of Sustainable Cities: Towards Climate Protection Plans

The general challenge to governance in climate policies is the effective connection between general scientific knowledge on climate change and the implementation of succesful local policies. Especially urban planners are facing two opposite emerging behaviours: on the one hand there is the globalisation of environmental polices, and on the other the decentralisation of policy development responsibilities (Corburn 2009). In this sense climate protection policies are in the near future expected to be the results of a mutual support relationship between the global theories and definition of local urban policies.

The structure of governance is based on the interaction between different levels of governments and different sectors, with the main aim to contrast fragmented decisions (Le Galès 2003), but also to strenghten each other against different kinds of power and legitimisation. Governance is a complete alternative to hierarchical control of policy making (both in the public and private sectors), and in this sense it defines a new style of government characterised by a deeper condition for cooperation and interaction between the State and civil society actors, within the decision making network. The government of a territory requires a permanent process of comparision and exchange between public and private actors (as a governance procedure), rather than being a single actor operating with the support of a specialised bureaucracy according to an own vision of the common public good.

A similar distinction is outlined by the Organization for Economic Development (OECD 2001), suggesting the substitution of the word 'government' with 'governance' when referring to territories or populations. 'Government in no longer an appropriate definition of the way in which populations and territories are organised and administrated. In a world where the participation of business and civil society is increasingly the norm, the term "governance" better defines the process by which we collectively solve our problem and meet our society's needs, while government is rather the instrument we use'. Instead the United Nations Development Programme (UNDP) (1995) proposed a definition connected with democratisation, sustainability and participation – very suitable from the perspective of local govenments – with governance as '[…] a framework of public management based on the rule of law, a fair and efficient system of justice, and broad popular involvement in the process of governing and being governed. This requires establishing mechanism to sustain the system, to empower and give them real ownership of the process'. Key factors of governance applied in local government activities are trust in the public institution proposing a new approch to manage the city, followed by the local community's control. Processes based on a governance approach can work only if these are really inclusive, if interests and point of views of involved actors play an effective role and can influence the decison making process. According to this vision, governance can be considered as the capacity of a public governing actor to clarify the stakes taken into consideration within the decision process, avoiding previously decided-on agreements and opening up of public control,

Climate protection implies a multi-scaled approach to analyse how policy is defined and applied, but also how the political arena and institutional networks are considered within such policies. The main issues of climate protection arise when planning urban areas, in mobility management, the design of buildings and planning the percentage of renewable energy resources used in processes (Bulkeley and Moser 2007). Here it is evident that local governments can and have to promote new instruments to assess all local policies for any kind of impact on climate (mainly in terms of $CO_2$ emissions equivalent). Coherent climate protection strategies and plans can be the proper solution in this sense.

The tradition of LA21 – in particular the part of the process dedicated to the Local Action Plan – is very relevant to determine an operative institutional and societal context that is ready for applying the new instrument. Since the start LA21 had a specific weak point namely that it is a voluntary agreement that is too dependent on local politics, often only implemented due to a specific individual such as a deputy mayor or technician working for a local authority in a particular period. Climate protection can not be a voluntary based policy – its impacts are too devastating for this. It is not necessary to define an instrument to be used in all local authorites, but it is important to outline a common framework in which all institutional and private actors must play a role to respond to a common challenge. Today in this sense the situation at the European level is very different from country to country. The presence of a National Mitigation Strategy and a National Adaptation Strategy – a first possible common framework – is not at at the same stage of preparation, development and implementation among the EU-27 countries (see Table 2.5.3 below).

However, the presence of a national institutional framework is not necessarily a guarantee for success. In the USA, for example, it was possibile to outline a first generation of climate plans promoted by local authorities belonging to the same network: it is the case of ICLEI's CCP campaign and the US Environmental Protection Agency (EPA) project for GHG inventories, as mentioned by Wheeler (2008).

## 2.5.4 Conclusions

LA21 permitted a large number of local authorities to start and implement policies for urban sustainability. Climate protection plans can provide the impetus for the local level to place a strong emphasis on $CO_2$ reduction but, at the same time, to also put into practice the adaptation policy and to prepare the urban environment for anticipated climate scenarios. To avoid large differences among countries and to address common challenges, a comparable policy method is urgently needed. The presence of a National Adaptation Strategy could be a proper framework to start plans at local level and provide a suitable indication to all public authority levels.

Ideally a strong coordination role and providing know-how has to be assumed by the intermediate level of government (province, county, region), to support small and medium sized local authorities to implement effective action for climate protection. The final responsability to protect their communities lies with local authorities.

**Table 2.5.3** Implementation of National Adaptation Strategies in EU members (Adapted and completed from EEA 2008)

| Countries | NAS adopted | Impacts, vulnerability or adaptation assessments to develop a NAS |
|---|---|---|
| Austria | – | 'Anpassungsstudie' |
| Belgium | (Expected in 2012) | SSD project |
| Bulgaria | – | NAPCC |
| Czech Republic | – | – |
| Cyprus | – | – |
| Denmark | 2008 Klimatilpasnings strategi | – |
| Estonia | (Expected in 2009) | ASTRA project |
| Finland | 2004 Finadapt | FINADAPT project |
| France | 2006 | GICC project adaptation au changement |
| Germany | 2008 Klimazwei | KomPass Competence Centre KLIMZUG projects |
| Greece | – | – |
| Hungary | 2008 | VAHAVA project |
| Iceland | | VO project |
| Ireland | Provisional National Climate Strategy 2007–2012 | ERTDI programme Climate Change Research Programme (CCRP) |
| Italy | – | In 2007 an important national conference but no official plan or strategy adopted. Some relevant initiatives by local governments or networks (Association Local A21 Charter, Rovigo Outreach) |
| Latvia | (Expected in 2009) | ASTRA project |
| Liechtenstein | – | – |
| Lithuania | – | ASTRA project |
| Luxembourg | – | – |
| Malta | – | Malta Climate Change project |
| The Netherlands | 2008 National Program of Spatial Adaptation to Climate Change | Delta committee ARK Programme –CcSP Knowledge for Climate |
| Norway | 2008 NORKLIMA project | NORADAPT project |
| Poland | – | – |
| Portugal | – | Climate Change in Portugal: Scenarios, Impacts, and Adaptation Measures – (SIAM) |
| Romania | (Expected in 2009) | – |
| Slovak Republic | – | – |
| Slovenia | – | – |
| Spain | 2006 Plan National de Adaptació al Cambio Climático (PNACC) | ECCE project Impacts on coastlines |
| Sweden | 2009 Sweclim | SWECIA project; CLIMATOOLS project |
| Switzerland | – | OcCC activities |
| Turkey | – | – |
| UK | 2008 Climate Change Adaptation Strategy (2008–2011) | UK National Risk Assessment UKCIP studies |

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