Chapter 6
Conclusions: A Way Forward

G. Guariso and M. Volta

Despite a general improvement expected for the next decade in EU, some urban areas and some regions will still struggle with severe air quality problems and related health effects. These areas are often characterized by specific environmental and anthropogenic factors and will require ad hoc additional local actions to complement medium and long-term national and EU-wide strategies to reach EU air quality objectives. These urban areas are also among the territories where most energy is consumed and most greenhouse gases (GHGs) are emitted.

So far, abatement strategies for air pollution and GHGs have mostly been treated separately. However, increasing scientific evidence shows that air pollution and climate change policies must be integrated to achieve sustainable development and a low carbon (LC) society. Combined efforts to deal with air pollution and climate issues at the urban level will be particularly important because here is where most people are exposed to air pollution, and 75 % of global GHG emissions are generated (Schmale et al. 2014; UNEP and WMO 2011). Urban air pollution and climate change simultaneously posing a serious threat to citizen longevity and quality of life: reducing and mitigating the corresponding impacts is vital. Such integration may exploit known synergies and would lead to substantial cost savings and important benefits for human health and the environment.

A widespread application of classical end-of-pipe measures, such as various types of filters and catalysts, may provide only a moderate improvement to the air quality in cities and regions and will not reduce their GHG emissions. Until now, however, the modelling and analysis underpinning the development of abatement strategies in the EU and in the Convention on Long-Range Transboundary Air Pollution (CLRTAP) has focussed on technical measures. In the future, non-technical mea-

G. Guariso
Politecnico di Milano, Milan, Italy

M. Volta (✉)
Università degli Studi di Brescia, Brescia, Italy
e-mail: marialuisa.volta@unibs.it

G. Guariso and M. Volta (eds.), *Air Quality Integrated Assessment*,
PoliMI SpringerBriefs, DOI 10.1007/978-3-319-33349-6_6

sures will become increasingly important for the mitigation of both air quality and climate change and policy development will require analytical tools which are capable of dealing with a wider range of measures and changes, which improve energy efficiency and air quality at the same time, while at least maintaining the same level of services. These measures cover a very wide spectrum, going from the change of production processes in industry, to shifts in transport modes, to changes in buildings, urban structures and plans, and in citizens' way of life.

Such important structural societal changes will require the involvement of a larger range of actors, with the citizen as a key stakeholder (Laniak et al. 2013). In many cases, citizens will need to modify their perceptions and behaviour: a process that may take much longer than the adoption of a new technology or a new regulation. Even when all the impacts are accounted for in a scenario analysis or in an optimization procedure, the final output of current tools is a classical "plan", i.e. a set of measures to be implemented, by a possibly "almighty" decision-maker. These plans disregard crucial issues, notably how these measures might be accepted by citizens, how long it will take to implement them and through what normative, economic, or simply persuasive ways they can be actuated. This, on the contrary, requires a long-term perspective and it is not sufficient to state a traditional air quality and GHG emission reduction plan with fixed actions and fixed targets to be achieved in a given number of years. What is needed is a continuous process, which takes into account the continuous changes of society and evolution of technology, as well as external conditions (such as, for instance, international agreements on climate or on transboundary pollution) and tries to accompany and foster the transition of society toward cleaner air and lower carbon emissions.

City and regional authorities cannot impose such a transition, particularly if behavioural changes are required, but they can certainly influence its direction and speed. Managing this transition is a complex task for city and regional authorities, that requires taking into account the governance levels to correctly target the areas where control measures should be implemented for highest efficiency and, at the same time, requires being able to confront environmental equity issues, public criticism and even protest.

Increasing awareness of this complexity has triggered the development of the "Transition Management (TM)" concept. Pioneered at the end of the '90s in the Netherlands in sectors such as water management, energy supply or mobility (e.g. Rotmans et al. 2001), it has been taken up in the meantime in several other countries and by international organisations such as the OECD (2014) or EEA (2014) in order to guide and inform innovation policy and associated sectoral policies.

Transition Management has also been proposed as guiding strategy for tackling major societal challenges in other areas (CEC 2011). Even if the European Commission suggests an evolving approach for moving to a competitive low carbon economy (EC 2011, EU 2013), in the development of plans for cleaner air together with low GHG emission, TM can be considered as quite new approach.

To apply such a new concept, decision makers must be supported by a systematic framework that can be adapted to the specific circumstances of the different regions and cities and to the complex systems dynamics of societal and technological changes, as well as by a working set of tools that may help at different stages of the transition.

Indeed, TM includes and extends the concept Integrated Assessment Modelling, a methodology that, as seen in the preceding chapters, has been developed over the last two decades to select "optimised" policies aiming at reducing the negative impacts of air pollution and climate change.

Central to the concept of TM is a multi-level perspective on long-term change processes (Rotmans et al. 2001) that may take a long time, sometimes decades, to be realised. Although there may be periods of slower and faster development, in general, there are no major jumps due to the manifold inter-dependencies in socio-technical systems. TM is therefore a goal-oriented process of continuous learning and adjustment among a broad range of actors and stakeholders.

The application of TM to air quality and at climate change mitigation actions will need the design of innovative strategies based on an in-depth analysis of the scientific findings (e.g. atmospheric composition dynamics, new modelling approaches, technological innovation, social analysis) and on technical and economic challenges (e.g. implementation of cleaner technologies or urban planning). It will also need the definition of the right level of actions to find efficient synergies and good compromises between European/national/local policies and air quality and climate issues.

While consensus can often be reached on the overarching transition goals (e.g. cleaner air in cities, fighting climate change), conflicts of interest may easily arise once those objectives and targets become more specific, and when policies in one area have negative impacts on another. Specific policies thus need to be carefully designed in order to disentangle the mechanisms behind acceptability for the different actors and stakeholders concerned and to avoid disruptive conflicts. Negotiating and moderating debates about conflict-prone policies is crucial to the success of TM (Smith et al. 2005). In order to underpin these debates and decision-making processes with information and knowledge as accurate as possible, suitable tools and approaches for data collection, analysis and assessment are needed. They are also essential to enable monitoring, learning, and adjustment during the relatively long time periods of the TM processes.

A key issue in the development of a transition process is the assessment of the social acceptability of political decisions. Different techniques are already available for this purpose.

Discrete Choice Models, for instance, present the advantages of stressing the trade-offs among different choice alternatives and have been used for the first time within the SEFIRA FP7 coordination action (http://www.sefira-project.eu) to assess the acceptability of Air Quality and Climate Policies. Different degrees of acceptability depend on citizens' preferences and their awareness of the drivers/pressures/impact in AQ and LC. These perspectives may be investigated using a discrete choice analysis performed asking citizens to fill a traditional questionnaire on their choices in relation to AQ and LC policies and/or developing CAWIs (Computer Assisted Web Interviewing). When conducted in selected regions where specific actions have already been applied, these methods allow to better investigate the impacts of local and regional policies on regional socio-economical systems and on how such impact is accepted by individuals. Two scenarios will be possible: (i) different local/regional environmental policies/measures having the same impacts can be implemented according to the individual preferences (acceptability ranking); (ii) most effective policies do not respect the acceptability ranking or, in the worst scenario are not accepted at all: in this case, communication plays a key role in building awareness on the trade-off existing between people desires and environmental constraints. This requires the development of education (long term perspective) and communication (short term perspective) tools, with a focus on tools aimed at raising awareness on win–win strategies for AQ and LC. Also the presence and impacts of AQ and LC policies in social media may contribute to the acquisition of scientifically ground knowledge that can be translated into concrete everyday life choices by citizens.

The definition of TM goals and vision requires a very strong involvement of all stakeholders, and needs to be embedded in a political process making commitment. An iterative process of monitoring, learning and adjustment must be designed, involving these stakeholders at regular intervals.

The experiences gained and the lessons learned must be suitably codified for subsequent use by other cities and regions; for instance, by compiling and circulating a detailed and comprehensive guidebook. This approach is similar to the provisions of the SEA (Strategic Environmental Assessment) Directive 2001/42/EC.

Research should be aimed at defining how to co-design and set up a suitable “toolbox” to support decision makers in selecting the measures and strategies that address their transition goals to be implemented. Such a toolbox should include models, databases, guidelines, dissemination formats, and the supporting software. The tools could be identified and structured on the basis of the DPSIR methodology that, as shown in the previous chapters, is well suited for describing the interactions between society and the environment.

Monitoring tools are also needed to continuously assess the effectiveness of the AQ policy in reaching its goals, in particular the socio-economic consequences.

All the tools should be connected within a suitable ICT environment.

Two components of the ICT infrastructure deserve a special attention, given that research activities in the recent past have mainly focused on the development and application of European and regional models: the first is the creation and diffusion of a (meta)data dictionary; the second, the implementation of a common database for emission abatement measures.

The dictionary can be implemented in different ways, including an ontology, to ease the communication between all the involved parties: scientists, decision-makers, citizens, all other stakeholders and within each group. Its purpose is to clearly define all the variables used in the DPSIR scheme in such a way that their meaning can be precisely understood by all as well as other perspective stakeholders both from a qualitative and quantitative viewpoint. It is in fact common that, for instance, emissions are classified and/or measured in different ways in different sites;

or actions, named in the same way, are in practice actuated with different means. The dictionary will clarify these differences thus allowing consistent comparisons between different situations and clear definitions of best practices.

The database of emission abatement measures should contain a standardized description of different reduction activities, as it is currently the case of end-of-pipe measures in the GAINS database. This means that all the activities must be accurately described with some indication of their cost, evolution, and effectiveness. This again would allow an easier identification of best practices as well as of the (private or social) investment needed for their implementation.

Finance and economic policy measures (public–private partnerships, concessional grants and loans at city, regional, national and EU levels, full private sector financing), for instance, can be used to facilitate rapid market deployment for innovative abatement solutions. In this respect, case studies of effective economic policy instruments to reduce air pollution and carbon emissions in European cities in the transport and heating sectors are already available (see, for instance, Chap. 5) as well as experiences in the adoption of economic policy instruments such as regulation, pricing, public funding, subsidies and exemptions.

Other measures can be related to educational efforts as integrated parts of air pollution and low carbon policies. These measures should address the challenges of consumer-citizens involvement and learning.

Once again, sharing studies, costs, results, and acceptance of these actions within a common framework over the Internet would allow for intercomparison and mutual learning among all local governments and environmental agencies.

References

CEC (2011) COUNCIL OF THE EUROPEAN UNION, The Budapest Declaration, Transition towards sustainable food consumption and production in a resource-constrained world. 10138/11

EC (2011) A Roadmap for Moving to a Competitive Low Carbon Economy in 2050, COM/2011/112 final

EEA (2014) Multiannual Work Programme 2014–2018: Expanding the knowledge base for policy implementation and long-term transitions, Luxembourg

EU (2013) Regulation (EU) No 1300/2013 of the European Parliament and of the Council of 17 Dec 2013

Laniak GF, Olchin G, Goodall J, Voinov A, Hille M et al (2013) Integrated environmental modeling: a vision and roadmap for the future. Environ Model Softw 39:3–23

OECD (2014) Synthesis report on system innovation, Paris. https://www.innovationpolicyplatform.org/sites/default/files/general/SYSTEMINNOVATION_FINALREPORT.pdf. Last accessed Mar 2016

Rotmans J, Kemp R, van Asselt M (2001) More evolution than revolution: transition management in public policy. Foresight 3:15–31

Schmale J, Shindell D, von Schneidemesser E, Chabay I, Lawrence M (2014) Air pollution: clean up our skies. Nature 515:335–337

Smith A, Stirling A, Berkhout F (2005) The governance of sustainable socio-technical transitions. Res Policy 34:1491–1510

UNEP, WMO (2011) Integrated assessment of black carbon and tropospheric ozone, Nairobi. http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf. Last accessed Mar 2016