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IMPROVING CO-ORDINATION BETWEEN ENVIRONMENTAL AND HEALTH POLICIES: FINAL REPORT

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This report analyses ways of improving the the governance of environmental health issues, based largely on findings derived from three case studies (United Kingdom, France and Canada), as well as from secondary literature.

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FOREWORD

This report examines how policy co-ordination between the environment and health fields could be improved in order to better address environmental health issues. To this end, three cases studies were implemented in the United Kingdom, France and Canada, with particular focus on air pollution.

The report synthesises the main findings arising out from these case studies as well as from a review of the governance literature. It identifies the main means and obstacles to improved policy co-ordination of cross-cutting issues, such as environmental health. Recommendations are then suggested, intending to improve co-ordination between environmental and health policies.

The report was drafted by Pascale Scapecchi under the supervision of the OECD Working Party on National Environmental Policies (WPNEP). It benefited from relevant comments from delegates to the WPNEP as well as from Nick Johnstone (OECD Secretariat). It is published under the responsibility of the Secretary-General of the OECD.

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EXECUTIVE SUMMARY

Why do we need to improve co-ordination between environment and health policies?

In order to reduce the health impacts associated with environmental degradation, different types of policy instruments are applied, alone or in combination. In particular, one can rely on an environmental policy which results in improved environmental conditions (*ex ante*) or on a health policy which addresses the health consequences (*ex post*). Policy evaluation of both types of intervention can help policy-makers decide which policy lever to strengthen in order to correctly address environmental health issues.

Despite some important elements in common, environmental and health policy interventions are characterised by many disparities, for example in terms of both the policy evaluation approach and the types of benefit measures used in these evaluations. These differences undermine the potential for comparative assessment of policy options in the two spheres. Moreover, they raise some concern that decisions regarding environmental health (which affects both Ministries) may be taken individually, when a "whole of government" approach would be preferable for environmental health outcomes. Co-ordination of environmental and health policies is particularly important because these two Ministries share a common goal: to protect the health of the population, in particular the health of the most vulnerable groups.

Assessing the level of co-ordination in these two policy areas in OECD countries, and assessing the benefits of better co-ordinating these two types of policies has rarely been undertaken. This report was prepared to help fill this gap in analysing the governance of environmental health issues and in providing policy recommendations to increase the level of co-ordination in this area.

Governance of environmental health issues

Environmental health by definition is a cross-cutting issue that necessitates the participation of many Ministries in the policy process. For example, environmental health should concern not only the Ministry of Environment and the Ministry of Health, but also the Ministries of Transport, Agriculture, Housing, or in Urban Planning. Integration of environmental and health policies in sectors that contribute the most to environmental pressures (*i.e.* the sectors listed above) would likely result in more effective policies.

However, existing co-ordination of environmental and health policies often takes place in a context of sectoral specialisation and distinct responsibilities. Individual departments work mainly in terms of their own policy "silos". Ministries do not always share the same objectives and interests. Policy domains, such as health and transport, have their own priorities and their own objectives to achieve, even though they are also concerned with environmental health issues. Environmental health is often a priority of the Ministry of Environment, but this is not the case for all relevant Ministries. In addition, the separation of responsibilities between institutional bodies is also problematic, especially in the case of environmental health issues as several Ministries are responsible for one aspect of the problem or the other, but none is typically responsible for environmental health in its entirety. Co-ordination is therefore impeded.

The arguments developed in this report highlight not only issues of co-ordination between these two policy fields, but also the need to consider environmental health issues in a broader context in order for them to be effectively addressed. The planning and management of these issues requires organisational support that goes beyond the traditional definition of individual policy fields, while still respecting ministerial portfolio boundaries. The departments of environment and health in particular need to work in a less fragmented, more coherent, and co-ordinated, way.

Lessons learned

Case studies were carried out in Canada, France and the UK in order to better understand what level of co-ordination actually exists between environmental and health policies, as well as what means can be used to improve this co-ordination, and what obstacles have yet to be overcome. The case studies were complemented by a review of the literature on governance of cross-cutting issues more generally.

Institutional means can facilitate policy co-ordination of cross-cutting issues, and more particularly of environmental health issues. Examples could include regulatory requirements, the creation of specific institutional bodies, enhancing the coherence between Ministries on policy evaluation approaches, a clear definition of responsibilities between the parties involved, the use of open and participatory approaches to facilitate idea exchanges, or the commitment of high level policy-makers. Supra-national initiatives, such as those implemented by the World Health Organisation (*e.g.* the European Environment and Health Process) or the European Commission (*e.g.* the European Environment and Health Action Plan 2004-2010), can also have positive impacts on policy co-ordination.

Several obstacles may hamper attempts at cross-departmental co-ordination. One of these is the specialisation among sectors and across levels of government. Ministries tend to defend their own priorities and area of expertise. In addition, segmented working methods prevail in the different sectors. Other obstacles, such as the competing and divergent discourses characterising the field of environment and health, the lack of coherence and consistency among Ministries concerning policy evaluation, the limited resources allocated to environmental health, the multiplication of players and "clientelism", neither facilitate nor encourage policy co-ordination in this area.

The report provides evidence-based recommendations to improve policy co-ordination between environment and health. In particular, coherence in the analytical approaches used to support decision-making seems to be a key prerequisite for effective policy co-ordination. Using the same methodology for policy evaluation ensures effective policy co-ordination as it promotes clear, transparent and coherent decision-making. More specifically, the systematic use of *ex ante* and *ex post* policy evaluations could facilitate policy co-ordination. As these practices are not equally applied in all OECD countries, they should be further promoted and encouraged.

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IMPROVING CO-ORDINATION BETWEEN ENVIRONMENTAL AND HEALTH POLICIES: FINAL REPORT

1. Introduction

What is environmental health?

The World Health Organisation (WHO) defines environmental health as the "*aspects of human health, including quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of future generations*." Environmental health programmes therefore have the objective of reducing morbidity and mortality from exposure to environmental hazards.

The links between the environment and public health have been known (or at least suspected) for many years. However, public health programmes concentrated more on the health *effects* rather than on the *causes* of ill health, such as environment. The adoption of Agenda 21 in 1992 at the United Nations Conference on Environment and Development (3-14 June 1992, Rio de Janeiro, Brazil) raised policy attention on environmental health determinants, particularly with respect to the impact of pollution and resource depletion on human health.

In this context, when one wants to reduce the health impacts associated with environmental degradation, one can rely on an environmental policy which results in improved environmental conditions (*ex ante*) or on a health policy which addresses the consequences (*ex post*). Both types of policy interventions involve expenditures of resources (private and public). Therefore, co-ordination of environmental and health policies would result in more efficient policy efforts and allocation of resources.

However, a great number of differences in terms of the policy evaluation framework (cost-benefit analysis vs. cost-effectiveness analysis), and benefit measures (willingness-to-pay values vs. quality-adjusted life years) characterise the approaches adopted in these two policy communities. Indeed, in the health field, analysts often use a valuation framework for cost-effectiveness analysis, while in the environmental domain analysts usually use a valuation framework which can be applied in a cost-benefit analysis framework.

Differences between these two types of framework undermine the potential for comparative assessment of policy options in the two spheres, and thus reduce the possibilities for effective policy co-ordination. More generally, there may be significant institutional barriers to policy co-ordination that need to be identified. If uncoordinated, there could be significant allocation inefficiencies between the two policy fields – with perhaps too much focus on addressing the health concerns generated by environmental problems, rather than on preventing the environmental problems in the first place.

The OECD Project

There is therefore some concern that decisions concerning both Ministries may be taken individually, when a "whole of government" approach would be preferable for environmental health outcomes. Assessing the value of better co-ordinating these two types of policies has rarely been undertaken. The OECD has therefore attempted to fill this gap. It launched a project in 2004 to analyse how it might be possible to improve co-ordination and collaboration between environmental and health policies.

The objectives of the project were two-fold. The first objective was to identify the methods by which health and environmental policies are assessed. Given methodological differences between the frameworks used in environmental policy and in health policy, it is necessary to understand the underlying mechanisms of the valuation processes in order to compare them and to examine how they might be efficiently reconciled.

The second objective of the project was to review the means of policy co-ordination in these two spheres. It also considered if (and how) a better co-ordination between environmental and health policies is valuable and possible. In comparing of the means by which environment-related health impacts are assessed in the environmental and health spheres, the work allowed for a comparison of practices and policies implemented in both fields. The overall goal was improved policy coordination and inter-departmental resource allocation.

To support the work, cases studies were carried out in Canada, France and the United Kingdom (UK) from November 2005 (UK) to April 2006 (Canada). The purpose of these case studies was to meet with officials from government dealing with environmental health issues in order to better understand priority-setting practices; as well as to determine the actual level of co-ordination between environmental and health policies. Interviews of officials from Ministries of Environment and Health and from expertise agencies were therefore organised. Information and documentation related to initiatives undertaken in the environmental health area have also been collected.

The analysis and case studies focused on air pollution, as this is the environmental health problem that concerns most OECD countries. Large numbers of epidemiological and economic studies have focused on this issue and have highlighted the significant relationship between air pollution and negative effects on human health. More particularly, it has been established that air pollution is a major aggravating factor for respiratory diseases, such as asthma[1]. It was thus expected to be particularly useful to OECD Member countries to analyse the means by which policies implemented in Environment and Health Ministries aiming at reducing the adverse health effects of air pollution could be better co-ordinated.

However, as co-ordination between environment and health Ministries generally takes place in settings broader than air pollution only, the analysis and recommendations presented in this report will not solely concentrate on air pollution but on environmental health issues more broadly.

The work was also based upon both theoretical and empirical findings, which allows for the development of recommendations.

Outline of the report

The next section of this report presents the reasons why policy co-ordination is often implemented in a government, and how this co-ordination is actually done. Policy co-ordination is first discussed in general terms. Policy co-ordination between two specific Ministries – environment and health – is then reviewed. This review allows for a better understanding of why co-ordination is particularly important in these areas, and why it is sometimes difficult to implement.

In the third section of the report, the main lessons learned from the case studies are presented (more specifically, the major obstacles to co-ordination and the main institutional means actually in place to improve co-ordination).

[1] Although air pollution can aggravate asthma symptoms, it is likely to be less important than other factors, such as infections or relevant allergens (*e.g.* house dust mites).

Based upon the findings from the case studies, a few recommendations are provided in the last section. These recommendations are aimed at improving co-ordination between environmental and health policies.

2. Policy co-ordination within government

2.1. Definitions

Different notions have been associated with policy co-ordination, such as policy collaboration, policy coherence or policy integration. A few definitions are provided here in order to clarify these similar (although distinct) terms.

Policy collaboration can be defined as a form of working relationships between several departments. Meijers and Stead (2004) described policy collaboration as "*a very positive form of working in association with other organisations for some form of mutual benefit*". As such, policy collaboration focuses strongly on the output of the collaboration process (*collaborative advantage*). Alter and Hage (1993) build a bridge between collaboration and co-operation, in defining *policy co-operation* as the degree to which collaboration exists in terms of programmes, resources, information, etc.

Policy co-ordination is often considered to encompass both policy collaboration and *policy coherence*. Indeed, policy co-ordination is generally implemented in order to ensure the mutual enforcement and consistency of sectoral policies, as a way of achieving specific goals (Meijers and Stead, 2004). Policy coherence is, in a very general sense, defined as "*an overall state of mutual consistency among different policies*" (OECD, 1996). The OECD Development Assistance Committee defines policy coherence as "*systematic promotion of mutually reinforcing policies across government departments and agencies creating synergies towards achieving the defined objectives*".

According to OECD (1996), *policy integration* is "*quite distinct and more sophisticated than policy co-ordination"*, as it requires more inter-sectoral interaction than the former. More specifically, policy integration is implemented to create synergies between different Ministries with respect to a given issue (*e.g.* environment) or to several interlinked issues (*e.g.* environmental health). It also refers to the management of cross-cutting policy issues[2] within a single department. Policy integration is therefore a more global notion than the other terms defined above, as it involves both policy co-ordination and collaboration. It also requires joint working and the use of similar goals in formulating policies (Meijers and Stead, 2004).

These terms have been presented in Table 1 in increasing levels of complexity.

Table 1.Differences between different policy concepts

Concepts	Focus	Complexity
Policy collaboration	Output	Very low
Policy coherence	Process	Low
Policy co-ordination	Process	Medium
Policy integration	Output and process	High

[2] The OECD defines cross-cutting issues as issues "*which transcend the boundaries of established policy fields, and do not correspond to the institutional responsibilities of individual Ministries*" (OECD, 1996).

Although policy integration looks to be the most far-reaching, it is also the most difficult to implement.

2.2. Governance of sectoral policies

The Brundtland Report (World Commission on Environment and Development, 1987) highlighted the tendency for institutions to be "*independent, fragmented, and working to relatively narrow mandates with closed decision processes*". Indeed, as reported in OECD (2002), modern governments are generally characterised by a significant degree of sectoral specialisation. Each department is therefore characterised by its own philosophy, priorities, agenda and operating mode. As such, departments often function as separate organisations (Meijers and Stead, 2004), the economic department promotes economic growth, the environmental Ministry works for the protection of the environment, the agricultural department intends to improve agricultural production, etc.

Sectoral specialisation was originally promoted in order to ensure a greater focus and efficiency in government operations, and to respond more effectively to complex and differentiated problems (OECD, 2002). It led to clearly defined policy domains and competencies between departments, and sometimes to what is referred to "departmentalism" (Russel and Jordan, 2004). It should be understood that these benefits should not be forsaken in an effort to improve co-ordination between two policy fields.

Departmentalism means that departments work mainly in terms of their own policy silos. They therefore produce stand-alone outputs. Departments are also less likely to be involved in the kind of horizontal activities that would be necessary, for example, to achieve cross-departmental objectives. Departmentalism also implies internal competition between departments seeking to realise their own sectoral goals and interests. Those interests are often associated with deep-rooted working ideologies or philosophies, and which can restrict policy collaboration.

Why does departmentalism arise? The main reasons relate to the different goals, languages, approaches, methods and instruments used in the different Ministries. Three theories to understand departmentalism are proposed in Russel and Jordan (2004):

- Bureau-shaping theory: bureaucrats aim to achieve goals that rationally maximise their own self-interest rather than the public's interests through increasing their department's size and budget. This theory is related to the interests and priorities of officials within a specific Ministry.

- Bureau-culture theory: decision-making is a collective action that results from officials being captured by certain routines, beliefs and rituals which they apply to their policy-making processes. There is a set of dominant departmental cultures which influence the way policies are made. This theory is related to the processes applied in the Ministries.

- Policy network theory: policy is the result of bargaining, conflict and consensus between governmental actors and non-governmental groups. This theory refers to the strategy employed by each Ministry to fulfil its objectives and their strategic behaviour as a result.

However, the emergence of cross-cutting issues such as sustainable development and environmental health problems, clearly calls into question the current organisational structure of sectoral departments, which is no longer appropriate. Possible ways to address the increasing complexity with policymaking is to better co-ordinate sectoral policies, and to proceed with an integrated understanding of policy problems.

2.3 Policy co-ordination

In a context where tasks and responsibilities are clearly divided, policy co-ordination is not straightforward, and is generally difficult to implement (Zingerli et al., 2004). However, policy co-ordination is vital to good governance. One can find many reasons for supporting policy co-ordination:

- Policy co-ordination ensures cooperative and collaborative decision-making. It provides all relevant departments and agencies with an opportunity to participate in the decision-making process. Interdepartmental discussion and co-ordination enables officials to consider their own initiatives with respect to initiatives undertaken in other departments regulating similar issues. Moreover, policy co-ordination provides a framework to resolve potential sectoral conflicts.

- Inter-departmental co-ordination establishes policy coherence and support in the government more broadly. Indeed, co-ordination across departments allows the government to speak with one voice and to convey consistent messages. Policy co-ordination allows, therefore, for greater coherence and consistency between departments, as well as for the identification of policy gaps. It also helps to clarify each ministry's role.

- Policy co-ordination reduces duplication of work, redundancy in policy programmes and initiatives, and waste of time, resulting in more effective and efficient use of government (scarce) resources. Policy co-ordination may then improve policymaking effectiveness.

Two types of policy integration can be defined: horizontal policy integration, which refers to sectoral integration between different departments; and vertical policy integration which refers to integration between different tiers of government (*i.e.* inter-governmental integration) (Meijers and Stead, 2004).

A list of tools for policy co-ordination is proposed in OECD (1996). According to that report, the most important tool of coherence is informed decision-making. Indeed, systematic evaluation of policy proposals, using a methodology common to all departments (or at least to those concerned with the issue in question), enhances policy coherence and reduces policy inconsistencies across departments. Other tools include the definition of an action plan defining long-term objectives and a comprehensive set of priorities and goals; policy co-ordination structure (*e.g.* advisory committees and interdepartmental committees); tools to ensure a more cooperative administrative culture, such as the development of a shared framework of understanding which enables the team members to conceptualise the issues in compatible terms[3].

Policy co-ordination seems to be of particular relevance when the linkages between the different Ministries are important (such as those involving environment and health) and the activities of one sector influence the activities of other sectors. These influences have to be taken into account correctly if the result is to be effective policies. As such, each policy area should integrate within its own policy-making the side effects of other policies. The next section analyses the co-ordination of environmental and health policies more specifically.

2.4 Governance of environmental health issues

Many initiatives have been undertaken in the area of environment and health (*e.g.* the "Health and Environment Linkages Initiative", launched at the World Submit on Sustainable Development in 2002), and environmental health is clearly a growing policy concern. Environmental conditions exert pressure on people's health. Exposure to air pollution can significantly harm health, and concentrations of many air pollutants are still very high in OECD countries and elsewhere (World Bank, 2006). As such, policymakers

[3] Differences in languages and methodologies are also significant obstacles to policy co-ordination (see below).

have to find ways to reduce exposure to various pollutants. To this end, different types of policy instruments can be applied, alone or in combination. Although environmental policies are in general effective, integration of environmental and health policies in sectors that contribute the most to environmental pressures (*i.e.* agriculture, energy, industry and transport) would likely result in more effective policies.

Environmental health is a cross-cutting issue that places new demands on policy-making. This implies the need for the participation of many departments in the policy process. For example, environmental health should concern not only the Ministry of Environment, but also the Ministries of Health, Transport, Agriculture, Housing, or Urban Planning. However, most co-ordination of environmental and health policies takes place in a context of sectoral specialisation and distinct responsibilities. The planning and management of environmental health issues therefore requires organisational support that goes beyond the traditional definition of policy fields, while still respecting ministerial portfolio boundaries. Sectoral specialisation does not facilitate information flows and communication between Ministries; co-ordination is therefore impeded.

In addition, various conflicting interests have to be considered. Environmental health is often a priority of the Ministry of Environment, but this is not the case for all Ministries. The separation of responsibilities is particularly problematic in the case of environmental health issues. Indeed, a number of Ministries are responsible for one aspect of the problem or another, but none is typically responsible for environmental health in its entirety.

This raises not only issues of co-ordination, but also the need to consider environmental health issues in a broader context in order for them to be effectively addressed. The departments of environment and health in particular need to work in a less fragmented, and more coherent and co-ordinated way. Policy co-ordination of environmental and health policies is particularly important because these two Ministries share a common goal: to protect the health of the population, in particular the health of the most vulnerable groups. However, requiring these two ministries to collaborate and co-ordinate their work is often quite challenging. Some of the problems are:

- Different objectives: environmental policies target a broad range of social benefits, including environmental and health benefits. In many cases, the importance of anticipated health impacts on their own justifies action – but this is not always the case. In contrast, environment is just one (and often an uncertain) contributor among others to ill-health. It therefore does not represent a major component of health policies. The perceived role and mission of health departments has traditionally not included environmental concerns. These risks broadly lie outside the health sector and are not regulated by health authorities.

- Different levers: among the potential policy instruments, environmental health issues can be addressed by two primary policy levers: health policies (addressing health issues related to illnesses) and environmental policies (aiming at improving environmental conditions to prevent illnesses). In this context, when facing environmental health issues, it is complicated to determine which policy lever should be strengthened to solve the problem: should resources be allocated to the Ministry of Health to find ways to treat the disease or should Ministry of the Environment set tighter emissions standards or mandate new production processes?

- Different training and expertise: officials working in Environment and Health Ministries do not have the same training or expertise. Indeed, most officials working in Ministries of Environment are engineers or natural scientists (with a small proportion of economists) whereas officials in Ministries of Health are frequently medical doctors or epidemiologists (with an even smaller proportion of economists). Each of them has its own area of expertise and the gap between them

is sometimes quite significant. As such, when the two Ministries collaborate, they may be confronted with people who do not share their language, their views and their approach to problem solving.

- Different resources (and public expenditures) implications: Ministries of Health and Environment have conceptually different objective functions. Health Ministries can be considered as "spending" departments providing services. Once resources are allocated, Health Ministries have an incentive to spend effectively their entire resources, in prioritising between different alternatives (*cost-effectiveness*). In contrast, Environment Ministries are essentially regulatory departments concerned with the introduction of appropriate environmental standards that target specific pollution sources. Their action is not primarily reflected in increased government expenditures but rather in their broader impacts on the economy. Environment Ministries have therefore an incentive to ensure the *cost-efficiency* of their policies, *i.e.* that the social benefits of a specific measure exceed the social costs.

- Different policy evaluation and valuation practices: The Ministry of Health and the Ministry of Environment use different approaches and frameworks when evaluating their policies. When policy evaluation is done (rarely in OECD countries), Health Ministries are likely to adopt a cost-effectiveness approach (CEA) while Ministries of Environment are more likely to adopt cost-benefit approaches (CBA). This divergence is related to their respective objectives (see above). However, the use of different approaches and methodologies can result in different and non-comparable benefit values[4]. The recommendations provided by the two Ministries may therefore not be consistent with each other, which then complicates the task of the policy-maker.

3. Lessons learned from the case studies

The case studies carried out in Canada, France and the UK help in better understanding what level of co-ordination actually exists between environmental and health policies, as well as what means can be used to improve their co-ordination, and what obstacles have yet to be overcome to improve this co-ordination. The main lessons learned from these three case studies are presented below. Individual reports associated with each case study are proposed in the Annexes (Annex 1: case study on the UK; Annex 2: case study on France; and, Annex 3: case study on Canada).

Means to improved co-ordination

Institutional means can facilitate policy co-ordination for cross-cutting issues, and more particularly of environmental health issues. Examples include the following:

- Regulatory requirement: communication and co-ordination between sectoral departments (or different levels of governance) can be required by regulatory policies. For example, in Canada, the Canadian Environmental Assessment Act (2003) and the forthcoming Regulatory Directive (2006) require that all departments work together where necessary.

- Creation of a specific institutional body: some specific institutions may be created in order to facilitate co-ordination of environmental and health policies and to reconcile the competing views and approaches of the two Ministries. A list of possible reforms is provided in OECD (1996), including interdepartmental committees, and ministry with coordinative portfolios. For example,

[4] Benefit values measured in the context of a CBA are generally expressed in terms of willingness-to-pay (WTP) while benefit values measured in the context of a CEA are generally expressed in terms of quality-adjusted life years (QALYs).

in Canada, the establishment of a committee on environment and health facilitated the collaboration between Health Canada and Environment Canada.

- Coherence across departments: An important aspect of effective inter-departmental co-ordination is coherence across departments. Indeed, if departments concerned with environmental health issues adopt the same approach to evaluating their policies, this can ensure policy coherence and consistency, and therefore facilitate policy co-ordination. For example, in Canada and the UK, all departments are required to apply the same valuation methodology for policy appraisal, *i.e.* cost-benefit analysis.

- Clear definition of individual responsibilities: a clear definition of each department's responsibilities and functions in the policy-making process ensures effective co-ordination. It is even more important in the particular case of cross-cutting issues, where the role and responsibilities of each party involved need to be clearly defined to avoid any confusion and misunderstanding that could compromise co-ordination. Each side (environment and health) has different tasks and different objectives on which they have agreed previously. A "Memorandum of Understanding" can also be formally prepared to define the working relationships of all the parties involved, clarifying functions.

- Specific forms of co-ordination: the form that co-ordination takes may be influential. For instance, the use of a forum or steering groups facilitates the exchange of ideas. Indeed, these formats allow for a better understanding of the respective languages, priorities and objectives. The timing of meetings is also important. Regular meetings ensure good working relationships and facilitate the achievement of the objectives. Finally, as open and participatory approaches are likely to make the results more acceptable and more credible, these should be promoted as far as possible (OECD, 2002).

- Nature of working relationships: partnerships between different Ministries facilitate working relationships, and therefore co-ordination. Long-term working relationships ensure effective collaboration. In addition, when the two Ministries act more as "partners" than as "competitors", policy collaboration and co-ordination are both easier.

- Consultation of stakeholders and citizens: the involvement of relevant stakeholders at an early stage of the decision-making process is important. This encourages transparency, openness to the public and effective public management. In addition, it forces departments to provide high quality and effective work. It therefore may help co-ordination between departments.

- High-level political commitment: high-level political commitment is needed to ensure credibility and to consider co-ordination as an active aspiration, not simply as a principle on paper (OECD, 2002). Co-ordination is expected to be more effective when it is promoted at a high level and when it concerns all relevant levels of policy-making (*i.e.* vertical co-ordination). In addition, high-level political commitment may ensure the definition of a long-term programme, which may then comfort policy co-ordination among the different sectors. A long term view is particularly relevant in the context of environmental health as environmental impacts on health may be fully revealed only several years after exposure (*latent effects*).

- Supra-national initiatives: Other actions undertaken at the international level can improve co-ordination between environmental and health policies. This is, in particular, the objective of the European Environment and Health Process (EEHP) and the Environmental Health Action Plan for Europe (EHAPE) developed by the World Health Organisation (WHO). In particular, the National Environmental Health Action Plan (NEHAP) is a powerful tool to increase collaboration between

the two fields and is intended to facilitate integration of the policy domains of environment and health. It plays an important role in ministerial co-ordination and decision-making. It has created positive dynamics around environmental health and has increased attention to environmental health issues (Perlstadt, 2003). According to Capleton *et al.* (2005), EEHP helped promote and strengthen the working relationships between Ministries dealing with environmental health. In addition, this process raised political awareness of environmental health issues in the UK, changing the way Departments think and consider these problems.

Obstacles to improved co-ordination

Several obstacles may hamper attempts at cross-departmental co-ordination. One of them is the sectoral specialisation and compartmentalisation of expertise among sectors and across levels of government. Individual departments continue to work mainly in terms of their own policy silos. In the context of environmental health issues, there is no formal requirement for departments to work on environmental health issues (except, generally, for the Ministry of Environment). Policy domains, such as health and transport, have their own priorities and their own objectives to achieve, although they are also concerned with environmental health issues. Ministries tend to defend their own area of expertise. Segmented working methods prevailing in the different sectors do not facilitate policy co-ordination (OECD, 2002).

Another consequence of specialisation is that few people work in the environmental health area. More specifically, it is generally the case that only a few people in Health Ministries work on environmental health issues. Raising political awareness on environmental health issues can increase the interest in this area of policy-making.

Co-ordination of different departments may also be confronted with competing and divergent discourses. This is particularly true for environmental health. Despite some important elements in common, environmental and health economics are well-known for their disparities, in terms of methodology, targets and indicators. Indeed, when the Ministry of Health and the Ministry of the Environment work individually, they apply different frameworks (respectively CEA and CBA), whereas they apply CBA when they work together. As such, there is a potential for cultural misunderstanding.

Lack of coherence and consistency among Ministries concerning policy evaluation may also make co-ordination difficult. Only a few OECD countries have recommended the use of a specific evaluation technique. Examples include the UK and Canada where CBA (using WTP techniques) is recommended over CEA for environmental health issues. There is a concern that the use of different and incompatible techniques for policy analysis lead to conflicting or incompatible solutions of the problem in question. This is particularly important for environmental health, where there is “substantial ambivalence” and mistrust displayed in some departments towards monetising environmental, and more particularly environmental health, variables. Nevertheless, it is reasonable to think that applying a single approach across all Ministries would be more efficient and effective.

Another significant obstacle to policy co-ordination is the lack of resources. Only limited resources are currently allocated to environmental health. Insufficient resources or unequal distribution of resources can make co-ordination difficult. A funding pot secured for a prolonged period of time would ensure the development of coherent policies, a better knowledge of environmental health issues as well as an effective co-ordination between the main Ministries. A trade-off has to be made: on the one hand, there is a pressing need for more research programmes necessary to obtain the scientific evidence required to determine the health impacts associated with environmental degradation; but, on the other hand, limited resources are devoted to research on environmental health.

A fifth obstacle is the multiplication of players. In many countries, multiple players are involved in environmental health issues. This is particularly true in federal countries where responsibilities are generally shared between the different levels of governments (federal and provincial). It is also the case in countries, such as Norway, where health aspects are administered at the municipal level whereas environmental issues are administered at the central or regional level. The presence of multiple players involved in the policy-making process can also arise in countries with particular institutional rigidities, where governmental bodies sometimes have overlapping or not clearly defined responsibilities and functions. In this context, policy co-ordination may require revisiting the institutional structure. For example, institutional bodies that are redundant or that represent an obstacle to improve the co-ordination of two policy fields should be deleted.

Another important barrier to co-ordination of environmental and health policies, or to policy co-ordination more generally, is *clientelism*. Clientelism refers to a specific structure/relationship where a more powerful agent (in this case, Ministry) decides on the approach to be adopted. In our context, clientelism occurs when one Ministry imposes its views, priorities and/or objectives on the other Ministry. Policy co-ordination may therefore be difficult, in particular if these objectives and priorities are not shared by the other Ministry and if the format of co-ordination does not allow for open participation or a clear exchange of ideas and views.

4. Recommendations

Contemporary policy problems are complex and often concern cross-cutting issues. However, traditionally-defined policies are single-purposed and do not necessitate inter-sectoral co-ordination. Policy co-ordination appears to be increasingly necessary to correctly address emerging issues, such as environmental health.

Based upon Russel and Jordan (2004), policy co-ordination of environmental health issues has to overcome three major obstacles: divergent interests, processes and strategies. The focus of the work undertaken here mainly addressed the last two issues. The issue of diverging interest was not thought as of primary concern since Environment and Health Ministries have a joint responsibility in ensuring good health quality. It would be more interesting to analyse this issue in the context of Ministries with competing interests and priorities.

Based upon the findings from the three case studies, recommendations are provided in order to improve the co-ordination between environmental and health policies. They include:

- Coherent decision-making framework across departments;
- Clear definition of each Ministry's role and responsibilities;
- Approaches based on partnership and networks; and,
- High-level political commitment.

Although these recommendations are of equal relevance and importance, coherence in the approaches used in decision-making seems to be a key prerequisite for effective policy co-ordination. Using the same methodology for policy evaluation indeed ensures effective policy co-ordination as it promotes clear, transparent and coherent decision-making. In particular, the systematic use of *ex ante* and *ex post* policy evaluation could facilitate policy co-ordination. These practices are not equally applied in all OECD countries. In particular, if such practice is not recommended, then it must be recognised that information conveyed by the Ministries of Environment and Health are fundamentally different and do not answer the same questions or address the same problems.

Environmental health issues require a shift from the traditional sectoral specialisation to a whole of government approach in order to be effectively addressed, and in order to ensure that sound, evidence-based decisions are made, and to better protect vulnerable population (*e.g.* children, pregnant women, the elderly and people with pre-existing diseases) from environmental hazards. However, the benefits of departmentalism should not be forsaken to improve policy co-ordination. What is really important to address contemporary policy issues (*e.g*. cross-cutting issues) is the need for greater organisational flexibility.

Cross-cutting issues create new interdependencies across Ministries. They require the co-ordination of different sectors having competing objectives and priorities. This is particularly relevant for environmental health issues. Although Ministries within the government work in the same direction, they may propose conflicting solutions to common problems, such as environmental health issues. In addition, there is a concern that interest in these issues is slightly decreasing in some Ministries of some OECD countries. It is therefore strongly recommended to improve and facilitate policy co-ordination between Ministries dealing with environmental health issues to result in effective policy-making.

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ANNEX 1: IMPROVING CO-ORDINATION BETWEEN ENVIRONMENTAL AND HEALTH POLICIES – FINDINGS FROM A CASE STUDY ON THE UK

1. Introduction

Environmental pollution is known to have serious adverse effects on human health. Environmental policies are thus designed to a large extent to reduce these health impacts. However, there is a concern that decisions concerning both Ministries are taken "individually", although a "whole-of-government" approach would be preferable for environmental health issues and would probably result in improved health and environmental policies.

Given a potential lack of co-ordination between the Ministry of the Environment and the Ministry of Health in many OECD Member countries, the OECD Secretariat has undertaken a project to analyse how it would be possible to improve co-ordination and collaboration between environmental and health policies.

The objectives of the project are two-fold: identify the methods by which health and environmental policies are assessed; and, review the means of co-ordination of policy in these two spheres. The project is focusing on the health effects of air pollution, more particularly on the respiratory diseases aggravated by air pollution. This contribution is based upon theoretical and empirical findings, as well as a review of existing practice in selected OECD Member countries.

The United Kingdom (UK) has been identified as a good candidate for case studies, as air pollution is of major concern and as UK asthma rates are among the highest in the world. This case study allows for a better understanding of priority-setting practices and policy assessment. In order to analyse the means of improving the co-ordination between environmental and health policies, it is useful to have all available information related to environmental health, with a specific focus on air pollution and respiratory diseases.

Information related to the assessment of environmental and health policies, as well as information on the valuation approach used in each field have been gathered. It was also necessary to analyse the different policies that have been implemented in each field in order to reduce the health impacts of air pollution. This allows for the identification of existing level and nature of co-ordination between the two spheres, and how this co-ordination has been achieved.

To this end, a series of interviews has been undertaken. The main departments and executive agencies dealing either with environmental or health issues (or both) (*e.g.* the Department for Environment, Food and Rural Affairs[5], the Department of Health and the Environment Agency) were contacted to discuss about policy appraisal and co-ordination between environmental and health policies[6]. This report presents the main findings from this case study.

[5] DEFRA. Formerly known as the Department of Environment and then as the Department of Environment, Transport and the Regions.

[6] I would like to thank all the people I met for their co-operation and assistance, namely: Heather Walton, Simon Dyer and John Henderson from the Department of Health; Bob Davies, Emma Powell and Jane Stratford from DEFRA; and, Ronan Palmer, Andy Croxford and Emma Hayes from the Environment Agency.

2. Health impacts of air pollution in the UK

As in most of the OECD countries, air pollution is a major concern in the UK. The health effects of air pollution are particularly high, both relative to other countries (*e.g.* UK asthma rates are among the highest in the world) and to health impacts associated with other environmental pollution (*e.g.* diseases associated with water pollution).

A report prepared by the *ad hoc* group on the Economic Appraisal of the Health Effects of Air Pollution (Department of Health, 1999) estimated that each year in the UK, 12,500 deaths from respiratory disease are brought forward (*premature deaths*) by acute exposure to ozone (O_3) air pollution. 407 patients were admitted in public hospital for respiratory diseases in 1999. Among those, 247 were less than 65 years old and 160 were 65 years old or over. The report also noted that there were 50% more emergency admissions among those under 65 years-old than among those 65 and over. The number of annual extra or earlier hospitalisations caused by certain pollutants was estimated to be as follows:

- PM_{10}: 10,500
- SO_2: 3,500
- O_3: 500-9,900

The current annual toll in UK from deaths in terms of life years lost is estimated as follows:

- Between 670 and 8,100 life years lost due to PM_{10}-induced premature mortality;
- Between 290 and 3,500 life years lost due to SO_2-induced premature mortality; and,
- Between 1,040 and 12,500 life years lost due to ozone-induced premature mortality.

Asthma is one of the respiratory illnesses aggravated by air pollution. Most of the OECD countries have experienced more asthma epidemics in the last decade than in the past. The Global Initiative for Asthma report published in 2004 provides interesting figures on the burden of asthma by world regions, and more specifically for the UK. This report highlights a marked increase in the incidence of asthma attacks diagnosed by general practitioners over the last few decades in the UK, so that it is now about five times higher than it was 25 years ago. Indeed, UK general practitioners are seeing 20,000 new cases of asthma each week. 1,500 people in the UK die from asthma each year; more than two-thirds were people aged over 65. 75,000 emergency hospital admissions are due to asthma, a quarter of which are in children below 4 years of age.

The UK has amongst the highest prevalence rates of asthma in the world. In total, there are approximately 5.2 million people affected by asthma in the UK, *i.e.* 1.1 million children and 4.1 million adults. The UK has twice as many adults (25%) with some degree of asthma as France. This total includes 700,000 people aged over 65 years and 590,000 teenagers with asthma, which means that 30% of kids of 13-14 years of age in the UK have asthma symptoms. In addition, about 20 million working days are lost due to asthma each year. The total cost of asthma in the region has been estimated to be about £2.5 billion. This includes the cost of about £900 million to the public health service. It is estimated that 50% of all annual healthcare costs for asthma come from the most severe 20% of the asthmatic population.

It should be reminded that air pollution is only one aggravating factor of asthma. High asthma rates in the UK are not solely due to air pollution and can also be attributable to other factors, such as allergens (*e.g.* house dust mites) or infections. The reasons for high asthma rates are not well understood yet and will

not be discussed in this document. Further research is needed in this area to better understand the relationship between air pollution and asthma.

More recently, a benefit analysis of the Clean Air for Europe (CAFE) EC programme has been published (AEA Technology Environment, 2005). Among other objectives, it assesses the benefits of current policies, in particular their health benefits. The results are provided for the whole EU and by individual country as well. More specifically, this report provides interesting figures for a great number of health endpoints associated with air pollution. Figures for a selected set of health endpoints are presented in Table 1 below.

Table 1. Estimated health damages due to PM air pollution for selected health endpoints in the UK.

Health endpoint	Endpoint output	Baseline in 2000
Chronic mortality	Life years lost	409,120
Chronic mortality	Premature deaths	39,470
Infant mortality (<1 yr)	Premature deaths	73
Chronic bronchitis (27yr+)	Cases	18,160
Respiratory hospital admissions (all ages)	Cases	7,010
Cardiac hospital admissions (all ages)	Cases	4,320
Restricted activity days (15-64 yr)	Days	38,022,110
Respiratory medication use (children 5-14 yr)	Days	585,200
Respiratory medication use (adults 20 yr+)	Days	3,058,690
Low respiratory symptoms (children 5-14 yr)	Days	24,188,370
Low respiratory symptoms (adults 15 yr+ with chronic symptoms)	Days	31,459,330

Source: AEA Technology Environment (2005).

These epidemiological figures highlight the importance of the effects of air pollution on human health in the UK. Different policies and measures have been introduced in order to reduce these adverse negative impacts. As the focus of the report is on air pollution, air pollution reduction policies will only be considered in this report. The next section presents the policy appraisal background in the UK and then proposes a review of air quality policies undertaken during the last decade in the UK.

3. Policy appraisal and evaluation

3.1 Policy appraisal

Recently, there has been a formal requirement to undertake risk impact assessment in the policy assessment process (HM Treasury, 2003). Therefore, all the departments have to measure the costs and benefits of every policy. This practice ensures that the costs and benefits of any proposed policy are fully

integrated into government decision-making. The UK has taken steps to include a full impact assessment of all policies through cost-benefit analysis (CBA). The inclusion of environmental impact assessment in policy-making has led to the evaluation of non-market goods.

In 2003, the Treasury produced the "Green Book" which explains the different stages required to undertake correctly a risk impact assessment (RIA) and thus the cost-benefit analysis of a policy. It proposes general guidelines on policy evaluation. More specifically, it presents the techniques and issues that have to be considered when policies are assessed. This guidance document is designed to maintain consistency among departments in basic ways of thinking and appraisal/evaluation procedures, and as a technical guidance on cost-benefit or cost-effectiveness analysis. It applies to all administrative actions conducted by all central departments and executive agencies, so that all departments apply a common (and thus comparable) approach. More recently, the Treasury released "Managing Risks to the Public: Appraisal Guidance" (HM Treasury, 2005) which provides a more detailed way to apply RIA and thus CBA to proposals related to public health and safety (*i.e*. occupational health context).

CBA is therefore a government-wide method to evaluate policy proposals. However, CBA is just a component of RIA: additional issues, such as the acceptability of the distributional effects of the policies and their alignment with social equity objectives, are also considered when making decisions. In addition, health impact assessment is beginning to be included in all departments' valuation guidelines as a part of the RIA.

The National Institute for Clinical Excellence (NICE) sets standards for the adoption of new health care technology and procedures within the National Health Service. It also produces guidance for clinical and public health. The key measure recommended by NICE is the cost per QALY gained[7]. Therefore, the Department of Health of the UK mainly uses cost-effectiveness analysis (CEA). Cost-effectiveness estimates are used to inform decisions, but not to determine them. There is currently no theoretical or empirical basis for assigning a specific cost per QALY threshold. Nevertheless, a threshold value is used: £20,000 per QALY gained (HM Treasury, 2005). Below this value, prioritisation of the interventions is primarily based on cost-effectiveness ratio estimates. Above this value, it would be likely that an intervention is rejected on the grounds of cost-effectiveness. But this threshold was more based on judgement than on evidence.

When it comes to environmental health issues, such as the health impacts of air pollution, the Department of Health uses the willingness to pay approach (and therefore CBA), according to the valuation work and methodology agreed through the Economic Appraisal of the Health Effects of Air Pollution *ad hoc* group, and more recently through the Interdepartmental Group on Costs and Benefits (see section 5.2.2).

The Department for Environment, Food and Rural Affairs (DEFRA) uses CBA and the cost-benefit criterion is applied to all environmental policies as far as possible. Other factors that cannot easily be incorporated into a monetary cost benefit analysis are also taken into account. Given the great level of uncertainty, ranges of values and cost-benefit criteria are proposed, allowing for the ranking of policy proposals. Then policy makers weigh up all the available information (cost-benefit criterion and other relevant information) and make a decision. The values applied in policy evaluation are those obtained from a survey commissioned by DEFRA in 2003 (DEFRA, 2004) (see Section 3.3).

[7] QALYs are obtained from cost-utility analysis, a special form of CEA.

3.2 Policy valuation

Policy valuation in the UK has significantly evolved and been improved over the last twenty years. These improvements were mainly driven by a need to reduce inconsistencies in policy valuation across the different Departments.

In 1987 the Department for Transport formally adopted a monetary value for deaths caused by road accidents. The value of preventing a fatality (VPF)[8] was estimated at £1.1 Million (2000 prices) per fatal casualty prevented[9]. This value was made up of loss of output, direct medical costs and intangible costs (*e.g.* intrinsic loss of enjoyment of life). This value was considered as the reference and was adjusted according to the characteristics of the particular context to which it was applied. For example, to apply this value to environmental contexts, one needed to adjust for the differences in affected populations, for latency, etc. Another example, the Health and Safety Executive recommended the use of values derived from road safety and to double this value for the deaths from cancers. It was argued that cancer mortality valuation may be entirely different to the valuation of mortality in other contexts. The reference value was then doubled to account for specific factors that could raise the value (*e.g.* dread factor, higher health care costs, etc.). However, no empirical evidence presented was supporting this approach.

To avoid such inconsistencies, several actions have been made. In 1997 the inter-departmental group on costs and benefits was set up after the first Air Quality Strategy (1997). This group, led by DEFRA, aims at providing the assessment of the costs and benefits associated with measures to meet current or proposed strategy objectives.

Later, an *ad hoc* expert group – the Economic Appraisal of the Health Effects of Air Pollution (EAHEAP) – was set up in 1998 by the Department of Health to provide recommendations concerning the monetary valuation of health benefits associated with a reduction in air pollution levels. The objective of this expert group was to assess the appropriateness of monetary valuation of health benefits, and to evaluate whether appropriate values could be derived. The willingness-to-pay approach was acknowledged as the most suitable method in this context (Department of Health, 1999). However they highlighted the lack of empirical evidence. Therefore it was strongly recommended to undertake empirical surveys of willingness-to-pay for reducing health risks associated with air pollution. In the meantime, it was recommended to adopt the baseline VPF figure for road safety and to adjust the value to take account of factors that are likely to apply to risks associated with exposure to air pollution (such as involuntariness and uncontrollability of risk, age of the population affected, etc.).

This need for evidence-based policy was stressed in the White Paper "Our Healthier Nation" presented in 1999 by the Department of Health. It is clear that sound policy-making relies upon reliable information. As empirical surveys were lacking, after the 2nd Interdepartmental Group on Costs and Benefits report (DEFRA, 2001a), DEFRA commissioned a contingent valuation survey whose purpose was to reduce the uncertainty associated with the monetary valuation of health effects in the context of air pollution. The report (summarised below) was finalised in 2004 and provides more robust monetary values to be included in the evidence base for policy making.

In addition, the Health and Safety Executive also commissioned a study on the prevention of particularly dreaded forms of death (such as cancer), which is still on-going. In the meantime, the values

[8] VPF is also known as the value of a statistical life (VSL).

[9] This figure was based on the findings of a study which estimated VPF for road safety using a variant of the contingent valuation approach. For more details, see Carthy et al (1999).

applied in the environmental health context are those obtained from the study commissioned by DEFRA (2004).

3.3 DEFRA study: Valuation of health benefits associated with reductions in air pollution

The study commissioned by DEFRA was a contingent valuation survey relating to a specific context: air pollution. The main objective of the survey was to elicit household's willingness to pay (WTP) to achieve a reduction in four adverse health effects of air pollution: chronic mortality, acute mortality, hospital admissions, and days of breathing discomfort. The authors also had to determine the relative importance attached to each benefit, in analysing the distinct components of the WTP values. In addition, they were requested, as recommended in the EAHEAP report (1999) and the Green Book (2003), to carry out a sensitivity analysis, in order to examine the sensitivity of responses to variation in nature and size of the benefits being valued. The survey was implemented between November 2002 and January 2003. Although 665 interviews were completed, only 517 responses were used for the analysis of the WTP values.

Individuals were randomly assigned to one of the three sub-samples designed for sensitivity analysis purposes. Each individual was asked to value different extensions of life expectancy, in both normal and impaired health. In one sub-sample, the gain in life expectancy was one month of life per person; in the second sub-sample, 3 months; and in the third sub-sample, 6 months.

The results presented in Tables 2 and 3 below only consider the sub-sample which had to evaluate a gain in life expectancy of one month – the most realistic figures as suggested by the authors[10].

Table 2. WTP values to reduce mortality risks associated with air pollution

	Chronic mortality	Acute mortality
WTP (per person, per month)	£29.52	£7.78
WTP for one year	£354	£93
Value of one life year (VOLY)	£27,630	£7,280
VSL (=VOLY*40 yrs)	£1.11 M	--

The WTP question was "*how much would you be willing to pay per month of your life, to reduce the mortality risk associated with air pollution?*". This number (£29.52) is multiplied by 12 to give an annual figure of £354. This number is then multiplied by 78, the average life expectancy over which people would be willing to pay this amount. Finally the value of £27,630 is multiplied by 40 (for the years of life lost from air pollution) to provide an estimation of the VSL of £1.11 million. The same methodology was applied to WTP questions for reducing hospital admissions and breathing discomfort associated with air pollution (Table 3.)

[10] More details on the study can be found in DEFRA (2004).

Table 3. WTP values to reduce hospital admissions and breathing discomfort associated with air pollution

	Hospital admissions	Breathing discomfort
Annual WTP (per person)	£16.77	£16.42
Annual WTP (per household)	£35.65	£34.9
Value of avoiding one case (per person)	£1,310	£1,280

It is clear that the most highly valued benefit of reducing air pollution is the one attached to reduced chronic mortality. The VOLY figure derived from the WTP to reduce chronic mortality (£27,630) is quite similar to the Department for Transport figure used for road accidents (£31,200). This study concludes that no strong evidence was provided for using a significantly higher or lower figure than the Department for Transport figure.

Although the sensitivity analysis showed that the WTP values did not vary proportionally with respect to changes in risk[11] (*i.e*. lack of sensitivity), the regression analysis indicated a certain degree of coherence and conformity of responses with expectations. A workshop gathering leading experts in this area was organised to assess the quality of the study and the relevance of its results for policy-making, and concluded that this new approach to valuing reductions in mortality risk had been correctly implemented[12]. Therefore, this study was recognised by the panel as providing robust WTP values that can be applied in the evaluation of any department policy.

4. Air Quality policies

The UK policy appraisal background has been reviewed. A review of the policies related to environmental health implemented in each field is now presented. However, as it will be further explained, the Department of Health in the UK is not primarily concerned with environmental health issues. In this field, DEFRA has the regulatory role. As the project focuses on the health effects of air pollution, air quality policies implemented in the UK through DEFRA were examined. The analysis is presented in the following sections.

4.1 The Air Quality Strategy

The elaboration of the UK Air Quality Strategy was required by the Environmental Protection Act of 1995. This requirement was justified by the need to address areas of poor and declining air quality, to reduce any significant risk to health and to achieve wider objectives of sustainable development in relation to air quality in the UK. The UK Air Quality Strategy was published in 1997 in response to this requirement and provided commitments to achieve new air quality objectives by 2005 (DEFRA, 1997).

More particularly, the Air Quality Strategy sets targets to improve air quality in the UK by 2005, based on the current understanding of the health effects of air pollution and on the costs of emission reduction methods. The Strategy sets out objectives for the main health-threatening air pollutants in the UK: carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulates (PM_{10}), ozone

[11] See DEFRA (2004) section 5 p35 for more details.

[12] For more details on the panel and the workshop where the study was presented, please visit: http://www.defra.gov.uk/environment/airquality/publications/healthbenefits/index.htm.

(O_3), lead, benzene and 1,3-butadiene. The standards proposed are based on an assessment of the effects of each pollutant on health, from EC standards and WHO guidelines. The Strategy also identifies the contribution that key sectors such as industry, transport and local government will have to make to achieve these objectives.

The strategy is subject to periodic reviews to assess the progress towards meeting the objectives and ensure the continuing relevance and cost effectiveness of the proposed measures. A comprehensive review of the Air Quality Strategy was published for consultation in April 2006. The purpose of this review was to assess the Air Quality Strategy objectives. The review suggested new or revised measures to reduce the negative impacts of air pollution as a result of scientific or technological developments. Examples of such measures include implementing tighter vehicle emissions standards; creating incentives for cleaner vehicles; and further reducing emissions from small combustion plants and emissions from ships. A revised Air Quality Strategy will be published shortly, accounting for responses received during the consultation period, recent developments and additional information.

4.2 Evaluation of air quality policies

An *ex post* evaluation of the air quality strategy was published in 2004 (AEA Technology Environment, 2004). This section briefly presents the most important air quality policies and the findings of this *ex post* evaluation.

Only the most important policies aimed at reducing the adverse effects of air pollution on human health are considered. As the main sources of air pollution are road traffic and electricity generation, policies and measures undertaken in these two sectors have been considered.

Concerning the **road transport sector**, the main policies and measures are European command and control policies affecting vehicle emissions and fuel quality (the "Euro" standards), and national initiatives through duty differentials (such as the Lower Sulphur Diesel Fuel measure). The regulated pollutants include NO_x, PM_{10}, CO, VOC, SO_2, and lead.

Concerning the **electricity generation sector**, two types of policy and measure can be considered: European Commission policies (translated into UK policies), such as the IPPC Directive or the EC Large Combustion Plant Directive, and national initiatives, such as the UK Sulphur Strategy, the National Emissions Ceiling Directive and the Sulphur Content of Liquid Fuels Directive. The main policies that have affected air quality are the following:

Although all these policies were not principally introduced to reduce some specific health endpoints, they achieved significant environmental and health benefits that are presented in the section below.

However, it should be noted that the results presented in the report are very uncertain; in particular the apportionment of air quality benefits to different policies and the effectiveness of air quality policies vs. other factors (*e.g.* the move to gas).

Environmental benefits

Policies introduced in both sectors have been extremely successful in reducing emissions of the main regulated pollutants against 1990 levels.

Road transport sector policies have led to a 96% decrease in SO_2 emissions, a 36% decrease in NOx emissions, a 48% decrease in PM_{10} emissions a 60% decrease in VOC emissions and a 42% decrease in CO emissions by 2001. Electricity generation policies have reduced SO_2 emissions by 77% decrease, NO_x emissions by 58%, PM_{10} emissions by 78% and CO_2 emissions by 30% by 2001.

In terms of environmental effectiveness, the greatest emissions reductions, in the road transport sector, have been achieved by fuel-based standards. They led to 93% decrease in SO_2 emissions and 99% decrease in lead emissions. The command and control instruments introduced through EC legislation (the "Euro" standards on vehicle emissions) have also be very effective in reducing emissions of all the main regulated pollutants, particularly for NO_x and PM_{10}.

The measures undertaken in the electricity generation sector are also environmental effective: both UNECE protocols have led to a very large reduction in SO_2 emissions by 2001. Other measures allowed for a significant decreased in NO_x and PM_{10} emissions.

Health benefits

Health benefits associated with reductions in PM_{10} emissions are presented in Table 4 below. Two approaches have been used to assess the health benefits: the "conservative approach" recommended by COMEAP (Department of Health, 1998) and a more comprehensive approach recommended by the Clean Air For Europe (CAFE) programme (AEA Technology Environment, 2005).

The figures reported in Table 4 highlight the importance of electricity generation policies on reducing health impacts from PM_{10} pollution. Indeed, the benefits of energy policies are almost twice as high as the health benefits from road transport policies.

Table 4. Health benefits associated with air quality policies

Cases avoided each year	Road transport sector	Electricity generation sector
Deaths brought forward	500	3,725
Respiratory hospital admissions	490	3,047
Life years saved per year	9,670 (COMEAP) 29,010 (CAFE)	29,320 (COMEAP) 87,961 (CAFE)

Source: AEA Technology Environment (2004).

If we compare these results with previous findings reported by COMEAP in 1998 (see Table 5), it is clear that the health impacts of air pollution have significantly decreased over the last decade.

Table 5. Comparison of selected health endpoints associated with PM10 pollution.

Number cases	Quantification in 1998 COMEAP	Quantification in 2001 AEA Technology Environment
Deaths brought forward	8,100	6,838
Respiratory hospital admissions	10,500	6,699
Number of life years lost	156,044-468,133	131,732-395,197

Source: AEA Technology Environment (2004).

The number of deaths brought forward and hospital admissions for respiratory diseases have gradually declined over the last decade. This can be directly associated with policies undertaken to reduce the health

effects of air pollution although other factors are also likely to have had an effect. Concerning cost-efficiency[13], the benefits were significantly higher than the costs. It appears that *ex ante* costs were over-estimated and benefits might have been under-estimated. Indeed, PM pollution has increased in the 1990s; and as PM have the largest impacts on health, it is likely that the benefits were largely under-estimated. It is also worth noting that the *ex post* benefits do not include benefits to the ecosystem (which could be rather important) and health benefits related to reduced morbidity risks. As such, benefit values presented in the *ex post* evaluation may under-estimate the total benefits associated with policies reducing air pollution. Nevertheless, the results of the *ex post* evaluation of air quality policies implemented in the UK during the last decade suggest that this was effective policy making (see AEA Technology Environment, 2004).

5. Governance of environmental health issues

5.1 Environmental health in the UK

Environment and health is a relatively new policy area. Although environmental health issues have long been policy's objectives in UK policy making, there is no formal environmental health policy. However, the links between environment and health are set out in a number of strategy and policy documents.

The European Charter on Environment and Health (Frankfurt, 1989) represented a major input to the development of "environment and health" policies. This Charter was particularly significant because it recognised the relationship between human health and environmental factors. The Charter set targets and proposed frameworks for monitoring environmental health indicators. In addition, it recommended that a common health policy be established. As a consequence, a number of important policies were developed in the UK during the 1990s.

In 1990, the Environmental Protection Act was introduced to prevent the pollution from emissions to air, land or water. The first explicit reference to environmental health was made in the Environmental Protection Act 1995. It introduced a new statutory regime for the identification and management of contaminated land. The new regime is intended to control risks to health or the environment from land contamination and is based on the "suitable use" approach. Its main purpose is to provide an improved system for the identification of land that is posing unacceptable risks to health or the environment, and for securing remediation where such risks cannot be controlled by other means. To this end, the Environmental Protection Act created a number of new agencies (*e.g.* the Environment Agency) and set new standards for environmental management.

In 1995, the Department of Health published a guide ("Policy Appraisal and Health") which set out a framework for other government departments to consider the likely health effects of their proposed policies. In 1998, the British Medical Association published a policy report calling for an integrated link between environmental impact assessment and consideration of the likely health effects of government policy.

In 1996, the UK introduced its National Environmental Health Action Plan (NEHAP). This policy was the result of the co-ordinated work of two departments and initiated a series of policies and reports produced by two or more departments. The role of the NEHAP in improving the co-ordination between the environment and health spheres will be further considered (see section 6).

[13] For more details on the *ex post* cost-benefit analysis of air quality policies, see AEA Technology Environment (2004).

More recently, UK national policy has been explicit in promoting a wider, more holistic approach to health. As such, policy documents in diverse areas of UK policy and legislation integrate environment and health considerations. They are summarised in Table 6 below.

Table 6. Principal UK policy documents pertaining environmental health

Title of policy/report	Year	Objective	Produced by
UK Environmental Health Action Plan	1996	Overview of future action plans in the area of environmental health	Department of Health and Department of the Environment
A Better Quality of Life: a Strategy for Sustainable Development in the UK	1999	To reduce the harm to health from poor housing and environmental pollution.	Department of the Environment, Transport and the Regions
A New Deal for Transport: Better for Everyone	1998	To develop an integrated transport policy to fight congestion and pollution.	Department of the Environment, Transport and the Regions
Directing the Flow: Priorities for Future Water Policy	2002	To set out future priorities and direction for the water environment, water resources, water management and sewerage systems.	DEFRA
Towards a National Ambient Noise Strategy (Consultation Paper)	2001	To determine exposure to environmental noise and adopt local action plans to prevent and reduce environmental noise where necessary and particularly where exposure is great	DEFRA
Securing Health Together: an Occupational Health Strategy for Great Britain	2000	To improve occupational health: set out a target for reducing the numbers of days lost through illness and injury at work.	Health Safety Commission, Health Safety Executive, Department of Environment, Transport and the Regions and Department of Health
The Air Quality Strategy	1997	To set out government's policy for improving air quality and objectives for key air pollutants to be achieved by 2010.	Department of the Environment
The National Cycling Strategy	1996	To increase cycling: target of doubling current use by 2002, and then doubling again by 2012.	Department for Transport, Department of the Environment and Department of Health

The UK Chemicals Strategy[14]	1999	To phase out chemicals posing an unacceptable risk to human health or the environment	DEFRA
Securing the Future – Delivering UK Sustainable Development Strategy	2005	To set out Government's objectives for four key priority areas: sustainable consumption and production, climate change and energy, protecting natural resources and environmental enhancement and sustainable communities.	DEFRA
Health Protection in the 21st Century – Understanding the Burden of Disease	2005	To identify and quantify the burden of disease associated with new threats, including environmental hazards. To help identify current and future health protection priorities.	The Health Protection Agency
Better Environment, Healthier People	2005	To set out priorities for action on environment and health and measure progress against these priorities.	The Environment Agency
Revised Air Quality Strategy	2006	To propose new or revised measures (relative to the Air Quality Strategy) to further reduce air pollution and associated impacts.	DEFRA

Source: Adapted from Bruce et al. (1999).

Table 9 clearly shows that several departments and executive agencies play an important role in determining Government's priorities in terms of environmental health. However, it does not clearly state who does what and what their relevant responsibilities are. The question of policy co-ordination with respect to environmental health in the UK is examined in the next section.

5.2 Co-ordination of environmental and health policies

5.2.1 Environmental health policy

Although environmental health policies do not formally exist in the UK, the assessment and valuation of health impacts associated with environmental pollution are considered in environmental policy-making. Environment is also playing a determinant role in health policy, as suggested in Wanless (2004).

The concept of public health has gradually evolved over time[15]. In the past, public health was mainly concerned with the adverse effects of environmental factors on food, air and water safety. The objective of public health policy was the prevention of communicable diseases and traumatic causes of death. In the

[14] The new legislation REACH (Registration, Evaluation, Authorisation of CHemicals) will replace the current system in a near future. The aim of this EU common strategy is to ensure a high level of protection for human health and the environment, while ensuring the efficient functioning of the internal market, and stimulating innovation and competitiveness in the chemical industry.

[15] This section draws upon Wanless (2004).

20th century, the emergence of new diseases associated with environmental degradation (among other causes) has required a change in the concept of public health. Prevention of these diseases was possible through social, environmental and behavioural changes. Public health evolved then from treating existing diseases and their consequences to dealing with the factors causing such diseases.

This shift from treatment to prevention has been supported by the Lalonde Report, published in 1974. This report highlighted a paradox in health policy: although most of diseases were caused by factors associated with lifestyle, natural environment and biology, health policy was focused on treatment and care of ill-health. The Report suggested that health policy should focus on other determinants of health than health care. Public health should then be concerned with both the promotion of good health and the prevention of diseases.

Under the thrust of WHO policies and endorsed international agreements, such as the Ottawa Charter (1986), UK health policies have considered different targets for selected diseases and key actions to promote health and prevent diseases. The recognition of the role of the environment (among other sources) on ill-health was made in "Saving Lives: our Healthier Nation", a White Paper published in 1999 by the Department of Health. Priority areas were identified and targets were set to be achieved by 2010.

Therefore, it seems that the environment plays a significant role in health policy. However, policies dealing with environmental health do not come from the Department of Health. The reason is simple: the Department of Health is neither in charge of working on environmental health, nor responsible for carrying out appraisal of environmental health policy. As environmental health concerns "the health effects of environmental degradation", the department in charge of environmental health is the one related to the causes of such diseases: DEFRA.

The prevention of environmental pollution consequences is a DEFRA priority. This is a key role of DEFRA. Reducing the health impacts associated with environmental degradation can be considered as one important goal of environmental regulations and policies. Examples of action that were taken to protect human health from environmental risks since the beginning of the 20th century include the building of sewer systems, the collection of garbage, the cleaning of streets, the improvement of drinking water quality, the establishment of natural parks and the regulation of air pollution. In the UK most of these interventions are implemented by DEFRA. The Department of Health does not have a regulatory role in the area of environmental health. It only provides advice relating to human health impacts to DEFRA which takes decisions and implements measures according to these recommendations. This co-ordinated work between the environment and health spheres is further described in the next sub-section.

5.2.2 Description of the current status of co-ordination in the UK

Current co-ordination between the different departments and executive agencies concerned with environmental health takes the form of steering groups. The Interdepartmental Steering Group on Environment and Health (ISGEH) includes several governmental bodies: DEFRA, the Department of Health, the Health Protection Agency, the Environment Agency, the Department for Transport, the Food Standards Agency, and officials from Scotland and Wales as well. This informal steering group was created in 2003 before the Budapest Conference (June 2004) to contribute to WHO Children's Environmental Health Action Plan for Europe (CEHAPE) process. It meets once a quarter depending on the process and is alternatively chaired by DEFRA and the Department of Health.

The ISGEH has two objectives:

- Develop UK children environmental health action plan (CEHAP); and,

- Define UK inputs to EU SCALE initiative[16].

The ISGEH addresses national issues as well, such as for example the implementation of an environmental health information system (EHIS) in the UK. This steering group is the strongest element within the environmental health area.

Through this ISGEH, the Department of Health and DEFRA co-ordinate their work on environmental health, with a particular emphasis on children's health. The Department of Health provides advice relating to health impacts to DEFRA and DEFRA designs and implements the regulation accordingly. However the outcome of the ISGEH is not to propose joint environmental health policies or measures. Regular meetings help assess progress and discuss some specific issues and national priorities as well. Although DEFRA may be considered as the leader, the agreement of all the parties involved is required for a decision to be validated.

Co-ordination between the environment and health spheres in the UK also arises through a more technical group: the Interdepartmental Group on Costs and Benefits (IGCB). The IGCB provides recommendations on the best evaluation methodology to apply in the context of air pollution. The IGCB is chaired by DEFRA but attended by a number of government departments, such as the Department of Health, the Department for Transport, the Department of Trade and Industry, the Treasury, the Environment Agency and representatives from the Devolved Administrations. The IGCB normally meets at least quarterly to discuss ongoing work in the area of appraisal and evaluation, agree methodological issues and review any results. The technical nature of the IGCB ensures that only objective issues are discussed, debated and quantified, and that wider policy issues do not arise. Although the IGCB is rather technical, policy leaders involved in this Group play an important role in keeping the focus on current policy issues. The IGCB therefore allows for interactions not only between the different Departments, but also between specialists in this area.

The IGCB has recently published a detailed report discussing the economic approach underlying the Air Quality Strategy review consultation as well as the results of the assessment (DEFRA, 2006). However, the IGCB tries to spread its work (the air quality analysis) beyond the specific air quality policies. For instance, a new tool based upon a damage cost function approach has been developed to assess the implications of a given policy on air quality and to provide estimates of associated costs and benefits[17]. This tool is intended for use across government Departments, such as for project appraisals and risk impact assessments. It is particularly recommended for policies with a pollution reduction over a period of less than 20 years, and where air quality impacts are expected to be ancillary to the primary objectives or are relatively small.

In addition, the Department of Health also participates in the Interdepartmental Group on Air Quality (IGAQ), by providing updates on health impact quantification. The IGAQ is the policy counterpart to the IGCB. The outcomes of the IGAQ are more practical endpoints than the ISGEH: they provide a report on the status of UK air quality every year.

These examples suggest that co-ordination between the environment and health sides does exist and seems to work quite well. Moreover, it seems that policy co-ordination lies at the different levels of policy

[16] The SCALE initiative presents a systematic approach to the development of a European Environment and Health Strategy. It is based on **S**cientific evidence, focused on **C**hildren, meant to raise **A**wareness, improve the situation by use of **L**egal instruments and ensure a continual **E**valuation of the progress made, hence the name SCALE. For more details, see http://europa.eu.int/comm/environment/health/index_en.htm.

[17] More details on the damage cost function approach as well as guidance on how to apply this approach for PM_{10}, NO_X and SO_2 pollutants are on http://www.defra.gov.uk/environment/airquality/panels/igcb/guidance/index.htm.

making. At the regulatory level, co-ordination involves the Department of Health and DEFRA. But at the practical/implementation level, co-ordination mainly involves the Environment Agency and the Health Protection Agency. Although DEFRA and the Department of Health work jointly with their respective executive bodies, the Environment Agency and the Health Protection Agency work more particularly in close collaboration as they are actually involved in the implementation side of the ISGEH process. In addition to the regular meetings of the ISGEH, the chief executives of the Environment Agency and the Health Protection Agency regularly meet to help ensure the co-ordination between the environment and health policy spheres. This probably allows for an effective co-ordination. Other means and obstacles to improve co-ordination between environmental and health policies are examined below.

5.3 Means for and obstacles to improving co-ordination

5.3.1 Structural means for improving co-ordination

According to the persons interviewed, co-ordination between environment and health spheres is well-established and is working quite well at the local and national levels. Three specific aspects have been identified as of major importance in the effectiveness of co-ordination:

- Clear definition of individual responsibilities: Co-ordination in the UK is working well because there is a clear definition of each department's responsibilities in the process. Everybody knows what he has to do. There are no formal terms of reference for the ISGEH, but there is a "Memorandum of Understanding" which defines the working relationships of all the parties involved. Health impacts are the area of the Department of Health and DEFRA will not take a decision in this area without the approval of the Department of Health. In the same way, appraisal is ultimately decided by DEFRA. Each side has different tasks and different objectives but everything is clearly stated. Everybody has agreed on that statement from the beginning. Agreement is also required on the choice of the valuation method adopted in the process. Agreement of all parties involved is necessary because it is a joint piece of work. As CBA is required by the government, CBA has been chosen as a framework. Concerning the approach used to provide a monetary value of the health effects of air pollution, the Department of Health agreed with DEFRA concepts. The work is based on DEFRA commissioned contingent valuation survey (DEFRA, 2004). Despite traditional divergences, the Department of Health and DEFRA have found an agreement, probably because of this clear division of responsibilities.

- Specific forms of co-ordination: a steering group is a powerful tool to facilitate coalition. This particular form is quite open and useful for discussing ideas. The steering group format highlights that people from different departments work actively together on specific issues. They are doing more than just sharing and providing comments on reports. They can express their agreement and disagreement. Points can be clarified if needed. Every decision has to be validated by all the parties involved before being engaged. A steering group allows for the establishment of personal relationships. As such, recent bodies, such as the Health Protection Agency, can be advised by more experienced departments on areas they should work on. Commitment and active collaboration with other organisations are good conditions for effective work and co-ordination.

- The timing: meeting at regular intervals facilitates the work. Discussions can go on and it helps people to know each other and to build personal relationships. Therefore, people included in the steering group really have to be motivated and to work hard. A steering group necessitates a general willingness to work together but there may be practical obstacles (see below). Regular meetings help build better work relationships.

5.3.2 Other means

Other means and actions undertaken at the international level can improve co-ordination between environmental and health policies at the national level. This is, in particular, the objective of the European Environment and Health Process developed by the WHO and the Children Environmental Health Action Plan for Europe developed by the European Commission.

The European Environment and Health Process (EEHP) is a tool developed by the WHO Regional Office for Europe to support the planning and the implementation of national environment and health policies. The EEHP has resulted in a series of Ministerial Conferences on environmental and health, and the last one (the fourth) was held in Budapest in 2004. The UK had considerable involvement in this process. It was one of the first countries to publish a National Environmental Health Action Plan (NEHAP) which aims at integrating the policy domains of environment and health[18]. The UK is also an active member of the WHO European Environment and Health Committee and the WHO international Steering Committee for Evaluation of Environmental Health Policies and Action Plans.

Finally, at the fourth Ministerial Conference on Environment and Health, the UK Ministers of Health and Environment committed themselves to develop a Children Environmental Health Action Plan (CEHAP) before 2007. The objective of the CEHAP is to facilitate and work with others to reduce the impact of environmental risks on children's health. As a consequence, a government inter-departmental steering group was set up in the UK to co-ordinate the UK contribution to the development of CEHAPE: the ISG on environmental health (see above ISGEH). Therefore, the ISGEH is overseeing the development and implementation of the national CEHAP and Environment and Health Information System (EHIS).

The development of the UK NEHAP can be considered as the starting point for integrating environmental and health policies. However, as suggested in Capleton *et al.* (2005), the EEHP had little direct impact on UK environmental and health policies. Nonetheless, based upon Capleton *et al.* analysis, this process had a number of indirect influences in the UK, such as:

- promoting and strengthening the working relationship between government departments responsible for environment and health issues;
- influencing the approach and thinking of UK government departments towards environmental health issues; and,
- raising political awareness of environmental health issues in the UK.

It is also worth noting that NEHAP is a long process whose positive impacts on UK environment and health policies may only be appreciated in the future. Therefore, it seems that the EEHP has been effective in the UK as it allowed for increasing co-ordination and collaboration between the environment and health spheres.

5.3.3 Obstacles to improving co-ordination

Inter-departmental co-ordination is not straightforward. Despite common willingness to make it work, some obstacles may undermine or make the co-ordination impossible. Three obstacles have been identified as potentially problematic:

[18] For more details on UK NEHAP, see Department of Health and Department of the Environment (1996).

- Specialised/new work area: environmental health is a new work area, very specialised. As it takes a long time to establish good working relationships among the parties involved, a long horizon timeframe is necessary to fully appreciate the effectiveness or ineffectiveness of co-ordination. Co-ordination is rather time-consuming and requires resources and effort. Another consequence of specialisation is that few people are working in this area. This is for example the case in the Department of Health: only a few people are currently working on environment and health issues. Raising political awareness of environmental health issues can increase the interest in this area of research.

- Lack of (research) resources: The main obstacle is the lack of research budget. Insufficient resources or unequal distribution of resources can make co-ordination difficult. The amount of research allocated to environmental health in the UK is not fixed. Each department provides money as far as they can. For the work on chemicals around £100,000 are devoted to research on the health impacts of exposure to chemicals, which represents less than 3% of the annual budget allocated to research in the chemicals area[19]. On the air quality side, most of the budget (more than 90%) is allocated to monitoring. DEFRA funds research related to environmental health, but not on an annual basis[20]. In the Environment Agency, the amount of resources allocated to environmental health is approximately £100,000 per year[21]. Only a small percentage of research budgets is allocated to environmental health issues. Allocation of resources is thus a major obstacle to improved co-ordination between the environment and health spheres.

- Involvement of different fields: environmental health is a cross-cutting issue that requires the collaboration of different government departments. As such, the parties involved may use different languages. As a consequence, communication is sometimes hard. It is then highly recommended to target the right information to the right people. This is particularly important for environmental health where there is "substantial ambivalence" and mistrust displayed in some departments towards monetising environment, and more particularly health. In addition, co-ordinating different fields highlights the issue of different priorities: environmental health is not at the core of every Department's priorities and working areas. For example, the Department of Health is more concerned by the NHS, health care services, etc. On the contrary, DEFRA work is largely related to sustainable development, suggesting that many officials in DEFRA may have to assess the (health) impacts of environmental degradation.

6. Concluding remarks and follow up

Environmental health is a cross-cutting issue. As such, the co-ordination between different ministries is required to result in effective policy-making. For example, environmental health should concern not only the Ministry of the Environment, but also the Ministry of Health, the Ministry of Transport, and to a lesser extent, the Ministry of Agriculture. Co-ordinating all these government bodies is not an easy task as co-ordination may have many implications with respect to each department.

Concerning policy valuation, CBA and CEA are important tools in UK decision making process. The potential impacts of regulatory proposals on the environment and health are quantified and monetised as far as possible. This practice therefore enables choosing the policy option which result in the most effect at

[19] Personal communication with officials from DEFRA.

[20] Personal communication with officials from DEFRA.

[21] Personal communication with officials from the Environment Agency.

least cost. The UK is one of the few OECD countries that systematically apply CBA (or CEA) in policy appraisal. Using a similar approach in all Departments ensures consistent and coherent policy recommendations. It is therefore considered as key to effective policy co-ordination.

The main finding of the analysis of the UK current situation is that co-ordination is effective and concerns all relevant levels of policy making. Despite the fact that there is no formal joint environmental health policy, progress is made towards a better convergence of health and environmental policies. The set up of several inter-departmental steering groups is a good starting point for the institutionalisation of environmental health policy. Associated with other institutional means (*e.g.* international processes), inter-departmental steering groups are a valuable resource and provide an effective forum within which to collaborate and co-ordinate environment and health policies. As suggested by the development and implementation of the NEHAP and the Air Quality Strategy, environmental and social impacts are more often included in UK policies. Such measures also provide opportunities for increased working relationships between departments.

However, obstacles may hamper attempts at cross departmental co-ordination. One of them is what is referred to "the pathology of departmentalism" in Russell and Jordan (2004): individual departments continue to work mainly in terms of their own policy "silos". Although the authors' analysis relates to sustainable development, this remark also applies to a cross-cutting issue such as environmental health. There is no formal requirement for departments to work on environmental health issues, except for DEFRA. As such, other departments involved in the process are free to pursue their own sectoral interests over those of DEFRA. Policy domains, represented by the Department of Health and the Department for Transport, have their own priorities and their own objectives to achieve.

Co-ordination of different departments may be confronted by competing and divergent discourses. This is particularly true for environmental health. Despite some important elements in common, environmental and health economics are well-known for their disparities, in terms of methodology, targets and indicators. Indeed, when the Department of Health and DEFRA work individually, they apply different frameworks (respectively CEA and CBA) whereas they apply CBA based upon the IGCB recommendations when they work together. It is reasonable to think that applying a single approach across all Departments would be more efficient and effective. As suggested in the Green Book and more recently in *Managing Risks* (HM Treasury, 2005), CBA (using WTP techniques) should be preferred over CEA.

Another related issue is the allocation of resources and selection of policy levers. For the ease of comprehension, consider the case of a disease caused (or aggravated) by air pollution. The Department of Health and DEFRA take their decisions individually to achieve their own objectives, respectively treating the disease and reducing air pollution. However, as they use different frameworks, they provide different and non-comparable benefit values (and probably different cost values as well). When confronted with this situation, the policy-maker will not be able to determine which policy lever should be strengthened to solve the problem: should resources be allocated to the Department of Health to find ways to treat the disease or should DEFRA set tighter emissions standards or mandate new production processes?

The various interdepartmental Groups that have been implemented in the UK in the area of environmental health have greatly facilitated the co-ordination between the Department of Health and DEFRA. As such, policy co-ordination between environment and health is effective in the UK. However, the two Ministries do not have joint responsibility for environmental health, and no formal environmental health policy arises out of it. Additional efforts should be made in order to ensure a further integration of environmental health issues in policy-making.

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ANNEX 2: IMPROVING CO-ORDINATION BETWEEN ENVIRONMENTAL AND HEALTH POLICIES – FINDINGS FROM A CASE STUDY ON FRANCE

1. Introduction

Environmental issues and impacts of the environment on human health require inter-ministerial co-ordinated policy intervention. However, the involvement of Ministries on environmental health and co-ordination of their tasks are complicated. This is no less true in France than elsewhere.

In the context of the OECD project on "improving co-ordination between environmental and health policies", a case study has been carried out on France in order to analyse how it would be possible to improve co-ordination in this area.

The objectives of the overall project are two-fold: identify the methods by which health and environmental policies are assessed; and, review the means of co-ordination of policy in these two spheres. The project is also focusing on the health effects of air pollution, more particularly on the respiratory diseases aggravated by air pollution. This contribution is based upon theoretical and empirical findings, as well as a review of existing practice in selected OECD Member countries based upon the findings of case studies. Three case studies have been undertaken in Canada, France and the United Kingdom.

Based upon the recent environmental performance review of France (OECD, 2005), it seems that air quality has improved on average, but significant concerns remain with respect to environmental health issues. This case study seeks a better understanding of priority-setting practices and policy assessment. In order to analyse the means of improving the co-ordination between environmental and health policies, available information related to environmental health has been collected, with a specific focus on air pollution and respiratory diseases.

To this end, a series of interviews has been undertaken. The main departments and executive agencies dealing either with environmental or health issues (or both) (*e.g.* the Ministry of Environment and Sustainable Development (MEDD), the Ministry of Health and Solidarity (Ministry of Health), the National Institute of Public Health Surveillance (InVS), the French Agency for Environmental and Occupational Health Safety (AFSSET)) were contacted to discuss policy appraisal and co-ordination between environmental and health policies[22]. This report presents the main findings from this case study.

2. Health impacts of air pollution in France[23]

The Environmental Performance Review of France carried out by the OECD in 2005 shows that air quality is improving in France. France has achieved significant reductions in most of air pollutants (*e.g.* SO2, NOx and VOCs) as requested in its national objectives and is about to fulfil its international

[22] I would like to thank all the people I met for their co-operation and assistance, namely: Louis de Gimel, Sandrine Rocard, Antoine Boisson, Céline Couderc and Laure Tourjansky from the MEDD; Jocelyne Boudot and Caroline Paul from the Ministry of Health; and, Benoît Vergriette, Anne-Catherine Viso and Salma Elreedy from the AFSSET.

[23] The objective of this section is to highlight the importance of the adverse effects of air pollution on health in France. It is one of the reasons why this case study has been undertaken.

commitments, such as the Gothenburg Protocol or the 2001/81/EC ceilings. However, although industrial sources of air pollution have decreased, emissions from urban motorised transports have rapidly increased. The health consequences of such changes are quite striking: the frequency of chronic bronchitis has fallen but prevalence of allergies, asthma more particularly, and of some types of air-pollution linked cancers is increasing rapidly, independently of population ageing (OECD, 2005).

A study carried out by the WHO in 1996 in three European countries (France, Austria and Switzerland) estimated the health damages associated with air pollution, and more particularly with traffic-related air pollution (Kunzli *et al.*, 2000). It is estimated that, in France, around 30,000 premature deaths per year could be associated with long term exposure to air pollution, which is equivalent to 316,000 life years lost, of which 176,000 are associated with transport-related emissions. More figures for France are presented in Table 1 below.

Table 1. PM10-associated health effects in France, in 1999 (number of cases)

Health effect	Associated with total PM10 emissions	Associated with traffic-related PM10 emissions
Long term mortality	31,692	17,629
Respiratory and cardiovascular hospitalisations	33,537	18,668
Chronic bronchitis (adults)	36,726	20,429
Acute bronchitis (children)	450,218	250,434
Asthma attacks	820,000	450,000
Restricted activity days	24,600,000	13,700,000

A recent study prepared by the French Agency for Environmental and Occupational Health Safety (AFSSE, 2005) proposes to quantify the life expectancy gain associated with reduction in fine PM pollution levels. Based upon the relative risk proposed by Pope *et al.* (2002) and previous study on health impact arising from long term exposure to fine PM (AFSSE, 2004), the results suggest that substantial gains in terms of life expectancy could be obtained if the current air quality policy is continued or – ideally – strengthened (a gain of 68 to 170 days of life saved, for an "average person", according the reduction scenario).

A cost-benefit analysis of the Clean Air for Europe (CAFE) programme published recently (AEA Technology Environment, 2005) assesses the benefits of current air quality policies, and more specifically their health benefits. The results are provided for the whole EU, and by individual country. This report provides interesting figures for a great number of health endpoints associated with air pollution. Figures for a selected set of health endpoints for France are presented in Table 2.

Table 2. Estimated annual health damages due to PM air pollution for selected health endpoints in France (for baseline pollution concentrations in 2000).

Health endpoint	Endpoint output	Baseline in 2000
Chronic mortality	Life years lost	482,210
Chronic mortality	Premature deaths	42,090
Infant mortality (<1 yr)	Premature deaths	112
Chronic bronchitis (27yr+)	Cases	21,220
Respiratory hospital admissions (all ages)	Cases	8,260
Cardiac hospital admissions (all ages)	Cases	5,100
Restricted activity days (15-64 yr)	Days	44,935,660
Respiratory medication use (children 5-14 yr)	Days	665,660

Respiratory medication use (adults 20 yr+)	Days	3,596,850
Low respiratory symptoms (children 5-14 yr)	Days	27,513,760
Low respiratory symptoms (adults 15 yr+ with chronic symptoms)	Days	37,202,230

Source: AEA Technology Environment (2005).

Table 2 indicates that France is greatly affected by PM pollution. The number of deaths and hospital admissions for environment-related causes is significant. When compared to other European countries, only Germany and Italy experience a greater number of mortality and morbidity cases associated with air pollution (AEA Technology Environment, 2005).

In particular, respiratory allergies are rising dramatically in France. For example, the prevalence of asthma has doubled in twenty years (OECD, 2005). Fine particles in ambient air play a role in triggering attacks and aggravating symptoms. In 2000, 4.5 million people in France (more than 10% of the total population covered by the French healthcare system) were affected by, and treated for, asthma (Seyer et al., 2005). In addition, Delmas *et al.* (2004) estimated that between 1980 and 1999, more than 38,000 deaths were associated with asthma, almost 9% concerning children and adults below 45 years of age. Death rates associated with asthma are the highest for children of less than 1 year of age, and for the elderly above 75 years of age.

These figures highlight the importance of air pollution impacts on human health in France. Different policies and measures have been introduced in order to reduce air pollution effects and to improve air quality. After briefly presenting the policy appraisal background in France, air quality policies undertaken during the last decade in this country are reviewed below.

3. Policy appraisal and valuation

3.1 Policy appraisal

3.1.1 Historical evolution of policy appraisal in France

According to Trosa (2003), the development of policy appraisal in France has followed three main steps. The first important step was the "efficiency of budgetary choices" ("*rationalisation des choix budgétaires*" - RCB) in the 1970s, when evaluation was thought to be useful and was recommended. The so-called *Rapport Nioche-Poinsard* of 1986 (Deleau et al., 1986) proposed the first summary of public policy evaluation in France. The conclusions of the report highlighted large disparities among Ministries of central government in the practice and use of economic evaluation. However, their recommendations were not taken into account by the government and marked the decline of the RCB era.

The second step began in 1989, when an independent commission was implemented to evaluate the law for the minimum integration income (*revenu minimal d'insertion* - RMI). A second report on the evaluation of public policies (*Rapport Viveret*, 1989) presented the evaluation of public policies as a democratically function and issue. The Viveret Report emphasised the need of a public pole of expertise independent of the executive body. Although the Report was not well accepted, it has allowed for the institutionalisation of proper evaluation bodies. The Scientific Council for Evaluation (*Conseil scientifique de l'évaluation* - CSE) was thus created in 1990. It was given responsibility to advise people in charge of evaluations and to control for the quality of the evaluations of inter-ministerial public policies.

However, this process still did not allow for a very coherent approach: there was no decisional rule on how to choose policies to be evaluated nor were evaluation practices disseminated among the various levels of central government. Evaluation of public policies was (and still is) largely the result of individual initiatives, launched without assessing their strategic relevance or their feasibility. The first report of the

CSE (1991) suggested an increasing interest from governmental bodies for evaluation but also emphasised large disparities according to public intervention areas. As an example, health safety policies, regulatory policies and macro-economic policies were not involved in this evaluation path. This report also highlighted that current practices had not changed much, since its conclusions were close to the ones made in the Nioche-Poinsard Report five years before.

By the end of 1998, the CSE was reshaped into the National Council of Evaluation (*Conseil national de l'évaluation* - CNE). At that time, evaluation of public policies was realised conjointly by the General Planning Department (*Commissariat general du plan* - CGP) and the CNE. They have different roles. The role of the CNE is both political and methodological. In theory, the CNE has a power of initiative, suggesting specific themes for evaluation to the Prime Minister. In practice, its work is also influenced by the views of affected Ministries. The CGP was pushing for more use of economic valuation (and particularly cost-benefit analysis) within the Ministries of the government, as expressed in the famous *Rapport Boiteux*, published in 2001. This report strongly supported the use of CBA, especially when evaluating important road projects. The main mission of the CGP consists in the evaluation of policies, studies and projects undertaken by internal services according to the needs of a specific administration. However, it has been recently decided (in October 2005) to reform the CGP in order to better integrate the challenges associated with globalisation and to better account for the evolution of society.

The third step in the development of policy evaluation in France began in 2001 with the acceptance of the Constitutional Bylaw (*Loi organique relative aux lois de finance* - LOLF) (which came into force in 2006). In order to improve the transparency of public management and the need for efficient budgetary choices, the LOLF proposes a new management approach for public projects. According this new law, a public project will be continued according to its evaluation results (*e.g.* positive or negative impacts on society, on citizens or on the economy). The LOLF will increase transparency as it will allow for the assessment of the effectiveness of public intervention. As a consequence, economic tools such as CBA are likely to be more used in the years ahead. However, as the LOLF implies many changes in the general governance structure ethos, it is already encountering some difficulties in its implementation.

The role of evaluation was also reinforced in the environmental field through the creation of specialised unit within Ministries, such as the Direction of Economic Studies and Environmental Evaluation (D4E) in the Ministry of the Environment created in 2000. This generated a diffusion of evaluation among French public institutions at different levels. However, this spread was not anchored in decision-making practices or in policy design. As we will see in the next sections, actual practices and use of economic valuation seem to be rather unequal.

3.1.2. Policy appraisal in France

Decision-making practice in France does not systematically require the assessment of the total costs and benefits associated with a project or policy. In fact, the degree of policy appraisal depends heavily on the nature of the policy being considered.

If the policy is derived from an EC Directive, cost and benefit aspects are already monetised and taken into account in the Directive. French policymakers do not undertake any additional valuation (to estimate costs and benefits of the policy), or to put emphasis on the health impacts (to justify an intervention). As CBA (or CEA) are undertaken at the EC level, there is no need for France to do specific *ex ante* or *ex post* evaluations. Through its Directives, the EC provides a framework to French (and of other member states) regulation.

If the policy comes from a national initiative, then the process is different. In environmental policymaking, impact assessment studies are undertaken, and the costs and the environmental and health

benefits are estimated as well. For every project, costs and benefits have to be estimated but not always in a monetised way. The impact assessment adopts more of a financial approach than an economic approach. This report ("*l'exposé des motifs"*) provides estimates of the benefit aspects related to employment and to the economy in general, as well as estimates of the costs of implementation, among other items. However, it seems that this report is not systematically done. In addition, a socio-economic analysis can complement the project, but it is not obligatory. In this context, costs and benefits can be quantified and monetised, but this is not systematic.

The methodology underlying this socio-economic evaluation is presented in the *Rapport Boiteux* (2001) (revised in 2005 in order to account for updated values to be applied; the economic valuation process was also defined with greater details – see Lebègue, 2005). When estimated, the health benefits are expressed in terms of life years saved. The balance of the costs and benefits of the project is considered as the most important part of the evaluation that helps decision-making. However, other non-monetised effects (such as the effects on urban planning, service quality, local economic development, etc.) should complement the economic analysis in order to provide a full picture. A complete proposal should also integrate a risk impact assessment (RIA) study to better account for the health impacts in environmental policymaking[24]. The final decision (of acceptance or rejection of the project) will be based upon this global picture; not only on the cost-benefit criterion.

In health policymaking, there is no explicit evaluation of health policies, in particular in the area of environmental health. Although the Panel of Health Economists (Collège des Économistes de la Santé, 2003) recommends using cost-effectiveness analysis in health policymaking, no formal economic evaluation is required in practice. Priorities for public health are based on:

- Their significance in terms of burden of illness;
- Their fit with societal values and priorities;
- Evidence of inequalities in health outcomes within the country or compared to other countries; and,
- The current state of knowledge about the health problem's etiology.

In other words, priorities are defined according to the existence or not of a health problem: when health authorities are certain that there is a health risk, this particular risk becomes a priority. The question of the cost efficiency of actions undertaken to reduce this health risk is not raised. An action is undertaken without knowing if it is efficient or not, even though there are no (or few) reliable data and information on the health risk in question.

3.1.3. Recommended valuation approach

Regarding the valuation approach, cost-benefit analysis (CBA) was applied in France in the 1960s as a tool to help policymakers, but CBA slowly disappeared from decision-making in the 1970s. CBA is now extremely rarely used in France. Monetised *ex ante* analyses are rarely performed. Exceptions could include a cost-benefit analysis prepared by the D4E to estimate the gains associated with the implementation of particulate filters on diesel vehicles. This CBA has accounted for environmental and health aspects. Another economic valuation has been performed on measures to reduce air pollution. These valuation surveys are presented in greater detail in section 3.2.2.

[24] RIA analyses are usually undertaken by the National Institute for Public Health Surveillance (InVS). The InVS has prepared guidelines on how to prepare a risk impact assessment: http://www.invs.sante.fr/publications/default.htm.

Concerning environmental policymaking, the *Rapport Boiteux* (2001) which proposed guidance for road projects assessment, is the main reference. This report provided details on the "socio-economic" approach recommended when evaluating an environmental project. Cost-benefit analysis is the standard methodology to apply to these contexts. A complementary series of guidelines have been produced by the D4E on how to implement standard approaches of economic valuation (*e.g*. the contingent valuation method, the hedonic pricing method, the travel cost method, etc.) (Terra, 2005a-2005d). The D4E also proposes a new approach to valuation of health effects from traffic-related air pollution, based on loss of life expectancy and the value of a life year (derived from the willingness-to-pay estimates) (Barbera, 2005) as now recommended by the EC (NewExt Project: see Markandya *et al*., 2004).

Concerning the valuation of health strategies, methodological guidance was proposed in 2003 by the Panel of Health Economists (Collège des Économistes de la Santé, 2003). These guidelines presented the main lessons from economic evaluation of therapeutic and health strategies. Although several types of analyses can be assessed, some should be avoided in this context because of the uncertainties attached to their hypotheses. This was notably the case of CBA, for which monetisation of health benefits is controversial, in particular among health economists. It was recommended to use cost-effectiveness analysis or cost-utility analysis instead. The effectiveness measurement unit most commonly used is the quality-adjusted life year (QALY) index. The QALY, and more particularly the cost per QALY, allows for comparing the cost of a preventive action and the number of life years (adjusted by quality of life) that this action would gain. This implies that prevention budgets should be allocated in priority to actions for which a low expenditure results in an important gain in life years, *i.e.* prioritise actions for which the cost per QALY is lowest.

However, many methodological and philosophical problems affect the aggregation rule proposed in the QALY approach[25]. In addition, there is a lack of expertise and of satisfactory data in this area. As such, the QALY approach is not recommended in France by the Panel of Health Economists to value health strategies. The same caveat affects the willingness-to-pay approach, whose use is not recommended by the Panel either.

Therefore, there is no specific methodology or framework prescribed. Diverse approaches can therefore be adopted in practice, depending on the topic to be evaluated. As the CNE is legally responsible for the evaluation of public policies, its practices should provide an idea of the methodology to be adopted in such circumstances. A report prepared by Bourdin *et al.* (2004) on public policy evaluation shows that economic valuation, and CBA more particularly, is never used in the CNE. Moreover, statistical and econometric models and multi-criteria analysis are rarely used. The report also suggests that evaluation methodology applied by the CNE is more based on sociological grounds than on economic ones. In addition, impact analyses of regulatory texts are sometimes done but not systematically.

A key actor of policy evaluation and of the use of economic tools is the European Commission. Many recent Directives support more efficient choices in risk prevention. In particular, Member states must prepare an *ex ante* evaluation of every project involving expenditures from the structural funds (*i.e*. related to the management of structural funds). In addition, EU actions co-financed by Community funds are subject to economic evaluation to ensure their economic, and thus social, efficiency.

[25] Health and longevity are aggregated into a single QALY measure.

3.2 Policy valuation

3.2.1 French practice

A framework Directive has been prepared in 2004 in order to provide guidelines on the economic valuation (using CBA) of important road projects. The value of a statistical life to apply in socio-economic analyses is €1.5 million for collective transport modes, and €1 million for individual transport modes. The difference between the value of a statistical life (VSL) attached to the two modes is related to their respective degree of voluntariness and controllability with respect to the fatality risk. Given that some risk attributes can be partially internalised in the individual mode, the VSL associated with such modes should be lesser than the VSL related to collective transport modes (Ministère de l'Équipement, des Transports, de l'Aménagement du territoire, du Tourisme et de la Mer, 2004). The VSL used in the transport context are different from the VSL recommended by Boiteux (2001) in the context of air pollution. The VSL to use in the context of air pollution is equal to: 1.5x0.56x0.6= €0.5 million. Two factors can justify for such a difference. First, the loss of life expectancy is different between the two contexts: 10 years in the context of air pollution vs. 40 years in the context of road accidents (reflected in the number "0.56"). Second, given that people affected from air pollution do not have the same age than people dying in road accidents, the VSL should be adjusted accordingly (reflected in the number "0.6")[26].

It is also recommended in this Directive to present discounted estimates of costs and benefits for the community. The official discount rate usually applied was 8% until a revision of this rate in 2005 (Lebègue, 2005). The discount rate that should be applied now is 4% for both costs and benefits for projects whose horizon is less than 30 years. For very long term projects (beyond 30 years), the discount rate decreases from 4% to 2%. Discounting guidance is intended to be reviewed every five years.

The EC (DG environment) has also provided recommended values to be used in a cost-benefit analysis within an "environmental" context[27]. Based upon the VSL derived from transport studies and adjustment for age, the VSL to be applied in an environmental context is €1 million (2000 prices), with an upper estimate of €2.5 million and a lower estimate of €0.65 million. According to the results from the recent NewExt study (Markandya *et al.*, 2004) commissioned by the EC, the value of a life year (VOLY) approach better suits environmental contexts than the VSL approach. The VOLY to be applied when evaluating the health effects of air pollution is €50,000.

According to the Panel of Health Economists (Collège des Économistes de la Santé, 2003), benefits and costs of health strategies should be discounted at the same rate. Different rates should be applied in order to test for sensitivity of the results. Rates recommended by the Panel are: 0%, 3% and 5%, which is in line with what is recommended for environmental (road) projects. However, no threshold values are provided for cost per QALY figures (unlike the situation in the UK[28]).

[26] For more details, see Boiteux (2001).

[27] See http://europa.eu.int/comm/environment/enveco/others/recommended_interim_values.pdf.

[28] In the UK Treasury recommendations, health strategies facing a value above £20,000 per QALY will likely to be rejected (HM Treasury, 2005)

3.2.2 Valuation studies

Only a few studies have estimated the costs or the benefits of air pollution in France. Despite their relative scarcity, these studies provide useful information on the magnitude of social impacts of air pollution and cost and/or benefit estimates that can be used for policymaking[29].

Zmirou et al. (1999) estimated the medical costs associated with exposure to PM10 pollution. They implemented a cost-of-illness (COI) study in 3 metropolitan areas in Rhône-Alpes (Lyon, Grenoble and Chambéry), with a total population of 970 000 inhabitants, in order to assess the prevalence of respiratory diseases and medical care usage. The annual cost of respiratory diseases was found to range between €12 and 21 million for the three metropolitan areas (1995 French franc values converted into Euros). Drug consumption is the largest cost component and represents almost 44% of the total costs. The second most important cost component is the wage losses, amounting 38% of the total costs. As most respiratory disorders do not require hospital care, hospital expenditures "only" represented 5% of total health costs. It should be noted that this study estimated COI values. As COI values only comprise tangible costs, they will underestimate the true morbidity costs associated with air pollution.

Another important study is the WHO study on transport-related health impacts implemented in three European countries, Austria, France and Switzerland (Sommer *et al.*, 1999). It provides global annual cost figures of PM10 pollution. The total annual cost of air pollution would amount to €670 per inhabitant (based upon the WTP approach) and €98 for economic losses (loss of productivity associated with ill-health). Long-term effects correspond respectively to 93% and 75% of these figures. The share attributed to transport emissions is approximately 50% in both cases. France-specific figures can be found in Table 3 below.

Table 3. Annual costs of PM10 pollution in France in 1999

	Total PM10 emissions (million €)			**Traffic-related PM10 emissions (million €)**		
	Cases or days	Individual WTP	Economic losses	Cases or days	Individual WTP	Economic losses
Long term mortality (adults)	31,692	28,523	3,916	17,629	15,866	2,216
Respiratory and cardiovascular hospitalisations	33,537	264.1	157.6	18,668	146.9	88.0
Chronic bronchitis (adults)	36,726	7,675.7	121.2	20,429	4,269.7	67.4
Acute bronchitis (children)	450,218	59.0	17.6	250,434	32.8	9.8
Asthma attacks (all ages)	820,000	25.4	0.45	450,000	14.2	0.25
Restricted activity days	24,600,000	2,310.5		13,700,000	1,285.2	
Total morbidity (million €)		**10,334.7**	**296.8**		**5,748.7**	**165.1**
TOTAL (million €)		**38,858**	**4,213**		**21,615**	**2,381**

Source: Chanel et al. (1999)

[29] The list of studies presented in this section is not exhaustive. The studies have been selected according to their relevance (*i.e.* focus on air pollution impacts) and when they have been made (recent studies).

Table 3 highlights the importance of the social costs of air pollution. Even though the relative health risk associated with air pollution seems relatively low (in comparison with road accidents, for example), public health consequences of air pollution could be rather substantial.

Rabl (2004) provides an overview of the studies estimating the health impacts of air pollution on children and adult populations in France. Values recommended for selected health endpoints to be applied in France are presented in Tables 4 (for children) and 5 (for adults).

Table 4. Recommended unit costs for children in France

End point	Cost of illness	WTP	Total (range)
Infant mortality	-	1 M€ ?	1 M€ (0.5 M€ – 3 M€)
Childhood cancer, fatal (20% of cases)	50,000 €	1.5 M€ ?	1.5 M€ (0.5 M€ – 3 M€)
Childhood cancer, non-fatal (80% of cases)	50,000 €	0.5 M€ ?	0.5 M€ ?
Asthma attacks, per case	184 €	31 € ?	220€ ?
Asthma , per year	1,800 €	200 € ?	2,000 € ?
Respiratory symptoms: simple bronchitis	34 €	31 €	65 €
severe bronchitis	226 €	200 €	400 € (300 € – 500 €)
laryngitis or pharyngitis	30 €	31 €	60 €
sinusitis	102 €	60	180 €
Respiratory hospital admissions, per day	350 €	low?	500 € (300 € – 600 €)
Respiratory hospital admissions, per case	2,500 €	?	2,500 € (1,000 € – 4000 €)

Source: Rabl (2004). The "?" indicates values that are especially uncertain.

Table 5. Recommended unit costs for adults in France

End point	Cost of illness + productivity	WTP	Total (range)
Mortality (VOLY)	-	50 000 €	50 000 € (20 000 € – 100 000 €)
Cancer, fatal	50,000 €	1.5 M€ ?	1.5 M€ (0.5 M€ – 3 M€)
Cancer, non-fatal	50,000 €	0.5 M€ ?	0.5 M€ ?
Chronic bronchitis			170,000 € ?
Minor restricted activity day		41 €	40 €
Restricted activity day	85 €	49 €	130 €
Workday lost	85 €	49 €	130 €
Emergency room visit	80 € + 425 €	242 €	750 €
Asthma attacks, per case	184 €	31 € ?	220€ ?
Asthma, per year	1,800 €	200 € ?	2,000 € ?
Respiratory symptoms: simple bronchitis	34 €	31 €	65 €
severe bronchitis	226 €	200 €	400 € (300 € – 500 €)
laryngitis or pharyngitis	30 €	31 €	60 €
sinusitis	102 €	60	180 €
Respiratory hospital admissions, per day	350 € + 85 €	low?	500 € (300 € – 600 €)

Respiratory hospital admissions, per case	2,500 € + 595 €	?	3,100 € (2,000 € – 4,500 €)
Cardiovascular hospital admissions, per case		?	4,900 € (3,500 € – 6,000 €)

Source: Rabl (2004). The "?" indicates values that are especially uncertain.

As there is a lack of economic studies focusing on children, most of the values recommended for children are based on adult populations. However, recent findings suggest that this could lead to inefficient policies and that children-specific values should be used in policymaking (OECD, 2006).

A cost-benefit analysis has been recently made by Massé (2005) in order to assess the effectiveness of mandating the use of particle filters on private and public vehicles. This study shows that adoption of filters to all types of vehicles (private and public) would lead to a decrease of PM10 concentrations by almost 20% (mean value) and of PM2.5 concentrations by 31% (mean value). Health benefits associated with these reductions would be rather substantial and greater than implementation costs, as follows:

- Implementation of filters on trucks and buses: 120,000 life years saved per year and a discounted net benefit[30] of €22.5 billion; and,

- Implementation of filters on individual vehicles: 200,000 life years saved and a discounted net benefit of €9.5 billion.

Based upon the value of a life year (VOLY) approach recommended by the EC, another study proposes the calculation of an index of population exposure to air pollution. This study aims at evaluating the health impacts of transport-related air pollution (Barbera, 2005). The global impact of transport-related air pollution is estimated to be €16.3 billion per year (with a VOLY of €50,000 and a discount rate of 4%).

Seyer *et al.* (2005) estimated the cost of treating asthma in France and found this cost to be over €1 billion. This result has significant policy implications, as it may suggest that preventing asthma attacks through the reduction of airborne particulate concentrations would result in health care savings of up to €1 billion.

3.2.3 Air quality policies

In 1996, the Law on Air and Energy Efficiency (LAURE) was published. This Law has been a key determinant of the development of public intervention in this area. This strategy has initiated the principle of double monitoring (environment and health) and has defined planning tools, such as the Regional Planning of Air Quality (PRQA), the Atmosphere Protection Plan (PPA), etc. This Law defines national technical measures to reduce energy consumption and emission sources. It also proposes financial and fiscal arrangements, for example to support the purchase of electric vehicles or of vehicles using natural gas. In addition, it initiates an alert procedure managed by the Prefect, operated when emissions rise above specified ceiling values. In this situation, the Prefect can restrict polluting activities, in particular traffic. As a complement, a high-quality monitoring network has been developed for air quality: 37 accredited associations on air quality monitoring (AASQA) were in place in 2006 in France.

In this context, environmental monitoring is quite effective and satisfactory, although fine particles (PM2.5) are not included yet in the French national strategy[31]. However, fine particles (PM2.5) have been

[30] The author uses a 4% discount rate and a VOLY of €50,000, as recommended in national guidelines.

[31] Fine particles are measured in France but they are not yet included in the national programme of air pollutant reduction.

included in the European Directive on ambient air quality and cleaner air for Europe (proposed in September 2005; to be adopted in June 2006)[32]. As such, PM2.5 are expected to be included subsequently to the review of the French programme of air pollutant reduction undertaken in 2007.

The environmental performance review of France with regard to air quality is quite satisfactory (OECD, 2005). Emissions from monitored air pollutants have largely decreased, mainly because of an effective control of stationary sources and improvement of fuels and engines (especially in cars). However, progress is still needed to reduce air pollution in major urban areas. Particular attention should be paid to ozone. In addition, it is recommended to expand the targets in order to integrate the pollutants of most concern, such as fine particles. Actions undertaken to reduce air pollution should also be better integrated into other public policies.

4. Governance of environmental health issues

4.1 Environmental health in France

Environmental health is a cross-cutting issue, and thus an inter-ministerial sphere of policy. Diverse procedures of collaboration were developed in the past, at the national and local levels. However, the way to carry out public intervention in this area was far from clear. The main problems were that objectives in this area were rarely assessed. Prioritisation procedures, and ultimately Ministries' responsibilities, were not clarified. The National Environmental Health Action Plan (NEHAP) was introduced in 2004 in order to help structure public intervention on environmental health issues.

4.1.1 Historical evolution of environmental health in France

Environmental health was the foundation of public health policies in the 19th century. Problems associated with drinking water and sanitation, housing safety, working conditions, etc. constituted the basis of public health and prevention medicine. Technological progress and improved performance of health care medicine then pushed prevention out of public health priorities. This field was thus progressively abandoned by the stakeholders of public health. The recent interest in the analysis of the health effects of environmental pollution, associated with the emergence of concerns for sustainable development, and therefore environmental policies in the late 1970s, has partially reversed this tendency. Environmental health is now one of the priorities of most OECD countries, including France. Environmental issues associated with health safety are an increasing concern for the general population and for public health decision-makers. Thus, the main actors in public health have invested in this field again. In particular, the General Direction of Health (DGS) of the Ministry of Health has been reshaped and agencies of health safety have been created.

4.1.2 Environmental health legislation and initiatives

Environmental health legislation and initiatives

Environmental health dimensions have recently integrated environmental policymaking in a more explicit way than in the past. Very few existing legislative and regulatory texts directly refer to environmental health. However, since the Law on Waste of 1975 and the Law on Classified Installations for the Protection of the Environment (*Loi sur les installations classées pour la protection de l'environnement*), French legislation promotes the right of French citizens to live in a physical environment that does not harm their health. Policy documents and texts related to environmental health include the following:

[32] This Directive revises substantially (through the inclusion of fine particles) and merges four separate documents on air quality into a single document.

- The Law on Waste of 1975 initiated the collection and disposal of household waste. It also initiated the Polluter Pays Principle to finance its implementation. The objectives were the reduction of waste generation and the promotion of waste collection and recycling. It stated that "*everybody has the right to be informed on the adverse effects to human health and the environment of collection, transportation, treatment, storage and disposal of waste*."
- The Law on Water (1992) proposed a mixed management (both private and public) of water resources. The objectives are to preserve aquatic ecosystems, to protect them from any kind of pollution, to restore superficial and groundwater quality, and to develop and protect water resources "*in order to satisfy or adjust for… health and public safety requirements"*.
- The Law on Noise (1992) aims at preventing and limiting the emission or propagation of noises or vibrations that can harm human health. It affects urban transports, planes and facility activities and institutions broadcasting music.
- The Law on Air and Energy Efficiency (LAURE) (1996) defined national technical measures to reduce energy consumption and emission sources. It put emphasis on monitoring aspects, on planning at the local/regional level and created the national commission for air. This is also the first Law that made a direct reference to environment and health, highlighting the health impacts associated with environmental degradation: "*a policy whose objective is the implementation of the acknowledged right to everybody to breathe air which does not harm his/her own health*".

- The National Programme of Reduction of Atmospheric Pollutant Emissions (2003), transposition of the EU Directive 2001/81/CE, and initiated by the LAURE, proposed alternative solutions to achieve EU ceilings for selected air pollutants by 2010. Pollutants monitored include: SO_2, NO_x, COV and NH_3. Health benefits associated with reductions in these pollutants are estimated, which means that external effects are explicitly considered in this programme. Implementation costs are also considered and they are significantly less important than the corresponding benefits.

- The National Sustainable Development Strategy (2003) defined the actions needed to reconcile environmental, economic and social concerns. One of the actions proposed was the adoption of an environmental health plan (see below NEHAP): "*based on an inventory of environment-related health hazards, this plan should enable a series of priorities to be defined and the actions to implement to be decided*".

- The Environment Charter (2004) established constitutional principles upon which a proper Environment Law could be defined. This Charter states "*everybody's right to live in a balanced environment and favourable to health*".

- The Public Health Law (2004) defined national public health objectives, main action plans and appropriate surveillance indicators. It proposed 100 objectives over 27 distinct domains. On of these domain is environmental health, defined over 9 objectives (including air, water, noise, lead, radon, CO and *legionella* (*i.e.* Legionnaires' disease)). The NEHAP is intended to achieve these objectives.

- The NEHAP (2004) for 2004-2008 determines the priorities of France in terms of environment and health. This is the first inter-ministerial set of measures explicitly dedicated to environmental health and actions to improve environmental health. It has been prepared jointly by four Ministries (Ministries of Health, Environment, Research and Labour) and two expertise agencies (InVS and AFSSET) (see section 4.1.3 for more details).

- The Asthma Plan (2002) for 2002-2005 proposed five objectives in order to prevent asthma and improve asthma care. One proposition consists in developing asthma surveillance as well as the

knowledge on asthma and on associated risk factors (e.g. environmental pollutants, allergens, etc.). The general objective of the past three years has been to reduce asthma morbidity and mortality[33].

- The Cancer Plan (2003) for 2003-2007 proposes 70 measures in order to prevent, screen out, and treat cancer. It also includes initiatives to educate and coach people about cancer, in order to better understand this disease. By the end of 2007, the objective will be to reduce cancer mortality by 20%[34].

History of the main programmes in France on environment and health

The Ministry of the Environment has a regulatory role regarding most of environmental health issues. In particular, concerning air quality, every policy, measure or action undertaken by the MEDD is based on reducing the adverse health impacts of air pollution. As health aspects are of high importance, they represent the justification of intervention and regulations related to air quality. The Ministry of Health also works on environmental health issues, especially to better understand and prevent the health impacts due to environmental hazards. The interventions of the Health Ministry related to air pollution consist of actions such as monitoring of pollens through a national network (*Réseau National de Surveillance Aérobiologique*), scientific check on the health impacts of air pollution, communication during crises, etc.

Scientific research has also become involved in this field. At the beginning of the 1990s, the National Institute of Health and Medical Research (INSERM) and the National Centre of Scientific Research (CNRS) have implemented a multi-disciplinary working group on environment and health. This group encompassed researchers from both natural and social sciences. The objective was to structure the research effort.

In 1992-1997, the CNRS put in place an inter-disciplinary research programme on the city (PRIVille), which defines five priorities for city and urban spaces, of which one is on environment and health. Simultaneously, the CNRS launched an inter-disciplinary research programme on the environment (PIREN) which aims at supporting *ad hoc* research programmes. This consortium comprises a thematic action on environment and health which covers two axes: emerging pathologies and evaluation of risks associated with chronic exposure at low levels.

In 1996, the Ministry of the Environment launched a research Programme on Environment and Health (PRES) whose priorities are: air, water, food and habitat. Very few economic studies are made under this programme (only 2 of 27 projects). This programme is directed by AFSSET since 2002.

In 2003, both INSERM and CNRS have individually undertaken research programmes on environment and health.

Other important French environmental health initiatives include the creation of specialised committees and safety agencies. A list of the main actors in environmental health is presented in the section 4.2.1.

4.1.3 The NEHAP (2004-2008)

The starting point of the elaboration of the French NEHAP was the publication of the National Sustainable Development Strategy in 2003. This Strategy emphasised environment-related health impacts and stressed the need for developing a NEHAP. The idea of a NEHAP was also echoed in the Public Health Law adopted in August 2004. With the publication of the Environment Charter in 2005, the

[33] For more details, see http://www.sante.gouv.fr/htm/actu/asthme/asthme.pdf

[34] For more details, see http://www.plancancer.fr

influence of physical environment on human health was publicly acknowledged. In a context of precaution and prevention, public interventions now have to account for the environmental determinants of health. In order to do so, it is necessary to improve knowledge and prevent health effects from environmental degradation. The NEHAP was also considered as being necessary to develop and improve inter-ministerial co-ordination in particular between the Ministry of the Environment and the Ministry of Health, and with other Ministries (e.g. the Ministries of Labour and Research) as well, and to streamline the debate on health issues associated with the environment.

The NEHAP was also the French government's contribution to the June 2004 Fourth Ministerial Conference on Environment and Health held in Budapest, Hungary, by the WHO Regional Office for Europe.

The NEHAP was therefore jointly proposed by the Ministries of Environment, Health, Labour and Research in 2004. This governmental Plan determines the priorities of France in terms of environment and health. Only few of the priority actions were defined on economic efficiency grounds. Indeed, measures with significant implementation costs have been evaluated in terms of (discounted) cost-benefit ratio, subject to the constraint that the cost per life year saved did not exceed €50 000. One example includes the evaluation of measures related to diesel particles. The objective is to reduce transport-related air pollution by 30% by 2010. Practical actions proposed in the NEHAP include the promotion of the use of particle filters and new European standards (EURO V) by 2005.

The implementation of the NEHAP is directed by a steering committee and a mid-term evaluation (in 2006) is undertaken by an evaluation committee in order to assess the process itself, rather than to evaluate its effectiveness[35]. More specifically, three questions will be answered:

- Are the objectives defined in the NEHAP relevant and at stake?
- Are the measures proposed in the NEHAP likely to contribute to achieve the objectives proposed in the NEHAP?
- Is the implementation of these measures effective?

Future evaluation of the NEHAP will analyse issues associated with risk perception and will include economic criteria.

4.2 Co-ordination of environmental and health policies

4.2.1 Main actors involved in environmental health issues

In addition to the Ministries of Health and the Environment, other important actors involved in the area of environmental health in France are:

- The National Institute for Public Health Surveillance (InVS) was created in 1998 to monitor population's health status, to alert authorities when there is a potential threat and to identify the determinants of changes in health status. This agency plays a central role in monitoring and alerting processes.

[35] The potential impacts of the NEHAP cannot be fully assessed only two years after its implementation. More time will be necessary to have a reliable evaluation of the effectiveness of this Plan.

- The French Agency for Food Safety (AFSSA) was created in 1998 to assess risks associated with food, and thus drinking water consumption. This agency also works on health of animals and on the control of veterinarian drugs.

- The French Agency for Environmental Health Safety (AFSSE) was created by law in 2001 (and operational in late 2003) to assess the health risks associated with the environment, with a particular focus on chemical risks. In 2005, its mandate was broadened to include occupational risks and its name changed to Agency for Environmental and Occupational Health Safety (AFSSET).

- National Institute for Industrial Environment and Risks (INERIS) was created in 1990. INERIS is a public research body under the supervision of the MEDD. The role of INERIS is to assess and prevent accidental and chronic risks to people and the environment from industrial activities, chemical substances and underground work.

- The High Commission of Public Health *(Haut conseil de santé publique)* was created in 2004 in order to combine the High Committee of Public Health *(Haut comité de santé publique)* with the High Commission of Public Hygiene of France *(Conseil supérieur d'hygiène publique de France)*. It proposes analyses of health issues and of factors thought to influence health to improve the health of the population.

The Agency for Environment and Energy Management (ADEME) aims at promoting, co-ordinating and undertaking projects to protect the environment and to efficiently manage energy. Although its main mission does not directly relate to environmental health, the ADEME contributes a lot to the work undertaken on air quality, noise and waste in France and it has been a major contributor to THE PEP (Transport, Health and Environment Pan-European Programme), a programme undertaken by the WHO and UNECE.

4.2.2 Current status of co-ordination

Inter-ministerial collaboration is not explicitly discussed in policy documents prepared by the Environment and Health Ministries. However, quite a number of committees and commissions have been established and deal with environment and health.

- The National Commission for Air (*Conseil national de l'air* - CNA) created in 1998 is related to the Ministry of the Environment (which has official oversight on the CNA). The Commission includes 31 designated members, including the Ministries of the Environment, of Health, of the Economy, of Industry, of Housing and of Transport. Representatives from expert agencies are also included such as the ADEME and INERIS. The CNA meets every two months to examine questions and identify priorities related to air quality monitoring and improvement. Examples of recent discussions include the CAFE programme and the revision of the Directive on ambient air quality to include fine particles (PM2.5).

- The Commission for Prevention and Precaution (*Comité de la prévention et de la precaution* - CPP) was established in 1996 to better integrate the prevention and precaution principles in environmental policymaking and to provide expertise on health impacts associated with environmental degradation. It is composed of representatives from both academic and governmental institutions (INERIS, INSERM, INRA, etc.). The CPP meets once a month and can commission experts if required by the situation (in case of emergency).

- The National Commission for Health Safety (*Comité national de sécurité sanitaire* -CNSS) (created in 1998) co-ordinates policies and programmes undertaken on health and safety by the

different agencies and Ministries involved in this area, such as the AFSSAPS, the AFSSET, the AFSSA, the InVS, as well as specific departments within the Ministries of Health, of the Environment, of Agriculture and of Labour. Directed by the Ministry of Health, the CNSS meets once every three months to identify emerging risks and to elaborate innovative approaches to scientific analysis and surveillance. The Law of Public Health (2004) merged the CNSS with the national technical commission of prevention (*Comité technique national de prévention*) into one single institution of inter-ministerial concertations and co-ordination of health policies: the National Commission of Public Health (*Comité national de santé publique*).

- The Inter-Ministerial Commission for Sustainable Development (*Comité interministériel pour le développement durable* - CIDD) was created in 2003 to define, co-ordinate and monitor the implementation of the national sustainable development strategy. Actions undertaken within each Ministry should comply with the policy on sustainable development, in particular to meet commitments made at the European and international levels. The CIDD meets at least once a year and more often if necessary. Representatives of all Ministries attend these meetings.

In addition, there are different Working Groups where the Ministry of the Environment and the Ministry of Health work together, such as the following:

- The co-ordination commission of the PRIMEQUAL programme: this is a research programme on air quality. It also requires co-ordination with the Ministry of Research. Orientation is jointly provided by MEDD and the Ministry of Health.

- Regular inter-ministerial meetings: specific services/units of MEDD and Ministry of Health meet on an *ad hoc* basis to discuss specific matters, depending on the needs of each stakeholder.

- The NEHAP steering committees (Steering committee and extended steering committee): the Steering committee, consisting of representatives from the pilot Ministries (health, environment, labour and research), from the AFSSET and the InVS, meets on average monthly. It has been created in order to organise the meetings of the extended steering committee, co-ordinate with regional services, etc. The discussions deal with progress on the implementation of the Plan. The extended Steering Committee meets twice a year and involves other Ministries and Agencies, including government representatives at the regional level. Progress on NEHAP implementation is presented.

At the policy level, there is effective co-operation between the two Ministries, in particular when it comes to defining common decisions. There are good exchanges between the MEDD and the Ministry of Health. The MEDD presents its projects involving health issues to the Ministry of Health and the High Commission of Public Health. They can provide comments and advice. The Ministry of Health often agrees with MEDD proposals, and both of them often co-sign the final policy.

On environmental health issues, the two Ministries often agree and go in the same direction. The MEDD is the leader in this field and uses scientific advices from the AFSSET or INERIS. The Ministry of Health provides advices on health aspects. These advices can be based on InVS and AFSSET studies, as well as on the work of the High Commission of Public Health. As the Ministry of Health oversees InVS work, it bridges the gap between research and policymaking. More generally, legislative texts related to environmental health are always developed jointly, even though most of the time it is the MEDD that is making the proposals given its regulatory role. This effective co-ordination can be explained by the good working relationships that have been recently established between the two Ministries and the various expert agencies, despite important turn-over within the Ministries.

4.3 Means for (and obstacles to) improving co-ordination

4.3.1 Institutional means

France is actively participating in related programmes developed by the WHO and the EC (SCALE).

The WHO programmes (*e.g.* EHAPE and CEHAPE[36]) are powerful tools to increase collaboration between the two fields of environment and health. More precisely, in the case of France, the NEHAP plays an important role in Ministries co-ordination[37]. It also facilitates co-ordination and decision-making. Before the NEHAP, communication between the Ministries was protracted and complicated because the different Ministries had very different priorities and approaches. The NEHAP has facilitated many aspects of co-ordination. It has allowed for increased co-ordination between the Ministries and the expertise agencies involved in the plan. The NEHAP has also increased the dynamics between the four Ministries mainly involved in its preparation and implementation, as well as with other Ministries, such as the Ministry of Transport and the Ministry of Agriculture. It has created positive dynamics around environmental health and has increased public awareness on environmental health issues. As a result, common knowledge has increased.

At the local level, the NEHAP has promoted co-ordination, in particular on occupational health aspects, to prepare regional environmental health action plans (by the end of the first quarter 2006). The main interest of the regional environmental action plans is to co-ordinate the regional administrative government representative with other stakeholders, such as territorial institutions, regional firms and associations. At the national level, as at the regional level as well, the effect is therefore rather positive. The NEHAP models the relationship between the different Ministries involved, as well as the follow-up of this working relationship.

Co-ordination within the NEHAP is increased through the two steering groups who assess progress made in the implementation of NEHAP. As such, the NEHAP allows for the development of working habits and strengthening environmental health culture within central government, expertise agencies and the general population. A lot of communication efforts about the NEHAP have also been put in place to increase the visibility of public intervention in this area. The NEHAP thus appears as a good communication tool, in particular to show that the general population's concerns are taken into account in policy-making.

4.3.2 Obstacles

Although the level of co-ordination has increased between the Ministry of the Environment and the Ministry of Health, there is still no co-elaboration of policy proposals: the Ministry of the Environment proposes policy proposals to the Ministry of Health for its views. Then, the two Ministries co-sign the proposal sent to the Cabinet. The involvement of people from the two Ministries early in the policy process would probably result in improved co-ordination and collaboration.

Obstacles to improved co-ordination between the two Ministries could include the following:

- Different cultures and languages: staff working in the Ministry of the Environment is quite different from those working in the Ministry of Health. Indeed, most of the staff in the Ministry of

[36] Respectively: the Environmental Health Action Plan for Europe and the Children's Environment and Health Action Plan for Europe.

[37] There is no French CEHAPE but children are included in the French NEHP, with other vulnerable populations (the elderly and pregnant women).

Health are medical doctors or have a strong background in public health. Staff in the Ministry of the Environment comes from very different horizons: economists, ecologists, engineers, etc. As a consequence, there are differences in terms of culture and languages between the two Ministries.

- Different approaches: the environment side is more regulatory. They are the leader on most of the relevant regulatory texts. On the health side, they are more focused on the evaluation of the health risk, less on the regulatory aspect. In addition, they do not use the same frameworks, as discussed in 3.1.2, which can sometimes lead to misunderstandings. It can also be explained by the fact that they come from very different horizons. Although these differences have been reduced over time, the two Ministries adopt different approaches.

- Different nature of actions: the Ministry of Health is focused on actions to undertake at the national level, very few actions are made at the European level and there is no international "culture" (except for their interaction with the WHO). The MEDD is focused on actions initiated at the European level. However, as the EC is increasingly entering the environmental health area, this may imply significant changes on the health side.

- Different priorities: one of the priorities of the MEDD is to improve environmental health conditions, while the actions of the Ministry of Health are more related to prevention of (general) health issues. Although there is now more collaboration both at the regional and national levels between environment and health decision makers, there is not yet more coherence. The NEHAP proposes to increase collaboration between these Ministries and agencies, and not to develop convergence and coherence.

- Lack of knowledge on environmental health in France: although there are some initiatives in environmental health, research institutes are not particularly involved in this field. Expertise is not efficiently used and multi-disciplinary approaches are not developed, although this is quite essential to a cross-cutting field such as environmental health. In addition, environmental health training and research efforts are not provided nor promoted enough to create incentives in this field. Environmental health is not a discipline that is yet developing in France. However, as it is one of the priorities of the NEHAP, things may change in the years ahead.

- Difficulty in sustaining momentum with respect to environmental health: when ministers change, priorities change. There is a lack of consistent, coherent and long-term actions (but it is not proper to the environmental health field). There is some concern that the interest raised by the NEHAP may begin to decrease, now that the official document has been released. Given the political context and the pressure of other priorities (*e.g.* the avian flu in France and the chikungunya fever epidemic in Reunion Island), environmental health is not the main priority of the Ministry of Health. In addition, Ministries have fewer political levers to reduce health impacts of environmental pollution than the MEDD, which remains greatly involved in the area of environmental health. Moreover, the quick turn-over of staff within Ministries makes the working relationships difficult to develop and to consider over a long timeframe.

- Decompartmentalisation of competencies and expertise: the Ministries defend their own area of expertise. The vision and intervention modes of each Ministry are labelled by very specific dominating disciplinaries and cultures. As such, there is a potential for cultural miscomprehension. For example, in France, risk assessments are only determined by technical experts, while risk management is entrusted to related Ministries, who try to include economic and social concerns. A more integrated approach (e.g. a risk assessment that would also include economic and social aspects) would be preferable.

- Institutional changes in health safety: in order to increase the French expertise and scientific independence, important institutional changes have occurred in the field of health safety the last 15 years. In particular, risk evaluation and risk management functions which used to be concentrated in the hands of central administration (*i.e.* the Ministries) have been devolved to specifically-created health safety agencies since 1998, such as the AFSSA and later on the AFSSET, etc. Further to several health crises observed in France in the 1980s and 1990s, a decision was made to separate risk assessment from risk management. This change had important benefits since it reinforced the expertise capacity as well as scientific independency. In addition, evaluation processes became more transparent. However, it also has important drawbacks, such as the co-existence of many heterogeneous stakeholders. This may create ambiguity and/or overlap in their missions, their skills, and their respective roles. This split of expertise may have complicated the co-ordination between the Health and Environment Ministries. Although it seems now impossible to have a unique agency of expertise dealing with environmental health, the definition of the domain of expertise and expected deliverables of each agencies (or technical bodies active in environment and health) should be clarified.

5. Concluding remarks

Environmental health is a cross-cutting issue that requires the involvement of many Ministries and related bodies to result in efficient policymaking. The case of France is particularly interesting because the French National Environmental Health Plan (NEHAP) has been published quite recently (June 2004). This Plan is currently being evaluated in order to evaluate the process itself.

The first observation of the French situation in the area of environmental health is the multiplicity of actors involved. Current decision-making in environmental health involves multiple players acting in a disjointed fashion. Governmental bodies have overlapping functions with very little evaluation of effectiveness. Co-ordination between them is not sufficient. However, a positive aspect is the strong involvement from the Ministries of Health and the Environment. Although still in its infancy, these bodies are developing strong working relationships and associated co-ordination. The French NEHAP has increased their load of commitment, as well as the participation of other Ministries (Ministry of Research and Ministry of Labour) in the discussions. However, the NEHAP does not cover all the domains of environmental health and did not involve all the Ministries working on environmental health issues. As such, although other Ministries' work is related to environmental health, they do not generally participate in this debate. As such, projects are multiplied "individually" without co-ordinating with the other (affected or related) Ministries.

Another important point that emerges from the analysis is the relative lack of systematic evaluation of policies. Although guidelines recommend the use of a specific approach in an environmental context, this is not systematically done. On the health side, recommendations have been provided as well but health policies are not generally subject to *ex ante* evaluation. In order to increase co-ordination across Ministries, in particular between the environment and the health Ministries, the tools used to evaluate policies should be more coherent across the whole government, particularly in the Ministries of Health and Environment when concerning environmental health issues, and the quality of these evaluations should be improved in providing clear guidelines.

Ex post evaluations are also rather rarely undertaken. However, they could provide significant inputs and help determine and compare the efficiency of prevention programmes. Results from *ex post* analyses could also imply a re-thinking of the allocation of resources. The use of economic analysis in this area could indeed help identify failures and determine better resource allocation. CBA used to be considered as a useful decision-making tool in France. However, it is not systematically used to evaluate the potential economic and social impacts of environmental policies.

Based upon this analysis, some recommendations could be formulated to improve the co-ordination between the Environment and the Health Ministries. Potential ways could include the following:

1) Recommend the use of a specific methodology for policy appraisal: policy appraisal should be systematically done as it allows for a better allocation of (scarce) resources. In order to increase coherence between Ministries, a single methodology should be recommended, at least when considering environmental health issues.

2) Reduce the lack of "global" analyses: risk impact analyses should also account for social and economic impacts (as far as possible) and should be undertaken for all environmental regulations. In addition, quantified analysis should be supported and monetisation of costs and benefits should be required as far as possible.

3) Increase political coherence between the Ministries: common guidelines on policy evaluation should be published so that all Ministries could apply the same approach. In addition, training of staff and high-level policy makers is recommended to facilitate the sharing of expertise.

4) Clarify the role of the expertise agencies in order to avoid overlap and duplication of work.

France has adopted its NEHAP quite recently. Promising initiatives have been implemented before and after the publication of the NEHAP. However, improved policy-making in the area of environmental health will require further actions and efforts, in particular by better co-ordinating the work and priorities of all the related Ministries. Indeed, co-ordination of all Ministries concerned with environmental health issues is necessary to result in efficient regulations in this area. As many obstacles may be encountered, a whole-of-government approach will likely be necessary to achieve these goals.

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ANNEX 3: IMPROVING CO-ORDINATION BETWEEN ENVIRONMENTAL AND HEALTH POLICIES – FINDINGS FROM A CASE STUDY ON CANADA

1. Introduction

Environmental issues and impacts of the environment on human health require inter-ministerial co-ordinated policy intervention. However, the activities or interventions of Ministries on environment and health and co-ordination of their tasks are complicated. In a country where regulatory authority is shared between federal, provincial and territorial governments, effective co-ordination may be even more challenging.

In the context of the OECD project on "improving co-ordination between environmental and health policies", a case study has been carried out on Canada in order to assess the level of co-ordination between the main stakeholders involved in environment and health and to identify the means for (and the obstacles to) improving policy co-ordination.

The objectives of the overall project are two-fold: identify the methods by which health and environmental policies are assessed; and, review the means of co-ordination of policy in these two spheres. The project is also focusing on the health effects of air pollution, more particularly on the respiratory diseases aggravated by air pollution. This contribution is based upon theoretical and empirical findings, as well as a review of existing practice in selected OECD Member countries based upon the findings of case studies. Three case studies have been undertaken in Canada, France and the United Kingdom.

Based upon the evidence reviewed in a recent Environmental Performance Review of Canada (OECD, 2004a), air quality in Canada has improved in certain aspects. For example, many pollutant concentrations in ambient air have decreased on average. However, emissions of traditional air pollutants in Canada remain very high compared with most OECD countries. In addition, recent epidemiological surveys undertaken in Canada have showed that significant concerns remain with respect to health damages associated with air pollution. Co-ordination between the Environment and the Health Ministries are therefore of significant relevance and importance.

A case study has therefore been carried out in order to provide a better understanding of priority-setting practices and policy assessment. In order to analyse the means of improving the co-ordination between environmental and health policies as well as potential obstacles, information related to environment and health in Canada has been collected, with a specific focus on air pollution and air quality policies.

To this end, a series of interviews has been undertaken. The main federal departments and executive agencies dealing either with environmental or health issues (or both) (*e.g.* Environment Canada, Health Canada, the Public Health Agency of Canada, the Commission for Environmental Co-operation (CEC)) were contacted to discuss policy appraisal and evaluation and co-ordination between environmental and health policies[38] as well. This report presents the main findings from this case study.

[38] I would like to thank all the people I met for their co-operation and assistance, namely: Michael Donohue, David Henderson, Dennis Herrod, Bill Jarvis, Céline Labossière, Fatma Maged, Anne O'Toole and Franck Portalupi from

2. Health impacts of air pollution in Canada

Environmental degradation/pollution has many adverse effects on human health. For example, health impacts of air pollution can be either characterised as acute (short-term) or chronic (long-term), including eye irritation (for acute effects) and premature deaths and hospital admissions (for chronic effects). They depend on the pollutant type, its concentration in the air, the length of exposure, the presence (and co-effects) of other pollutants in the air, weather conditions as well as individual susceptibility. Different pollutants can lead to respiratory problems, exacerbated allergies and adverse neurological, reproductive and developmental effects as well. This is especially true for vulnerable populations, such as children, pregnant women, the elderly, people with pre-existing conditions (such as heart or lung disease) and people with a weakened immune system. People who work or exercise outdoors may also be particularly exposed.

More precisely, a large number of epidemiological studies have demonstrated the linkages between exposure to fine particulate matter ($PM_{2.5}$) and significant health impacts. Some of these studies have been undertaken in Canada and show that air pollution-related health damages are important. One of the most influential studies was carried out by Burnett *et al*. (1998) on 11 Canadian cities to assess the risk of premature mortality associated with urban air pollution. The study showed that nitrogen dioxide (NO_2) had the largest effect on mortality risk, followed by ozone (O_3), sulphur dioxide (SO_2) and carbon monoxide (CO). The results suggested that ambient air pollution is a significant contributor to premature mortality in 11 Canadian cities.

Another study (Burnett *et al*., 2004) analysed the relationship between NO_2 and mortality in 12 Canadian cities *(i.e.* Halifax, Saint John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Edmonton, Calgary and Vancouver) based upon time-series data (from 1981-1999). The study used concentration-response function for these Canadian cities to estimate the excess death associated with short-term exposure to air pollution. Although the multi-pollutant model proposed in the study did not include PM (it only includes NO_2, O_3, SO_2 and CO), it was considered as reflecting well the impact of the overall air pollution mix on health. As such, results from this study served as basis for other Canadian studies.

In particular, Judek *et al*. (2004) estimated the annual number of excess deaths associated with air pollution in eight Canadian cities based upon the concentration-response functions derived in Burnett *et al*. (2004). They estimated that premature deaths associated with short-term exposure to air pollution were around 1800 (± 700). The annual number of excess deaths associated with long-term exposure to air pollution wais 4200 (± 2000), although there might be a delay before preventing such deaths (*i.e.* it might be necessary to wait for five years or more after having reduced the air pollution levels). Therefore, air pollution was estimated to be responsible for 5900 (± 2100) annual premature deaths. However, as this study only included one third of the Canadian population, these results should be considered cautiously.

Previous studies employed Generalised Additive Models (GAMs) to determine concentration-response functions from time series studies. Yet, a number of statistical and numerical flaws were discovered. This problem, generally referred to as the "GAM error", is the tendency to slightly overestimate the magnitude of the regression parameters and underestimate the corresponding standard errors. It was therefore appropriate to solve this problem. Health Canada scientists re-evaluated the times series studies in question to correct any resulting errors. The problem was fixed and all recent Health

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Environment Canada; Annie Bérubé, Barry Jessiman, Susan McClelland, Karen Schwerdtfeger, Dave Stieb and Marielou Verge from Health Canada; Louise McRae, Lina Racine and Paula Stewart from the Public Health Agency of Canada; Keith Channon, Rolando Ibarra Rodriguez, Marilou Nichols, Luke Trip and Doug Wright from the CEC; and, Bruce Dudley from Delphi Consulting.

Canada mortality studies and estimates have been corrected for any problem associated with the GAM error[39].

At the provincial level, the Ontario Medical Association (OMA, 2005) has produced a report that evaluates the damages for Ontario. In 2005 in this province, PM and ozone-related air pollution was estimated to be responsible for 5,800 premature deaths, 16,800 hospital admissions, nearly 60,000 emergency room visits and over 29 million minor illness days[40].

A similar health assessment has been undertaken in Hamilton, focusing on mortality and hospital admissions related to exposure to air pollution (Sahsuvaroglu and Jerrett, 2003). The study found that 217 deaths, 352 respiratory hospital admissions and 1120 cardiovascular hospital admissions can be attributable in part to air pollution, NO_2 and O_3 having the largest impacts on mortality and morbidity. Based upon these results, air pollution can be considered as a major source of mortality and hospital admission in Hamilton.

More recently, Pengelly and Sommerfreund (2004) have estimated the air pollution-related burden of illness in Toronto. Based upon data from 1999, they estimated that approximately 1,700 premature deaths per year and between 3,000 and 6,000 annual hospital admissions can be associated with exposure to O_3, SO_2, NO_2, CO and PM_{10}.

These results suggest that Canadian population's health in certain regions is significantly affected by air pollution. Moreover, these health impacts have a cost for society. For example, OMA (2005) estimated the cost of illness due to air pollution for Ontario. They provide estimates of the costs associated with lost productivity, healthcare costs, pain and suffering and loss of life. These estimates (expressed in Canadian dollars[41] 2005) are reproduced in Table 1 below.

Table1. Illness costs of air pollution (2005 C$)

Impacts	**Costs**
Lost productivity	$374,342,400
Healthcare costs	$506,612,700
Pain and suffering	$536,546,600
Loss of life	$6,391,700,000
Total	$7,809,201,700

Source: OMA (2005)

In 2005, the costs of illness associated with air pollution are estimated to be around $7.8 billion. The share of the costs associated with mortality represents almost 82% of the total costs.

Some studies have focused on a specific disease related to exposure to air pollution and have provided the corresponding cost of illness (COI) figures. As 2.5 million Canadians are affected by asthma (Health Canada, 2001) among which 845,000 are children, some studies have focused on it. For example, Krahn *et al*. (1996) calculated the direct and indirect costs of asthma in Canada in 1990. They estimated that asthma costs $504 million, among which 61% ($306million) are direct costs, including drugs, hospital inpatient

[39] For more details on the GAM error, see Ramsey *et al.* (2003).

[40] Although this is significant, it should be kept in mind that the data only covers one year and time series is needed to develop an annual estimate.

[41] All monetary estimates reported in this case study are expressed in Canadian dollars (C$), except when differently stated.

care and physician services. In 1990 the cost of asthma represented 7.1% of the burden of respiratory illness and 0.4% of total economic burden of illness in Canada (Krahn *et al.*, 1996).

More recently, Laurier *et al*. (2000) calculated the cost of asthma for Quebec, focusing on the cost of hospitalisation based upon data for the 1994-95 periods. In 1994-95, they estimated the total cost of hospitalisation for asthma to be between $18 and $21 million in Quebec.

Based upon cost of illness values, Stieb *et al*. (2002) estimate the economic benefits of reducing acute cardio-respiratory morbidity associated with air pollution in Canada. Results, expressed in 1997 Canadian dollars, are presented in Table 2 below. Estimates range from $13 for an acute respiratory symptom day to $5,152 for avoidance of a cardiac hospital admission.

Table 2. Costs of acute cardio-respiratory morbidity associated with air pollution (1997 C$)

Health endpoint	Cost of treatment	Lost productivity	Pain, suffering and averting expenditures		Total costs
			In hospital	Out of hospital	
Respiratory hospital admission	$2,800	$300	$670	$410	$4,200
Cardiac hospital admission	$3,800	$270	$760	$340	$5,200
Respiratory emergency department visit	$930	$160	$430	$520	$2,000
Cardiac emergency department visit	$3,200	$210	$680	$330	$4,400
Restricted activity day		$25		$23	$48
Asthma symptom day		$12		$16	$28
Acute respiratory symptom day		$12		$1	$13

Source: Stieb et al. (2002)

The cardiovascular impacts of air pollution constitute the most important share of morbidity costs. In addition, treatment represents the most costly component while lost productivity is almost always smaller than the other types of cost.

All these studies that have calculated the cost of illnesses commonly associated with exposure to air pollution suggest that prevention (through the implementation of environmental policies) could lead to significant reduction in healthcare costs.

3. Policy appraisal and valuation

3.1 Policy appraisal

Policy appraisal is used by policy-makers in order to evaluate the potential impacts of a given policy and more particularly to evaluate whether the benefits of the policy outweigh its costs. When policy evaluation is carried out after the implementation of a policy (*ex post* evaluation), it allows for the assessment of policy effectiveness. Evaluation plays a central role in demonstrating policy results. Policy evaluation is a useful tool to improve policy-making and resource allocation.

Policy evaluation is important in Canada. In the early 1970s, it was recognised that evidence about the effectiveness of government policymaking in achieving public policy objectives should be given a

significant place in decision-making and resource allocation (Aucoin, 2005). Since then, many directives and policies have been introduced to improve the Canadian decision-making process.

The first important directive was the requirement in 1978 that all major new or revised regulations must be preceded by a Socio-Economic Impact Analysis (SEIA) designed to determine whether the costs of regulation are likely to exceed the benefits. This Directive thus promoted a framework to assess the potential economic and social impacts of a regulation.

Another important step in policy evaluation in Canada was the publication in 1986 of the *Guiding Principles of Regulatory Policy*. These principles required the use of regulatory impact analysis (RIA). As defined in these guidelines, any significant regulatory proposal must present a Regulatory Impact Analysis Statement (RIAS) to demonstrate that the proposed regulation is preferred over other policy alternatives to achieve the objectives. The RIAS also testifies that consultations with relevant stakeholders have taken place. The necessity to undertake a RIA for each regulatory proposal has selected the cost-benefit analysis (CBA) as the standard economic evaluation tool.

A significant regulation (i.e. when its costs are anticipated to be greater than $50 million) must therefore undergo a CBA. The impact assessment should clearly assess the economic, social, environmental and health impacts of the regulatory proposal, as well as the distributional impacts (fairness and equity implications). Central discount rates range from between 4-6%. The Cost-Benefit Guide for Regulatory Programs (Government of Canada, 1995) provides additional guidance for risk assessment.

More recently, the federal *Regulatory Policy* has been set in 1999. It provided the framework and the guiding principles for the development of regulations. It also required the use of CBA to estimate the costs and benefits of a regulatory proposal, as well as stakeholder consultation and inter-governmental co-ordination. Among the priorities identified in the Government of Canada's Smart Regulation initiative is the need to update and enhance the existing regulatory policy. The proposed *Government Directive on Regulating* is designed to establish a life-cycle approach to regulatory governance by identifying requirements for regulatory management, impact analysis and reporting results to Canadians. The proposed Directive would also provide an opportunity to integrate modern policy and management techniques, such as performance measurement, into the regulatory system.

Under the proposed Directive, departments and agencies are expected to assess the significance of a regulatory proposal according to several criteria, including the magnitude of the risks being addressed by the regulation; the potential impacts on health, safety and security, and environmental quality; the economic and social impacts; the implementation and compliance costs; and, the degree of interest and contention among the public (Government of Canada, 2006a). In addition, the proposed Directive requires the use of CBA to estimate the costs and benefits of the regulatory proposal and of the other policy alternatives as well. Based upon these assessments, departments and agencies will develop a recommendation in choosing the option that is the most appropriate, but not necessarily the one that offers the greatest benefit at the lowest cost. The cost-benefit criterion is therefore necessary but not sufficient to inform the decision.

The proposed *Government Directive on Regulating* would also require from departments and agencies systematic *ex post* evaluations in order to measure the extent to which the regulation has achieved the predetermined objectives. Some *ex post* evaluations have been made previously but not systematically, mainly because of a lack of infrastructure and resources. *Ex post* evaluations are made either in-house or by external consultants.

The proposed Directive is complemented by the introduction of a Triage Framework for Regulatory Submissions (Government of Canada, 2006b). This framework introduces a new manner of categorising

regulatory proposals according to their relative importance. Regulatory proposals will then be defined according to "low", "medium" and "high" significance levels. A regulatory proposal will then be referred to have "low significance" when it is expected to have negligible impacts (both positive and negative) on the economy, health and safety, society, security, the environment, etc. and that its total costs and benefits are anticipated to be less than $10 million. A regulatory proposal will be defined as having "medium significance" when it is expected to impact positively or negatively the environment, economy, government, social and ethics, security, health and safety, and impose some costs or savings onto the target population (total present value between $10 and $100 million). Finally, a regulation will be considered as of "high importance" when it is expected to involve impacts on the environment, the economy, the government, social and ethics, security, health and safety and major costs or savings for the stakeholders (total present value greater than $100 million).

The *Triage Framework* is developed in order to increase the efficiency and effectiveness of the regulatory process and to promote a consistent framework across all departments. In addition, this framework will imply significant changes relative to RIAS. Indeed, medium and highly significant proposals will provide an in-depth analysis in areas where impacts are expected to be most important, while low significance regulatory proposals will be subject to abridged RIAS (Government of Canada, 2006).

3.2 Valuation

As presented above, the federal *Regulatory Policy* (1999) requires that all departments and agencies carry out a CBA for all regulatory programmes. Guidelines have been produced to explain how to carry out a CBA[42] (Government of Canada, 1995). The Treasury Board Secretariat Canada is currently updating the CBA guidelines, which should be released in 2007. Although all regulatory departments and agencies are required to apply CBA, the values used in the valuation process may differ across Ministries. This section examines the valuation approach applied in Environment Canada and Health Canada, in the specific context of air pollution.

3.2.1 Valuation studies

Two valuation studies are of significant importance and relevance for air quality decision-making in Canada.

The first one is a contingent valuation survey conducted by Krupnick *et al.* (2002) to elicit willingness to pay (WTP) values for mortality risk reductions. The survey was administered in Hamilton (Ontario) to persons 40 to 75 years old – people that are likely to benefit the most from environmental programmes. Two risk reductions were proposed: a 5 in 1,000 risk reduction taking place over the next ten years, and a 1 in 1,000 risk reduction over ten years. Annual WTP and Value of Statistical Life (VSL) estimates are presented in Table 3 below.

Table 3. WTP and VSL estimates (1999C$)

Risk reductions	WTP estimates (1999 C$)	VSL estimates (1999 C$)
5 in 1,000	$601	1,202,000
1 in 1,000	$368	3,684,000

Source: Krupnick et al. (2002)

[42] In this guidance document, CBA covers all evaluation techniques, including CBA, risk analysis, SEIA and CEA.

However, it should be noted that this survey focused on people of 40 years of age or older – one sub-population most affected by air pollution[43]. Therefore, the sample is not representative of the whole population and WTP values derived may not reflect the "true" social welfare.

The VSL for Canada from Krupnick *et al.* (2002) is very different to that used by regulatory departments. Indeed, Health Canada and Environment Canada, for example, use a VSL adjusted by age, *i.e.* they apply a VSL of $5.2 million to exposed population under 65 years of age and use an adjustment factor of 0.75 for population over 65 years of age, leading to a VSL of $3.9 million for people over 65 years old. The "average" VSL is therefore $4.1 million, the value used in the Air Quality Valuation Model (see below).

The second important survey was undertaken a few years before by Desvousges *et al*. (1997). The objective of this survey was to estimate the WTP for health improvements associated with reduced exposure to air pollution, *i.e.* derive WTP values for a reduction in morbidity risk. Health effects considered include episodes of mild to severe respiratory and cardiac illnesses. WTP estimates obtained from this survey are reported in Table 4 below.

Table 4. WTP for selected morbidity impacts of air pollution (1997C$)

Symptom	Mild activity limitation	Severe activity limitation
Stuffy/runny nose and sore throat	$143	$683
Eye irritation	$104	$797
Generally tired and weak	$130	$875
Fluttering in chest and feeling light-headed	$69	$1471
Coughing, wheezing, and shortness of breath	$215	$1638
Coughing or wheezing with fever, chills, or aching all over	$433	$1491
Shortness of breath, swelling in ankles and feet	$570	$1586
Pain in chest or arm	$1443	$1816

Source: Desvousges et al. (1997)

These estimates should be interpreted cautiously as they are based on relatively small samples (246 respondents). Nonetheless, these results are illustrative and show that significant health benefits could be expected from reduced air pollution.

3.2.2 Policy valuation in Environment Canada and Health Canada

Federal departments are subject to Directives regarding benefits valuation. Valuation results are applied to address various issues, such as policy appraisal, programme evaluation, environment and health assessment, priority setting, indicators, effective incentive design (*e.g.* taxes, economic instruments).

In the context of air quality regulations, air quality assessment requires the evaluation of environmental and health impacts as well as an economic valuation of these impacts. To this end, the Air Quality Valuation Model (AQVM) is used to quantify and monetise the benefits associated with the policy proposal[44]. AQVM was jointly developed by Environment Canada and Health Canada in 1996 to propose a

[43] Populations most affected by air pollution include children, people with pre-existing conditions (such as respiratory or cardio-vascular diseases) and people over 65 years of age.

[44] For more details on the AQVM methodology, see Chestnut and Mills (1999).

generalised tool that can be applied everywhere. The Air Quality Valuation Model (AQVM) is a computational model used to estimate the health and welfare benefits (or damages) associated with changes in Canada's ambient air quality. It allows for the evaluation of alternative air quality policies in assessing their respective benefits. The values currently used in AQVM rely on a range of estimates transferred from existing meta-analyses and review studies.

The model uses a damage function approach to quantify the benefits from air pollution control or the damages from decrements in air quality. Air pollutants considered in AQVM include ozone, PM, sulphates (SO_X), CO, SO_2, and CO_2. The model computes changes in annual impacts and the associated economic benefits for over 20 different human health and welfare effects. It also includes statistical analysis options that can be used to assess the uncertainty in the benefit estimates. Examples of policies and regulations for which benefits have been estimated utilising AQVM include benzene in natural gas dehydrators, diesel fuel regulation, US transboundary air pollution, sulphur in gasoline initiative, National Acid Rain Strategy, and ethanol gasoline.

Selected monetary values obtained from available economic studies are used to monetise the benefits associated with reductions in mortality and morbidity risks. Willingness-to-pay (WTP) values are preferably used but when WTP values are not available, AQVM uses cost-of-illness (COI) values adjusted in order to be as close as possible to WTP values. Examples of values proposed in AQVM which are often used in environmental and health policy-making in Canada are reported in Table 5 below.

Table 5. Monetary values used in AQVM

Health effect	Estimate (1996C$)	Primary source	Type of estimate
Mortality			
VSL	$4.1 million		WTP
Fatal cancer	$4.3 million		
Morbidity effects			
Adult chronic bronchitis	$266,000	Viscusi *et al*. (1991) Krupnick and Cropper (1992)	WTP
Respiratory hospital admission	$6,600	Canadian Institute for Health Information (1994)	Adjusted COI
Cardiac hospital admission	$8,400	Canadian Institute for Health Information (1994)	Adjusted COI
Emergency room visit	$570	Rowe *et al*. (1986)	Adjusted COI
Child bronchitis	$310	Krupnick and Cropper (1989)	Adjusted COI
Restricted activity day	$73	Loehman *et al*. (1979)	WTP and adjusted COI
Asthma symptom day	$46	Rowe and Chestnut (1986)	WTP
Minor restricted activity day	$33	Krupnick and Kopp (1988)	WTP
Acute respiratory symptom day	$15	Loehman *et al*. (1979) Tolley *et al*. (1986)	
Non fatal cancer	$305,000		

Source: Chestnut and Mills (1999)

Although AQVM has been successfully applied in different contexts and different policy scenarios, there was a desire from the designers to improve the model. As a result, the Air Quality Benefit

Assessment Tool (AQBAT) is being developed with various capabilities. Still in development, this model will also estimate the health and welfare benefits associated with changes in ambient air quality. The main difference with its predecessor is that AQBAT offers more flexibility than AQVM. The analyst could change different parameters according to his/her needs. For example, any change from baseline can be proposed while only a few cases could be mapped under AQVM; many scenario years can be considered while AQVM is a single-period model; AQBAT could propose 4 population projections while AQVM was limited to a single population projection; the model allows for selecting different averaging periods, regression types and probability distributions. Finally, the risk measures obtained from AQBAT would allow for the evaluation of long-term impacts of air pollution trends, short-term impacts of specific interventions and of air quality changes. As such, results from AQBAT evaluation can be used in CBA to inform decision-makers.

More precisely, at Environment Canada, when the programme or the policy proposal is related to health or environmental protection, CBA is required. Benefit measure is expressed in WTP terms. If WTP values are not available, adjusted COI values (adjusted so that they are equivalent to WTP values) are used instead. When the policy is related to biodiversity aspects, it is more difficult to monetise the benefits. Environment Canada is about to use a framework to assess cost-effectiveness analysis (CEA) in this specific context. At Health Canada, CBA is required when the proposal relates to environment and health. When the policy or programme proposal deals with medical intervention, CEA is required. For example, CEA is applied to assess the efficacy of a new drug. Therefore, Health Canada uses both WTP and QALYs (or DALYs) measures on the benefit side depending on the nature of the impact being valued[45].

Concerning age and latency issues, there is no accounting for age differences. Children and women are considered as "most sensitive populations" in some regulation (*e.g.* the sulphur in gasoline regulation), but on the valuation side, there is no distinction between children and adults. In the VSL work a distinction is made between working-age adults and seniors. On the concentration side, there is not enough evidence at the moment (limited evidence for selected health outcomes) for considering different age groups. However, as many of the major regulations are being reviewed (such as Canadian Environmental Protection Act or the regulations on pesticides), new amendments are likely to include and explicitly mention vulnerable populations, in particular children and pregnant women.

As for latency, AQVM considers only one year at a time, so it does not account for latency effects. However, AQVM does include chronic effects. AQBAT will better integrate this characteristic in incorporating discounting. A nominal rate of 5% is the central value generally used in the valuation work. The new CBA guidelines (which should be released in 2007) may recommend a specific discount rate.

3.3 Air quality policy

3.3.1 Air quality trends

The Environmental Performance Review of Canada (OECD, 2004a) shows a generally positive balance sheet for air quality. Indeed, concentrations of the main air pollutants (SO_2, CO and VOC) have decreased between 1990 and 2001, in particular SO_2 emissions. Concentrations of PM measured at 12 urban sites decreased between 1985 and 1996. They have since remained unchanged (composite annual mean) or have increased (high 24-hour average) but in many Canadian areas, daily PM levels are still high. Ground-level ozone levels have not significantly changed across Canada during this period and trends are variable according to the province (decrease in British Columbia and Atlantic, stable in Eastern Ontario and Quebec). However, current ground-level ozone concentrations are high in major urban areas in the

[45] Personal communication with officials from Health Canada.

country. High levels are particularly notable in the Windsor-Québec City corridor and to a lesser extent the southern Atlantic Region and the Lower Fraser Valley of British Columbia (OECD, 2004a).

3.3.2 Air quality policy in Canada

Air quality is one of the priorities of Canada and therefore of Environment Canada, more particularly acid rain deposition and smog. However, jurisdiction over the environment is shared between federal and provincial governments and control of air pollution emissions is not straightforward. As such, the Federal Government works in conjunction with the provinces to set air quality standards (e.g. the Canadian-wide Standards (CWS)) and regular reports on progress made. For all intra-provincial emissions, the provinces establish their target policies.

The Federal Government has the authority to conduct a national programme of air-pollution surveillance, and establish air quality objectives (targets). Air monitoring stations are operated by both federal and provincial governments. A National Air Pollution Surveillance (NAPS) network was established in 1969. It is a joint programme of federal and provincial governments to measure and report outdoor air pollution levels in Canadian urban centres. In 2002, 271 air monitoring stations were distributed across 163 municipalities. A similar network has been developed for rural areas: CAPMON. This network consists of 21 air monitoring stations in Canada and one in the US. CAPMON has been in operation for more than 20 years. Its initial focus was on acid rain but increasing concern for smog pollutants (in particular NO_X, PM and O_3) lead to their measurement in some sites.

Provincial governments across Canada have a variety of air quality initiatives in place, including implementations of vehicle inspection and maintenance (I&M) programmes, emissions caps for industrial polluters and various public informational and educational programmes. For instance, Ontario, Quebec, Alberta and British Columbia operate their own air monitoring stations independently of NAPS and CAPMON.

The Canadian Council of Ministers of the Environment (CCME) plays a key role in Canadian air quality policy. Comprised of 14 Ministers of the environment from the federal, provincial and territorial governments, the CCME establishes nationally consistent environmental standards, strategies and objectives. One example is the establishment of CWS for ozone and PM endorsed in 2000 (see below).

Environment Canada collaborates in joint action under the CCME and is responsible for the national leadership under the CWS, the federal implementation plan of the CWS, the development and implementation of the 10-year agenda for cleaner vehicles and fuels (see below) as well as the enhancement of the air monitoring network and the publication of the annual report on PM and O_3 levels and trends.

Six of the most important governmental measures regarding air quality policy include the CWS, the National Ambient Air Quality Objectives, the Cleaner Gasoline programme, the Canadian Acid Rain programme, the Air Quality Index initiative and the Canadian Smog Advisory Programme. They are presented below.

3.3.2.1 Canadian-wide Standards

The Canadian-wide Standards (CWS) define achievable targets in order to reduce environmental and health risks associated with specific air pollutants, within a specific time frame. They are the environmental quality objectives under the Canadian Environmental Protection Act 1999.

PM and O_3 were the priority substances for the development of CWS under the *Canadian Wide Accord on Environmental Harmonisation* and CWS for PM and O_3 were signed in January 1998 by the CCME (except Quebec). The established targets for ambient levels of PM and O_3 (to be achieved by 2010) are the following:

- PM: 30 µg/m3 (24-hour average)
- O_3: 65 ppb (8-hour average)

The implementation plan of the CWS was released in 2001 under the *Interim Plan 2001 on particulate matter and ozone* (Government of Canada, 2001). The Interim Plan set out a series of commitments, initiatives and actions under the CWS on PM and O_3, aimed at controlling emission sources with the greatest impact on air quality. As transboundary pollution and the transportation and industrial sectors are the major sources of air pollution, the Plan also proposes initiatives and regulations to address those issues. It particularly highlights the importance of maintaining a high-quality monitoring network in order to increase the knowledge and understanding of the impacts of PM and ozone on human health and the environment, and to measure the effectiveness of air quality policies (Government of Canada, 2001). As it is not believed that there is any threshold under which PM and O_3 have no effect on health, regulations regarding PM and O_3 will probably become more and more stringent over time.

CWS have also been established for benzene. Benzene is also a non-threshold toxicant (*i.e.* a substance for which there is considered to be some probability of harmful effects at any level of exposure) that is carcinogenic to humans (Prüss-Üstün and Corvalán, 2006; WHO, 2004). Therefore the CCME established CWS for benzene in 2000 in order to reduce its adverse health impacts.

A 2-phase approach was endorsed in 2000 by the CCME (except Quebec) to reduce population exposure to benzene. Phase 1 establishes a target of 30% reduction in national emissions from 1995 levels by the end of 2000. Key actions included the benzene in gasoline regulations, voluntary initiatives to reduce emissions from natural gas dehydrators and the chemical industry, and implementation of measures in the steel industry. Phase 2 (endorsed in 2001) establishes a target of 6-kilotonne reduction in national emissions by 2010 in addition to the 30% reduction established in phase 1. Phase 2 also provides national application of Best Management Practices and develops the function for additional reductions to be achieved through other air issues (including other CWS initiatives). Key actions includes follow-through on the benzene in gasoline regulations and voluntary initiatives to reduce emissions from natural gas dehydrators and the steel industry.

In addition, Canada and the United States (US) signed the *Canada-US Air Quality Agreement* in 1991 to address transboundary air pollution leading to acid rain. Both countries agreed to reduce emissions of SO_2 and NO_X. In December 2000, the *Ozone Annex* was added to the Agreement to address transboundary air pollution. More precisely, Canadian NO_X emissions are to be reduced by 39% by 2007 and 44% by 2010, relative to 1990 levels. In 2003, Canada and the US jointly developed a *Border Air Quality Strategy* in order to identify projects which would enable to significantly reduce transboundary air pollution.

3.3.2.2 The National Ambient Air Quality Objectives

The National Ambient Air Quality Objectives (NAAQOs) establish objectives at federal and provincial levels to protect the population and the environment. As such, NAAQOs play an important role in air quality management.

The NAAQOs propose long-term air quality objectives. They were established and reviewed based upon recommendations of the National Advisory Committee Working Group on Air Quality Objectives and Guidelines (WGAQOG). This responsibility has been transferred to the Committee on Health and Environment (CHE – see below). The NAAQOs are promulgated by the federal government. However, as provincial governments have primary responsibility in many areas of air pollution, they may establish their own NAAQOs and implement them as appropriate.

3.3.2.3 Cleaner gasoline

Actions undertaken to improve air quality are often associated with actions to reduce emissions from the transportation sector. Over the past decade there has been considerable effort by government in this area. In the last three decades, Canada has adopted increasingly stringent controls on fuels and motor vehicle emissions. Canada current vehicle emissions standards are aligned with US requirements. Under the ten year federal agenda for cleaner vehicles, engines and fuels, new emissions standards for SO_X, NO_X and ozone-depleting substances were issued in 2001. Other initiatives include the removal of lead and reductions of benzene and sulphur levels.

The *Benzene in Gasoline Regulations* took effect in July 1999 and prohibit the supply of gasoline containing more than 1% benzene by volume.

The federal *Sulphur in Gasoline Regulations* took effect in July 2002 and required an average sulphur concentration in gasoline of 150 mg/kg by July 2002 and of 30 mg/kg by January 2005. These reductions represent a cut in sulphur contents by more than 90% from previous levels. Since 2005, low-sulphur gasoline (*i.e.* with an average sulphur level of less than 30 mg/kg) has been required throughout Canada.

In addition, the *Sulphur in Diesel Fuel Regulation* sets maximum limit for sulphur contained in on-road, off-road, rail and marine diesel fuels. The maximum allowable limit for sulphur in on-road diesel fuel is 15 mg/kg starting June 1, 2006. This regulation has been set in order to complement the stringent new exhaust emission standards to be introduced on mid-2006 and 2007 vehicles.

3.3.2.4 Canadian Acid Rain Programme

The *Canadian Acid Rain Programme* was created in 1985 to reduce SO_2 emissions to 50% below the 1980 level by 1994. In 1998, the *Canada-wide Acid Rain Strategy for Post 2000* established new SO_2 emission reduction targets for provinces in Eastern Canada and proposed preventative measures to protect Western and Northern Canada from acid rain. For instance, Ontario, Quebec, New Brunswick and Nova Scotia were committed to cut SO_2 emissions by 50% beyond already existing levels by 2010 to 2015. Ontario was also committed to reduce its NO_X emissions too (OECD, 2004a). The *Canada-wide Acid Rain Strategy for Post 2000* is currently being reviewed in order to determine whether a revision of its objectives or its measures is necessary.

In addition, Canada has signed the Convention on Long Range Transboundary Air Pollution (LRTAP) which sets SO_2 emission caps. Targets for SO_X, NO_X and VOC to 2010 were also imposed on Canada as the country has also signed the Gothenburg Protocol.

3.3.2.5 Air Quality Indices

In 1980, the federal and provincial governments jointly proposed the *Index of the Quality of the Air* (IQUA) which prompted the development of air quality indices (AQI) in several provinces during the 1980s. AQIs convert the concentrations of various pollutants into a single value that can be used to represent the overall quality of air relative to health impacts and/or environmental targets. For example, an index value of 50 corresponds to a concentration in ozone of 82 parts per billion[46].

The AQI can be used to describe either measured air quality or predicted air quality. When index levels are expected to rise above predetermined levels, warnings are issued to the public. Such warning systems are in operation in Ontario, Quebec, Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island, Alberta and British Columbia. They therefore enable people to behave according to the information provided and to protect themselves from the adverse health impacts of air pollution.

However, concerns about fundamental flaws in the assumptions used in the calculation of the AQIs (*e.g.* they do not account for the cumulative effects of multiple pollutants (Stieb et al., 2005)) have led

[46] For more details see http://library.usask.ca/lists/govinfo/2001/0093.html

Environment Canada and Health Canada to work to improve the AQIs and their calculation so that they better reflect health risks. Indeed, in most jurisdictions, AQIs are calculated by comparing individual pollutants to standards. Their validity has therefore been called into question. Several Canadian provinces have already implemented remedial measures to ensure that their AQIs more accurately reflect the effects of current air pollution levels. Most notable changes include the inclusion of $PM_{2.5}$ in the AQI of the provinces of Alberta, Ontario, British Columbia and Quebec.

Since 2001, Environment Canada and Health Canada support work to produce a new index that would reflect the overall health risks associated with all types of air pollution. This alternative AQI is presented in Stieb *et al*. (2005). The Air Quality Health Index (AQHI) will consist of a no threshold, multi-pollutants air quality index, based on evidence from studies of short-term exposure (*c.f.* Burnett *et al*. (2000)). The AQHI is being tested.

3.3.2.6 The Canadian Smog Advisory Programme

The *Canadian Smog Advisory Programme* was put in place in 1993 to advise people when hourly ozone concentrations were likely to exceed 80 parts per billion by volume. This level is defined as the *National Ambient Air Quality Objective* maximum acceptable limit. This national initiative has been adopted in a number of provinces, including Ontario, Quebec, New Brunswick, British Columbia and Nova Scotia.

3.3.3 Examples of cost-benefit analysis of air quality policy

This section proposes examples of cost-benefit analyses (CBA) undertaken in the context of air quality policy in Canada.

In Canada, a CBA has been conducted in order to determine the most efficient air-quality options (CWS Development Committee for Particulate Matter and Ozone, 1999). This CBA was done in the context of CWS for particulate matter and ozone. The Air Quality Valuation Model was used to estimate the health and environmental benefits associated with reductions in ambient levels of PM and ozone. The AQVM adopt a VSL of C$4.1 million (1996 Canadian dollars). Values have been discounted at a 5 % rate. Results from the CBA showed that the number of avoided deaths was rather substantial, (from 326 to 3,563 according to different scenarios) and so were the monetised benefits. Table 6 below presents benefit and cost values and benefit to cost ratios for the different policy options.

Table 6. Benefits and costs of various air quality options

Target pollutant level	Avoided mortality (death / year)	Benefit of avoided mortality (million CA$ / year)	Estimated cost (million CA$ / year)	Benefit to cost ratio
Pm_{10} / $PM_{2.5}$ ($\mu g/m^3$)				
70/35	1,021	4,186	170	24.6
60/30	1,639	6,720	620	10.8
50/25	2,790	11,439	1,600	7.1
Ozone (ppb)				
70	167	685	790	0.9
65	203	832	1,871	0.4
60	239	980	6,502	0.2
CWS: PM_{10}/$PM_{2.5}$/Ozone				
60/30/65	1,842	7,552	2,491	3.0

Source: Pandey *et al*. (2003).

This table clearly shows that societal benefits of any policy option are much larger than corresponding social costs. Reductions in PM levels are particularly beneficial while reductions in ozone exhibit costs larger than benefits. However, the overall CWS for both PM and O_3 easily pass the cost-benefit test, with a benefit-cost ratio of 3.

Another CBA was undertaken in 1998 in order to estimate the environmental and health benefits of a reduction of sulphur levels in gasoline. It was undertaken in the context of the Cleaner Vehicles and Fuels programme developed to reduce emissions in ambient air from vehicles. The 1994 sulphur level content in gasoline was 360 ppm, one of the highest in OECD countries. It was then clear that reducing the sulphur content of gasoline would contribute to improving air quality in Canada and also to reduce the adverse environmental and health impacts associated with vehicle emissions. Five policy alternatives to reduce emissions from vehicles were examined and the scenario proposing to reduce the sulphur content from 360 ppm to 30 ppm was the option selected. The Health and Environmental Impact Assessment Panel Report estimated that over the 20-year period of analysis (2001-2020), reducing sulphur in gasoline to 30 ppm would result in approximately 2100 avoided premature deaths, 90,000 avoided respiratory cases in children and 3,200,000 fewer acute asthma symptom days. In addition, the national benefits would amount to $12.7 billion over 20 years (using a 3% discount rate). The Panel conclusions were supported by a Health Canada study published in an academic journal (Burnett *et al*., 1998). Given the massive health and environmental gains associated with a reduction of sulphur content of gasoline, a regulation was implemented a few years after these recommendations.

At the provincial level, CBA are also undertaken. For instance, in Ontario, a CBA was carried out to evaluate the replacement of electricity production from coal (Ministère de l'énergie de l'Ontario, 2005). A CBA was undertaken to assess the financial costs (which include investment, operating, maintenance and fuel costs), and the health and environmental costs of four different scenarios of electricity production.

The four scenarios considered are the following:

- Scenario 1: "status quo": nothing changes, coal plants are used in the context of current regulatory regime.
- Scenario 2: "all gas": electricity is produced by gas power plants specially designed to this end.
- Scenario 3: "nuclear and gas": electricity is produced by renewed nuclear power plants and new gas power plants.
- Scenario 4: "stringent measures against emissions": coal power plants are still used but the best technology to reduce emissions has to be installed.

Table 7 below presents estimated financial, health and environmental costs associated with each scenario. The unit is million Canadian dollars. The "net benefit" row provides estimates of the net benefits in comparing scenarios 2 to 4 with the status quo situation.

Table 7. Financial, health and environmental costs of the different policy scenarios

Costs	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Financial costs	$985	$2076	$1529	$1367
Health costs	$3020	$388	$365	$1079
Environmental costs	$371	$141	$48	$356
Total costs	$4377	$2605	$1942	$2802
Net benefits		$1772	$2435	$1575

Source: Ministère de l'énergie de l'Ontario (2005)

Health costs vary between $0.4 billion (scenario 3) and $3 billion (scenario 1). As such, the implementation of scenario 3 would lead to health benefits of about $2.6 billion. However, it should be noted that this analysis does not cover all health and environmental damages. In addition, the sensitivity

analysis showed that net benefits were very sensitive to the value of the discount rate and the WTP of individual to reduce the risk of premature deaths from air pollution exposure. Nonetheless, scenario 3 is likely to produce the highest net benefit. These results were echoed in current initiatives undertaken by the Government of Ontario.

4. Governance of environmental health issues

4.1 Environmental health in Canada

Although environmental health is a relatively new policy area, environmental health issues have always been important in Canada policy making. As such, the links between environment and health are set out in a number of Acts and regulations. Some of them are listed below.

Canadian Environmental Protection Act (1988; 1999)

The main regulation related to environment and health is the *Canadian Environmental Protection Act* (CEPA). The original CEPA passed as federal environmental law in 1988. The focus was at that time on the protection of the environment. It allowed for the assessment of air pollution and control of its impacts through the setting of *National Ambient Air Quality Objectives* (NAAQO) and the *Canadian Wide Standards* (CWS). The revised CEPA (or CEPA 1999) became law on March 2000 after a five-year review process. It then shifted its focus on pollution prevention and protection of the environment and human health, in order to contribute to sustainable development. CEAP and its administration must be reviewed every five years by the Parliament.

Canadian Environmental Assessment Act (1995; 2003)

The *Canadian Environmental Assessment Act* (CEAA) has been in force since 1995. It reviewed in 2000 and amended in 2003. The Act promoted environmental impact assessment and collaboration between the federal, provincial and territorial governments.

The CEAA also addresses the effects of environmental degradation on human health. Indeed, "*in administering the Act, federal authorities are obligated to exercise their powers in a manner that protects the environment and human health, and applies the precautionary principle*"[47]. Moreover, under the CEAA, "environmental effect" includes as any change in health or socio-economic condition caused by environmental sources (Health Canada, 2004).

Under the CEAA and in the context of environment and health assessment, Health Canada is responsible for ensuring that health is included in environmental assessments, that health implications are correctly identified and evaluated in order to minimise health risks to the population. Health Canada has an expert authority if population's health may be at risk.

Including health in environmental assessments in Canada is also recognised by provinces and territories under different legislative acts and requirements. Health is therefore included in environmental assessments in many Canadian jurisdictions (*e.g.* British Columbia, Alberta, Ontario, Quebec, Nova Scotia, etc.).

Food and Drugs Act (1985)

[47] Source: http://www.ceaa-acee.gc.ca/013/intro_e.htm.

The *Food and Drugs Act* applies to all food, drugs, cosmetics and medical devices sold in Canada, whether manufactured in Canada or imported. It specifies the safety, compositional, nutritional and labelling requirements for food. In addition, new drugs cannot be marketed in Canada without a Notice of Compliance from Health Canada ensuring that the new drug is in compliance with the *Food and Drugs Act*. Medical devices, cosmetics and "old" drugs must also meet safety standards.

The CEPA 1999 amended the *Food and Drugs Act*, requesting the assessment of the environmental and health impacts of the release of food, drug, cosmetic and device into the environment.

Hazardous Products Act (1985)

The *Hazardous Products Act* is administered by the Minister of Health. It prohibits the advertising, sale, and importation of hazardous products. The objective of the *Hazardous Products Act* is to protect the health and safety of consumers and workers.

Pest Control Products Act (1985)

The *Pest Control Products Act* regulates products used for the control of pesticides and organic functions of plants and animals. Under the Pest Control Products Act, any pesticide must be controlled before being manufactured, sold or used.

Until recently the Act did not provide information on what risks would be acceptable. Due to public concern over pesticide risks, a new version of the *Pest Control Products Act* recently passed. When it becomes law, it will require the consideration of the health risks associated with exposure to a specific pesticide and will apply more stringent standards in order to protect the most vulnerable populations, such as children. In addition, all registered pesticides will need to be re-evaluated at least every 15 years.

Radiation Emitting Devices Act (1980)

The *Radiation Emitting Devices Regulations* were introduced in 1980 to protect sunlamp users from exposure to ultraviolet radiation by restricting the time of exposure to the time set on the timer provided with the device by the manufacturer.

Subsequent new technology, new designs for tanning equipment and recent scientific studies have shown that the 1980 requirements need to be updated to ensure safer use of new equipment entering the market and to minimize unnecessary exposure to ultraviolet radiation.

Health Act (1985)

The *Health Act* is administered by the Minister of Health and deals with a range of issues intended to protect the health of the public. Much of the *Health Act* is concerned with preventing health hazards. Health hazards include any "*condition or thing that does or is likely to endanger the public health, or prevent or hinder the prevention or suppression of disease*". The Act may be advocated when environmental issues are serious enough to pose an actual threat to human health. For example, regulations made under the *Health Act* focus on the standards water treatment must meet in order to ensure that tap water is fit for human consumption.

4.2 Co-ordination of environmental and health policies

4.2.1 Main actors involved

Environment Canada and Health Canada both have significant legislated responsibilities related to environment and health issues. At the federal level, Environment Canada is responsible for the protection of the environment. Therefore, Environment Canada is the department that is responsible for the key regulations and acts concerning environment and health issues, such as the *Canadian Environmental Protection Act* (1999) and the *Department of Environment Act* (1985).

The Canadian Environmental Assessment Agency is the federal body responsible for the *Canadian Environmental Assessment Act* (2003) and its regulations. Both under the responsibility of the Minister of the Environment, Environment Canada and the Canadian Environmental Assessment Agency work together closely on areas of shared interest.

Recently, Health Canada has moved beyond an organisation of risk assessment to an active player in the environment and health arena. Indeed, Health Canada undertakes many initiatives in the environmental health area. Health Canada is responsible for a certain number of Acts related to environmental health, such as the *Food and Drugs Act* (1985), the *Hazardous Products Act* (1985), *Drinking Water guidelines*, the *Waste Management Act* (1992), the *Pest Control Products Act* (1985), and the *Radiation Emitting Devices Act* (1980). Health Canada also has a *Safe Environment* programme. Health Canada works closely with other federal departments, agencies and health stakeholders to reduce health and safety risks to the population. As such, Environment Canada and Health Canada share responsibilities for environmental health issues.

Within the federal system, both Environment Canada and Health Canada have levers to address health impacts of the environment. Environment Canada and Health Canada work jointly and co-propose regulations to reduce the health impacts of air pollution. More precisely, one of Health Canada's activities is to explore and understand the impacts of poor air quality on health. Health Canada therefore conducts fundamental research and risk assessment, and synthesises existing scientific information on various air pollutants. Health Canada's science serves as a basis for strategies that aim at improving air quality, such as Canada's Clean Air Agenda. The "Air Health Effects Division" focuses on air quality issues and provides the scientific-supporting direction for federal and cross-departmental initiatives. Health Canada also provides information to the public about actions to undertake and health risks associated with air pollution.

More generally, Environment Canada collects data on air quality. Then, Health Canada provides the medical expertise to Environment Canada based upon health data Health Canada collected. Finally, Environment Canada provides the economic expertise and regulates according to Health Canada health assessments. Environment Canada is therefore involved in environmental evaluation and economic expertise of environment and health issues and in air quality data collection, while Health Canada focuses on health data collection and health impact assessments. Because of changes in its organisational structure, Health Canada has to rely on Environment Canada economic expertise for economic evaluation. Other stakeholders are also involved in the decision-making process, including for example external consultants, industry (for scrutiny and consultation processes), and the Royal Society of Canada (a think tank group).

4.2.2 Current status of co-ordination

Health Canada and Environment Canada share responsibilities for environment and health issues. In addition, federal departments share responsibility with provincial governments. In this complex

institutional framework, communication and interaction between institutions and jurisdictions are required as well as specific processes for reaching decisions.

Therefore many initiatives have been undertaken to facilitate this inter-departmental and intra-governmental co-ordination, and to ensure horizontal coherence across departments as well. A number of committees testify to the active collaboration of environment and health ministries. Some of them are presented here.

The Committee on Health and the Environment

The Committee on Health and the Environment (CHE), created in 2005, is a federal, provincial and territorial committee and the principal forum for advice and joint-action on health and environmental issues of national interest. CHE is a liaison committee to the Advisory Committee on Population Health and Health Security (ACPHHS). It also reports to the CCME's Environmental Planning and Protection Committee.

CHE provides ongoing support to these committees by addressing significant political, regulatory, guideline and programme issues related to the impact of the environment on health.

The CHE strategic goals are two-fold:

- Increase capacity in Canada to address issues related to the impact of the environment on health within a population health approach[48];
- Facilitate the integration of health and environmental issues at the national level.

To this end, the CHE is expected to develop a national Strategy applicable to all jurisdictions in Canada. The CHE meets twice a year. It is constituted of a representative of each health and environmental sector from each jurisdiction. CHE is co-chaired by Environment Canada and Health Canada. It is involved in the Air quality group (to develop and update CWS), the Air Quality Index from a health perspective, children's health, and in monitoring and tracking population exposure.

CEPA Committees

Environment Canada and Health Canada jointly administer the 1999 CEPA. The two departments collaborate on research activities related to environment and health. In addition, Environment Canada and Health Canada have signed a Memorandum of Understanding to ensure the protection of the environment and human health, more specifically to ensure that the environmental and health impacts of new substances in products regulated under the *Food and Drugs Act* are correctly addressed.

Two Committees have been established under CEPA: the Environment Canada/Health Canada CEPA management Committee (established pursuant to the 1990 Memorandum of Understanding between Health Canada and Environment Canada concerning toxic substances and CEPA) and the CEPA National Advisory Committee. The CEPA National Advisory Committee (NAC), under CEPA 1999, is the main inter-governmental forum for the purpose of enabling national action and avoiding duplication in regulatory activity among governments. The CEPA NAC is composed of officials from Environment Canada and Health Canada, one representative of each province and territory, as well as six representatives of aboriginal governments. The NAC is co-chaired by Environment Canada and Health Canada.

[48] A population health approach focuses on the health of a population as a whole and on the health of sub-groups within the population by addressing factors that contribute to health and their complex interactions.

Working Group on Air Quality Objectives and Guidelines

The Working Group on Air Quality Objectives and Guidelines (WGAQOG) is composed of representatives from federal, provincial and territorial departments of environment and health. The WGAQOG was established to review scientific information, to develop *National Ambient Air Quality Objectives* (NAAQOs) for airborne pollutants and to undertake their periodic review, as well as to provide support in the development of the CWS. The WGAQOG ceased to meet in 2000 and its functions are now under the CHE.

Deputy Ministers' Policy Committee on the Environment and Sustainability

The Deputy Ministers' Policy Committee on the Environment and Sustainability was established in order to implement an integrated and coherent environmental and sustainable framework, and to develop guidance in areas such as climate change, environmental health, and setting long-term environmental objectives.

This Committee is chaired by the Deputy Minister of Environment Canada and includes a representative at the Deputy Minister level from all departments.

Deputy Ministers' Policy Committee on Economic Prosperity, Environment and Energy

The Deputy Ministers' Policy Committee on Economic Prosperity, Environment and Energy was established to promote integrated policy development in support of federal priorities and medium-term planning. The Committee is chaired by the Deputy Minister of Environment Canada and includes representatives from ten other federal departments, including Health Canada. The Committee provides advice on Canada's long-term economic competitiveness and prosperity, as well as direction on environmental policy and sustainability of Canada's natural resources.

Current level of co-ordination

Co-ordination between Environment Canada and Health Canada is very effective. The different committees and working groups dealing with environment and health issues are active and facilitate the co-ordination both over and across levels of governments. For a great number of reasons which are further explained in the following section, Environment Canada and Health Canada work in close collaboration to find ways to better address environment and health issues. Examples of their successful co-ordination could include the joint development of AQVM (which signifies a joint will to use a coherent approach when evaluating regulatory proposals), the formulation and implementation of the AQHI, and many regulations (including the Sulphur in Gasoline Regulation, and the Canadian-wide Standards for PM and O_3).

4.3 Means for co-ordination

In addition to committees dealing with environmental health issues, other means have been implemented to encourage collaboration between the two departments. They are presented here.

4.3.1 Institutional means

The proposed *Government Directive on Regulating* (still under development) requires that departments and agencies are responsible for working together to develop and implement regulation, and minimise the aggregate and unintended impacts of regulations. More specifically, departments and agencies are expected to:

- Identify and consult with other federal departments and agencies that have a specific interest in the proposed regulation;

- Identify similar or related regulatory requirements – either existing or proposed – in the area regulated; and,

- Assess these requirements to determine the likelihood for aggregate impacts and the potential for complementary and co-operative approaches.

The forthcoming *Government Directive on Regulating* will therefore increase the moral "obligation" of collaboration between federal departments.

The *Guidelines for Effective Regulatory Consultation* (Government of Canada Privy Council Office, 2006) highlights the importance of collaboration and co-ordination within a department and between departments. In particular, inter-departmental co-ordination is necessary to establish coherence and support in the government. Indeed, co-ordination across departments allows the government to speak with one voice and to convey consistent messages. It also provides all relevant departments and agencies with an opportunity to participate in the decision-making process. Interdepartmental discussion and coordination enables officials to consider their initiative with respect to initiatives undertaken in departments regulating similar issues. This is particularly important for environmental health which is a cross-cutting area, covering the activity of several departments. Finally, effective co-ordination will prevent duplication of work and waste of time which results in more effective and efficient use of government (scarce) resources.

In addition, the Canadian Council of Ministers of the Environment has been created to provide a multi-level framework on environmental issues. As such, it plays a leading role in integrating views across levels of government and improving collaboration between federal departments and the different jurisdictions on environmental issues.

One of the objectives of the *Canadian Environmental Assessment Act* (CEAA, 2003) is to promote communication and coordination between federal authorities. Amendments to the Act include measures to improve coordination among federal departments and agencies, particularly when several bodies are involved in the same environmental assessment. The Act also aims to prevent overlapping and duplication among jurisdictions. As such, departments are required by the CEAA to work together.

4.3.2 Other means

An important aspect of effective inter-departmental co-ordination is coherence across departments. First, all departments are required by a federal Act to apply the same valuation methodology and process for policy appraisal, *i.e.* CBA. In addition, the fact that Health Canada and Environment Canada use the same approach when valuing the environmental and health benefits of the proposed policy option ensures a good level of co-ordination and coherence between them. It is also important to note that Health Canada and Environment Canada have jointly developed the model they use for this purpose (AQVM). It therefore suggests that their collaboration goes far beyond a joint proposition of regulations: they have a common objective and they work together, as partners, to achieve it.

In using the same approach, Health Canada and Environment Canada use the same values when assessing the benefits and costs. This may not be the case for all departments. For example Transport Canada uses different values, a lower VSL of $1.76 million, compared to the $4 million figure used by Environment Canada and Health Canada. In their analyses, Transport Canada generally includes the full costs of transport which correspond to the overall impacts and not only the environmental and health impacts (Zhang *et al*., 2004).

In addition, there is a clear definition of each department's responsibilities. Indeed, with regard to environment and health issues, Health Canada provides health impact assessment to Environment Canada which then carries out an economic analysis and regulates accordingly. Their roles are clearly defined so there is no confusion and misunderstanding. Another related aspect is that there is no leader or follower. It facilitates the working relationships as the two departments act more as partners than as competitors.

The nature of the working relationship between the two departments is also very important. Health Canada and Environment Canada are well co-ordinated because there is a long record of working effectively together. There have been long standing relationships on the scientific level and lots of collaboration on the economic valuation side. Co-ordination between Environment Canada and Health Canada on environment and health issues is the "standard". There has been a natural evolution to work together and now it has become a way of working. It is an ongoing co-ordination and collaboration. The establishment of a committee on environment and health has made the collaboration even easier.

It is possible that the format of co-ordination helps effective co-ordination. Indeed, the use of a forum format (such as the National Round Table on the Environment and the Economy) facilitates the exchange of ideas and allows for a better understanding of each other and of the respective priorities and objectives. It provides impetus and helps promote action and awareness for raising issues, finding new approaches, reaching agreement and fostering action. The timing of meetings is important: organising regular meetings ensures good working relationships.

4.3.3 Obstacles

Based upon interviews, a number of issues have been identified as being important obstacles to improved co-ordination between environmental and health policies. Examples of such obstacles could include the following:

- Different priorities: Health Canada and Environment Canada have different priorities. Environment Canada priorities are the protection of the environment and human health. Although Health Canada has many responsibilities and undertakes many initiatives in the environment and health field, environmental health is not as important as other priorities of Health Canada, such as healthcare and access to healthcare services. As such, there is no federal research agenda on environment and health[49].

- Lack of resources: as there is no formal agenda on environment and health issues, there are limited resources allocated to research in this area. The lack of resources can make co-ordination difficult. A funding pot secured for a long time would ensure an effective collaboration between the two departments.

- Fragmentation: the institutional framework in Canada is complex, in part because of the sectoral fragmentation between a great number of specialised departments at both the federal and provincial levels (OECD, 2004b). Responsibilities are in general shared between the different departments and jurisdictions, which may not facilitate co-ordination. This is particularly true for the environment and health field which may be too fragmented, according to some people interviewed. Communication and credibility are therefore not straightforward and may complicate co-ordination.

- Lack of evidence: decision-making in Canada, and more specifically policy appraisal, relies heavily on scientific evidence. However, at the moment, the relationships between human health

[49] Personal communication with officials from Health Canada.

and the different types of environmental degradation are not perfectly understood and lot of uncertainties remain. As such, it is quite difficult to base recommendations on such limited information. For instance, although it has been acknowledged that children are particularly vulnerable to environmental pollution, the scientific evidence is not important enough to base more stringent standards, to better protect children from environmental hazards. A paradox has to be solved: on the one hand, there is a pressing need for more research programmes necessary to obtain the scientific evidence required; but, on the other hand, there is an obvious lack of resources devoted to research on environmental health.

- Decreasing interest: as a complement to all obstacles mentioned above, there is a general decreasing interest in environmental health issues. Environmental health is not a priority in all departments. New emerging issues coupled with "classic" priorities (*e.g.* health care and health services are the main priorities of the department of Health) leave little resources (in time and money) to work on environment and health issues.

5. Concluding remarks

The joint responsibilities of Health Canada and Environment Canada on environment and health issues require them to work together. In addition, both Ministers have to sign the regulations they jointly propose. Both Health Canada and Environment Canada have key regulatory roles which are quite clear: Environment Canada focuses on environmental policies/regulations/evaluations and economic valuation while Health Canada provides the medical expertise and health assessments.

Environmental health issues cover a broad scope. Therefore interdepartmental co-ordination is necessary to result in effective policy-making. To this end, important regulatory Acts, such as CEPA and CEAA, have encouraged cross-departmental cooperation and collaborative decision-making. Co-ordination between Environment Canada and Health Canada was also particularly required to reduce overlap and to harmonise each ministry's role. Indeed, CEPA engages different ministries in a partnership while CEAA gives shared responsibilities for all federal departments, including EC and HC. The many initiatives that have been undertaken in the context of environment and health have brought coherence among the various stakeholders involved. They all share the same priority concerns and they make collective decisions.

The policy co-ordination between Environment Canada and Health Canada is very effective. Examples of effective collaboration between the two departments include important regulations, such as the sulphur in gasoline regulation or the CWS for PM and O_3, and informational programmes, such as the development of the AQI or the smog alert programmes. They also collaborate upstream, like for example for the joint development of the AQVM, which can be used by all departments to assess the environmental and health benefits of regulatory proposals.

This case study highlights potential means that have helped improve the co-ordination between environmental and health policies. They include:

- Coherent decision-making framework across departments;
- Clear definition of each Ministry's role and responsibilities;
- Approach based on partnership and networks; and,
- Long-term collaboration;

Another aspect that has not been discussed in detail in the report is the extensive use of consultation of stakeholders and citizens at the stage of policy elaboration. Indeed, the involvement of relevant

stakeholders at an early stage of the decision-making process implies transparency, openness to the public and effective public management. In addition, it forces departments to provide high quality and effective work. It therefore may help co-ordination between departments.

As policy co-ordination of environmental health issues is very effective, the next step to clear seems to be policy integration. Policy integration of environment and health issues would result in one joint policy for all sectors involved. It can be implemented by the creation of a council or an agency specifically dealing with environmental health issues. The idea of an environment and health institute was first considered but it was rapidly abandoned. The number of initiatives undertaken in environment and health suggest that there is a place to be filled in.

Policy integration of environmental health issues can also be achieved through the development of an Environment and Health Strategy, defining long-term, clear and comprehensive priorities and objectives. Health Canada is currently working in collaboration with Environment Canada in order to find the best way to address the adverse environmental impacts on human health across the federal system. This collaboration could result in a long-term strategic vision for environmental health.

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