

**RISK MANAGEMENT IN ENVIRONMENTAL POLICY:  
LESSONS FROM AMERICAN  
AND JAPANESE EXPERIENCES**

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## ABBREVIATIONS

ACEA	European Automobile Manufacturers Association
BCA	Benefit-cost Analysis
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change
CO <sub>2</sub>	Carbon dioxide
EPA	Environmental Protection Agency
EU	European Union
ISO	International Organization for Standardization
JAMA	Japan Automobile Manufacturers Association
KAMA	Korean Automobile Manufacturers Association
Keidanren	Japan Federation of Economic Organizations
METI	Ministry of Economy, Trade and Industry
OECD	Organisation for Economic Co-operation and Development
PRTR	Pollutant Release and Transfer Register
RIA	Regulatory impact analysis
TRI	Toxics Release Inventory
U.N.	United Nations
UNFCCC	United Nations Framework Convention on Climate Change



## INTRODUCTION

In recent years, many environmental problems – local, regional, and global – have come to the fore. Traditionally, in order to address such issues, many countries have undertaken mandatory command-and-control regulations. Conversely, especially in industrialized countries, other methods, such as voluntary approaches or their combination with regulatory measures, have been introduced. Whenever a government considers appropriate ways to solve environmental issues, it causes a certain amount of conflict among stakeholders. In such cases, the cost-effectiveness and necessity of such measures are discussed, and stakeholders focus on the existence of how much scientific certainty surrounds these environmental issues. Lack or insufficiency of scientific certainty usually results in controversy over the introduction of new measures.

Based on these experiences, the “precautionary approach,”<sup>1</sup> a significant concept for environmental policy, was established internationally in the 1990’s. In 1992, at the United Nations (U.N.) Conference on Environment and Development in Rio de Janeiro, the Rio Declaration on Environment and Development, which was composed of 27 principles, was announced. Principle 15 stipulated: “In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”<sup>2</sup> This principle does not specifically mention how we should address environmental issues that lack full scientific

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<sup>1</sup>U.N., Rio Declaration of Environment and Development, 15 February 2005  
<<http://www.unep.org/Documents/Default.asp?DocumentID=78&ArticleID=1163>>.

<sup>2</sup>U.N., Rio Declaration.

certainty, but emphasizes “threats of serious or irreversible damage” and “cost-effective measures.” accompanying the Rio Declaration, this U.N. Conference adopted the Agenda 21 Declaration, which reflected a global consensus and political commitment at the highest level with regard to developmental and environmental cooperation and also identified the program areas that should be priorities for the various players.<sup>3</sup> Both declarations were compiled based on the scientific concept of risk assessment and management.<sup>4</sup>

The risk assessment method is a generally useful scientific measure; thus, it is adopted in many countries when governments need to make regulatory decisions in order to protect the environment and human health from environmental pollution. But the range of its application is limited by the existence of available data. On the other hand, the concept of “risk management” is less familiar, but becoming more important. One reason for this is that recent environmental issues are becoming more invisible and their future effects more difficult to predict than in the past.<sup>5</sup> The difference between conventional pollution problems and recent environmental issues can be described by the magnitude of risks.<sup>6</sup> Another reason is that further improvement by the regulatory approach will likely be very expensive for the additional benefit gained, even though this approach could contribute to protecting the environment and human health. For instance, with regard to lifesaving, among several administrative interventions, risk reduction policies using environmental control will likely tend to be less cost-effective than other controls in areas

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<sup>3</sup>U.N., Programme for the Further Implementation of Agenda 21, 15 February 2005  
<<http://www.unep.org/Documents/Default.asp?DocumentID=52>>.

<sup>4</sup>Risk is generally defined as the probability that a substance or situation will produce damage to human health and/or the environment under specified conditions. It is a combination of the probability that an adverse effect will occur and the consequences of the adverse effect, and is determined by hazard and exposure.

<sup>5</sup>Toshihiro Oka, *Kankyo Seisaku Ron* (Tokyo: Iwanami Shoten, 1999) 1.

<sup>6</sup>Junko Nakanishi, *Kankyo Risuku-gaku: Fuan no Naka no Rashinban*. (Tokyo: Nihon Hyoron-sha, 2004)

such as safety or health as demonstrated by Tengs et al.<sup>7</sup> and Kishimoto.<sup>8</sup> These authors analyzed a number of life-saving interventions and defined cost-effectiveness as the cost per life-year saved, (Table 1).

To this end, various types of management options for reducing risks have been explored, and managing them appropriately is becoming more important. In cases where it is difficult to reach a consensus about introducing regulatory measures because of a lack of full scientific certainty as well as ambiguity about the cost-effectiveness, governments sometimes adopt voluntary approaches instead of legislating for regulatory measures. But the efficiency of these approaches has not been sufficiently explored from either the environmental or economic perspective.

This research examines whether voluntary approaches are effective measures in both environmental and economic policy and how we should create environmental policy in certain situations. It provides an overview of the role of risk management in traditional environmental regulations in Chapter 1 and surveys the limitations of regulatory approaches based on risk assessment in Chapter 2. Chapter 3 presents the progress of non-regulatory approaches, especially voluntary approaches, and examines their positioning in the policy frameworks of the United States and Japan. Chapter 4 explores typical case studies of voluntary approaches in the United States, Japan, and the European Union; Chapter 5 presents the empirical findings on the environmental and economic efficiency of voluntary approaches, and proposes a new framework

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<sup>7</sup>Tammy O. Tengs, Miriam E. Adams, Joseph S. Pliskin, Dana Gelb Safran, Joanna E. Siegel, Milton C. Weinstein, and John D. Graham, "Five-hundred Life-saving Interventions and Their Cost-effectiveness," *Risk Analysis* 15 (1995): 369-390.

<sup>8</sup>Atsuo Kishimoto, "The Cost-effectiveness of Lifesaving Interventions in Japan," *Proceedings of the 2<sup>nd</sup> International Workshop on Risk Evaluation and Management of Chemicals*, Yokohama National University (1999): 80-87. 15 February 2005 <<http://risk.kan.ynu.ac.jp/rmg/WS99PDF/99kishimoto.pdf>>.

for environmental policy making. Chapter 6 covers the economic analysis of voluntary approaches.

## CHAPTER 1

### THE ROLE OF RISK MANAGEMENT IN ENVIRONMENTAL REGULATIONS

#### Policy Making Based on Scientific Knowledge

During the last several decades, risk management has been applied in many policy fields such as food safety, pharmaceuticals, and nuclear energy, and its application has been extended to environmental regulation to protect human health and the environment. In these fields, risk management is traditionally defined as the process of deciding what to do about an assessed risk or group of risks. It is also defined as the process of deciding how dangerous the matter is. The Carnegie Commission on Science, Technology, and Government defined risk assessment as follows:

The first step in the process of risk assessment is to identify and qualitatively describe the hazard to be assessed. Next, the level of exposure to the hazardous entity is estimated, along with the response of the organisms in question (usually humans, but sometimes, as when evaluating ecosystems, other species) to different dose levels, using the best scientific data available. Finally, the above information is combined to characterize the risk quantitatively.<sup>9</sup>

Risk assessment is crucial in setting the target for risk management such as ambient standards, especially in introducing command-and-control regulations because these regulations are needed to prescribe quantitative limits on emissions of pollutants and certain other main causes of pollution. Such information is provided by the results of risk assessment. In other words, as long as risk assessment is able to give the rationale behind the regulation, the regulatory authorities are able to decide whether to introduce new regulatory measures and to

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<sup>9</sup>Carnegie Commission on Science, Technology, and Government, *Risk and the Environment: Improving Regulatory Decision Making* (New York: 1993) 32.

manage the regulatory measures based on the best available scientific knowledge. Risk concept, in particular, which was developed in the field of radiological protection, is more effective when probabilistic effects caused by such phenomena as nuclear radiation or carcinogens are addressed. These effects have no threshold levels; thus, it is not possible to establish a clear line between safety and danger.<sup>10</sup> Even if uncertainty remains about an environmental issue, risk concept has the potential to quantify this uncertainty and to explain the impact of the environmental destruction wherever possible.

The existence of scientific knowledge and adequate application of risk management could help to give legitimacy to policies and minimize the controversy among stakeholders.

### **Evaluation of Regulatory Measures by Economic Analysis**

In addition to the legitimacy of policies, their efficiency is among the important elements to be considered in the policy-making process. In general, the efficiency of environmental regulatory measures can be measured by methods of economic analysis, such as cost-effectiveness or study of cost-benefit. When using risk assessment, it is possible for decision-makers not only to describe the impacts of pollutants as magnitude of risk, but also to apply these methods to some policy options during the policy-making process and after implementation of the policy. That is, it makes it possible to take into account the costs of reducing the risk as well as the magnitude of risk throughout the risk management process.

For example, cost-effectiveness analysis can help identify the least costly option needed to reach a target and prioritize policy options. It is significant for decision-makers not only to utilize resources effectively, but also to achieve accountability in the policy-making process.<sup>11</sup>

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<sup>10</sup>Oka 15.

<sup>11</sup>Oka 73-74.

## CHAPTER 2

### LIMITATIONS OF REGULATORY APPROACHES BASED ON RISK ASSESSMENT

#### The Assessment Process

While many environmental issues are addressed using regulatory methods based on risk assessment, especially end-of-pipe pollution controls, these approaches have inherent technical limitations. Basically, implementing risk assessment requires a good deal of information about a situation that poses or may pose a risk to human health and the environment, particularly, hazard information and exposure information. Decision-makers, however, cannot always gather enough information.

For example, hazard information about certain chemical substances that may cause air pollution has not yet been sufficiently investigated or, in some cases, exposure information about hazardous chemicals, such as monitoring data in a specific environmental medium, has not been adequately collected. In other cases, such as endocrine disrupters, even a cause-effect relationship between substances and harm to human health or the environment is not clear. In these instances, it is difficult to evaluate the magnitude of risk, which is necessary in the decision-making process. Even if the magnitude of risk could be calculated using multiple assumptions or estimates, the situation increases the uncertainty of risk assessment and detracts from the legitimacy of proposed regulatory measures.

Another limitation arises from the risk assessment procedure itself. The traditional procedure tends to specify objective substances or situations, media, and risks. It is effective for medium-specific statutes. It makes the regulations inflexible, however, and it is difficult to address the more complex risk problems derived from multiple environmental media and multiple sources of risk.

As a result, there is an increased need for a new approach to risk management in order to address issues related to scientific uncertainty in risk assessment and to provide flexibility to firms.

### **The Management Process**

In the past decade, regulatory approaches represented by command-and-control regulations have contributed to progress in improving the environment. Doubts about the effectiveness of increasing reliance on such regulations, however, have emerged.<sup>12</sup>

The first limitation of regulatory approaches is, as mentioned above, that this type of regulation needs to specify quantity limits on emissions of pollutants and the sources emitting them. These regulations necessarily, more or less, accompany restrictions on the rights of polluters. When they intend to introduce new regulations, therefore, regulatory authorities have to achieve accountability based on the results of risk assessment. It takes considerable time, however, to gather the relevant information, complete the risk assessment, and go through the legislative process before the new legislation can be enforced. Thus, in some cases, it may be difficult to introduce the regulations in a timely fashion.

The second limitation is that the mechanism of minimizing the total reduction cost does not work. Regulatory approaches generally tend to be medium-specific, facility-specific, and inflexible. In addition, they require all similar sources that contribute to the pollution to reduce their emissions to the same level, such as per day or per hour. They do not take into account differences of marginal abatement costs of specific facilities or firms unless they introduce them

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<sup>12</sup>Madhu Khanna, "Non-mandatory Approaches to Environmental Protection," *Journal of Economic Surveys*, Vol. 15, No. 3 (2001): 291.

along with a tradable permits system.<sup>13</sup> This implies that total abatement costs for society as a whole tend to be high, as regulatory objectives have increased and implementation costs per emission on firms and regulatory authorities have risen steeply.

For these reasons, the need to broaden risk management methods beyond the regulatory approach has increased because of the more complicated issues we now face.

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<sup>13</sup> Organisation for Economic Co-operation and Development (OECD), *Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency and Usage in Policy Mixes* (Paris: OECD, 2003) 66.

**CHAPTER 3**  
**DIVERSIFICATION OF RISK MANAGEMENT METHODS**  
**BY NON-REGULATORY APPROACHES**

**Progress of Voluntary Approaches**

In recent years, the needs mentioned in Chapter 2 have produced a paradigm change in environmental policy in among members of the Organisation for Economic Co-operation and Development (OECD) toward exploring and implementing a number of non-regulatory alternatives. The number of non-regulatory policy options for reducing risks to human health and the environment, including voluntary approaches, incentives, monitoring, education, and research, has increased.

Economic incentives such as taxes and tradable permits have become common approaches in some of these countries.<sup>14</sup> These are measures that could induce rational pollution control relying on price signals and provide flexibility as premises for the market mechanism. They are theoretically expected to improve the economic efficiency of risk reduction. In recent years, the European Union (EU) has applied a policy mix between taxes and tradable permit systems to achieve reductions of carbon dioxide (CO<sub>2</sub>) emissions. Actual application of such measures, however, has not become widespread because the task of designing instruments efficiently for a number of high-risk pollutants or situations is administratively difficult, slow, and costly.<sup>15</sup>

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<sup>14</sup>National Center for Environmental Economics, “The United States Experience with Economic Incentives for Protecting the Environment,” U.S. Environmental Protection Agency 15 February 2005 <[http://yosemite.epa.gov/ee/epa/eamfile.nsf/11f680ff78df42f585256b45007e6235/da1eb5228bd1257b852569e0007130c6/\\$FILE/EE-0216B-13.pdf](http://yosemite.epa.gov/ee/epa/eamfile.nsf/11f680ff78df42f585256b45007e6235/da1eb5228bd1257b852569e0007130c6/$FILE/EE-0216B-13.pdf)>.

<sup>15</sup>See, for example, Khanna 291.

On the contrary, among various non-regulatory measures, a number of voluntary approaches have been on a sharp increase in most OECD countries since the beginning of the 1990's.<sup>16</sup> There is no standard terminology to designate the broad category of voluntary approaches.<sup>17</sup> In one common definition, they are defined as “voluntary instruments, whereby firms make commitments to improve their environmental performance beyond what the law demands.”<sup>18</sup> By this definition, hereafter called “voluntary approaches” in this paper, for example, more than 330 voluntary approaches are in force in the EU, and, at 42, their use is already significant in the United States.<sup>19</sup> The OECD mentioned that “this increase is mainly due to the favorable attitude of both industry and public authorities towards these instruments.”<sup>20</sup>

### **The Positioning of Voluntary Approaches in Policy Frameworks**

How voluntary approaches have been really applied in each country seems to depend on the policy framework for risk management or any guidance for environmental policy making and the positioning of voluntary approaches in them. It varies depending on the country. The circumstances in the United States and Japan are as follows.

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<sup>16</sup>OECD, *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999) 46.

<sup>17</sup>Note that this absence of common terminology is an obstacle to a common understanding of the nature of voluntary approaches.

<sup>18</sup>Jean-Philippe Barde, “Environmental Policy and Instruments,” in Henk Folmer, H. Landis Gabel, and Hans Opscoor (eds.) *Principles of Environmental and Resource Economics* (London: Edward Elgar, 1995) 201-227. This definition consists of three broad categories of environmental policy instruments, which have evolved over the past 30 years, that is, regulatory instruments, economic instruments, and voluntary instruments.

<sup>19</sup>OECD (1999) 46. The OECD also mentioned the number of voluntary approaches in Japan, placing it as more than 30,000 local pollution control agreements. In this paper, however, this type of agreement is excluded because it is designed on the premise of prior existence of relative regulations.

<sup>20</sup>OECD (1999) 46.

## *The United States*

In the United States, risk management has been applied before the process of evaluating alternative regulatory actions and selecting among them in various fields such as environmental protection, occupational safety, safety of drugs and food, and so on. Such risk management is rated according to how it contributes to the improvement of public and worker health and the environment. On the other hand, some problematic issues have emerged. One is that some regulatory approaches are not the most cost-effective. Another is that there are more complex risk problems, in which it is difficult to establish appropriate quantitative targets for risk management because of the lack of adequate scientific information. The reform of the regulatory process has also been discussed in the U.S. government and the U.S. Congress, and in 1981, Executive Order 12291,<sup>21</sup> requiring consideration of the benefits and costs of regulatory actions, was issued. This Executive Order superceded by Executive Order 12866 of September 30, 1993 under the Clinton Administration.<sup>22</sup>

Executive Order 12866 advocates the regulatory philosophy to be followed in deciding whether and how to regulate how federal agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Furthermore, it prescribes several significant principles of regulation as below.<sup>23</sup>

### Section 1. (b)

(3) Each agency shall identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such

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<sup>21</sup>This executive order, including a regulatory impact analysis, was originally enacted as part of measures for deregulation aiming at economic recovery under the Reagan Administration.

<sup>22</sup>White House, "Executive Order 12866," 15 February 2005 <<http://www.faa.gov/avr/arm/EO12866.html>>.

<sup>23</sup>"Executive Order 12866," Section 1.

as user fees or marketable permits, or providing information upon which choices can be made by the public.

(4) In setting regulatory priorities, each agency shall consider, to the extent reasonable, the degree and nature of the risks posed by various substances or activities within its jurisdiction.

(6) Each agency shall assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.

Under such circumstances, based on the mandate in the 1990 Clean Air Act Amendments,<sup>24</sup> the Presidential/Congressional Commission on Risk Assessment and Risk Management (hereinafter “Commission”) was assembled in May 1994. It was charged with making a full investigation of the policy implications and appropriate uses of risk assessment and risk management in regulatory programs under various federal laws to prevent cancer and other chronic human health effects that may result from exposure to hazardous substances.<sup>25</sup>

In 1997, the Commission finalized its report, which proposed a new framework for making risk management decisions. In this report, the Commission defined risk management as follow: “Risk management is the process of identifying, evaluating, selecting, and implementing actions to reduce risk to human health and to ecosystems. The goal of risk management is scientifically sound, cost-effective, integrated actions that reduce or prevent risks while taking into account social, cultural, ethical, political, and legal considerations.”<sup>26</sup> In accordance with this definition, the Commission proposed principles for risk management decision-making as

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<sup>24</sup>Together with this mandate, Congress added to this amended law a requirement under section 812 that the Environmental Protection Agency (EPA) conduct periodic, scientifically reviewed studies to assess the benefits and costs of the Clean Air Act as a whole.

<sup>25</sup>The 1990 Amendments to the Clean Air Act, 15 February 2005 <<http://www.epa.gov/oar/caa/caaa.txt>>.

<sup>26</sup>The Presidential/Congressional Commission on Risk Assessment and Risk Management (Commission), “Final Report Volume 1: Framework for Environmental Health Risk Management,” The Riskworld 15 February 2005 <<http://www.riskworld.com/Nreports/1997/risk-rpt/pdf/EPAJAN.PDF>> 1.

well. Specifically, the principles consist of eight elements and focus on involving stakeholders, scientific evidence, cost-benefit, priority to preventing risks, and flexibility.

As to the use of economic analysis, such as benefit-cost analysis (BCA), the report noted: “Despite its limitations, BCA can provide useful information to help evaluate the favorable and unfavorable effects of proposed regulatory policies and should continue to be used as appropriate to inform, but not as the sole criterion for decision-making.”<sup>27</sup> Although the strengths and limitations are mentioned, it is recognized that BCA is a legitimate and useful way to provide information for risk managers making decisions. On the other hand, one of the other principles clearly states: “A good risk management decision is made after examining a range of regulatory and non-regulatory risk management options.”<sup>28</sup>

These principles are consistent with the provisions of Executive Order 12866, that is, in both of the above cases, the focus is on maximizing net social benefits in the BCA and regulatory and non-regulatory options seem to be equally addressed in the risk management process.

### *Japan*

The directions or guidance of environmental policy in Japan are outlined in the Basic Environment Law, which was established in 1993, and the Basic Environment Plan designed in accordance with this law.<sup>29</sup> The law declares the basic principles of environmental policy, defines the responsibilities of each actor in the society, and prescribes the policy instruments to be used

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<sup>27</sup>Presidential/Congressional Commission on Risk Assessment and Risk Management (Commission), “Final Report Volume 2: Assessment and Risk Management in Regulatory Decision-Making,” The Riskworld 15 February 2005 <<http://www.riskworld.com/Nreports/1997/risk-rpt/pdf/EPAJAN.PDF>> 96.

<sup>28</sup>Carnegie Commission 4.

<sup>29</sup>Basic Environment Law, 15 February 2005 <<http://law.e-gov.go.jp/htmldata/H05/H05HO091.html>> article 15.

to protect the domestic and global environment. The Basic Environment Plan is stipulated as one of the policy instruments in this law. The first plan was approved in a cabinet meeting in 1994.

With regard to the measures for environmental conservation by the state, the Basic Environment Law prescribes regulatory measures, economic measures, promotion of construction of facilities, use of eco-friendly products and voluntary activities, education, monitoring, and research.<sup>30</sup>

These provisions indicate the great contrast between regulatory and other measures. While regulatory measures are prescribed as those that “the state shall take,” the other measures are defined as those that “the state shall make efforts to take necessary measures to provide” or “the state shall take necessary measures to promote.” Economic measures, in particular, are those in which “the State shall appropriately conduct surveys and research on the effectiveness of implementing such measures with regard to prevention of interference with environmental conservation and on the effects of such measures on the Japanese economy.”<sup>31</sup> Besides this contrast, an idea of the principles needed to manage these measures for environmental conservation is not specifically given.

To that end, the latest Basic Environmental Plan has specifically prescribed six measures, i.e., direct regulatory measures, regulated framework measures, economic measures, voluntary measures, informational measures, and procedural measures.<sup>32</sup> The voluntary approaches

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<sup>30</sup>See the Basic Environment Law, Chapter 2, Section 5.

<sup>31</sup>See the Basic Environment Law, Article 22. Note that this provision is followed by “and should it be deemed necessary to implement such measures, the State shall make efforts to acquire the understanding and cooperation of the people with regard to utilization of such measures to prevent interference with environmental conservation.”

<sup>32</sup>Ministry of the Environment, “Kankyo Nihon Keikaku: Kankyo no Seki e no Michishirube,” 15 February 2005 <[http://www.env.go.jp/policy/kihon\\_keikaku/plan/keikaku.pdf](http://www.env.go.jp/policy/kihon_keikaku/plan/keikaku.pdf)> 27-29.

addressed in this paper seem to be included in “regulated framework measures” and “voluntary measures.” It also appears certain that non-regulatory measures are involved in policy options.

These descriptions, however, do no more than mention the importance of a policy mix. How these measures should actually be applied to specific problems, and what principles should be based on in deciding environmental policies to reduce risks, are not sufficiently clarified. Even more importantly, the framework of risk management is not presented.

As a specific example, the goal of the chemical management policy is stipulated in the Basic Environmental Plan as “to avert the environmental risks that are not acceptable in view of building a sustainable society by means of assessing the environmental risks from chemical substances scientifically and quantitatively as well as possible and ensuring the promotion of environmental risk management by various measures with social consensus building.” Furthermore, it mentions that, in order to manage the environmental risks efficiently and effectively, the use of various measures such as the promotion of research or voluntary activities, application of regulatory measures and so on, should be emphasized.

On the other hand, some attention should be paid to new action regarding the policy evaluation for regulation in Japan. In March 2004, the Three-year Regulatory Reform Program was approved by the Cabinet. It prescribed that each office and ministry should perform trial implementation of regulatory impact analysis (RIA) starting in fiscal 2004, and, after developing evaluation methods, RIA should be mandatory under the relative law.<sup>33</sup> The concept of RIA seems to be similar to that of the regulatory process prescribed in Executive Order 12866. If this is the case, there is a possibility that Japan’s regulatory planning process would be changed to a great extent.

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<sup>33</sup>The Cabinet Office, “The Three-year Regulatory Reform Program (2004),” 15 February 2005 <<http://www8.cao.go.jp/kisei/siryu/040319/>>.

At this time, however, it is quite different from the U.S. method, whereby a range of regulatory and non-regulatory risk management options are examined fairly from various standpoints, especially economic analysis. The policy framework of the United States seems to be greatly influenced by the idea of the Pareto standard in welfare economics, while that of Japan seems less likely to be so affected. One of the reasons for this difference is thought to derive from the background of environmental policy in Japan. The Amendment of the Basic Law for Environmental Pollution Control in 1970 could be a particularly symbolic instance.<sup>34</sup> In this amendment, the provision that had prescribed the harmonization between the protection of the living environment and sound economic development was deleted, taking into account the serious level of environmental pollution at that time. This officially meant that the protection of the living environment should have priority over economic development.

### *Comparison*

Both frameworks include voluntary approaches as one environmental policy measure to manage risks, but they seem to be quite different. The policy framework in the United States is thought to have more explicit principles and to be able to allow more flexibility in deciding risk management options than that in Japan. The difference of the policy frameworks between the two countries is thought to result in the difference in the number of voluntary approaches. The number of voluntary approaches in Japan that have been in force nationwide seems to be less than that in the United States

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<sup>34</sup>Planning and Coordination Division, Planning and Coordination Bureau, Environmental Agency. *Kankyo Kihonho no Kaisetsu* (Tokyo: Gyosei, 1994) 12.

## CHAPTER 4

### CASE STUDIES OF VOLUNTARY APPROACHES

The voluntary approaches that have been implemented in recent years are quite diverse. Some typical voluntary approaches to protect the environment (e.g., emission reduction programs involving hazardous chemical substances) that were adopted in United States, Japan, and the EU can be categorized into several types by their features. Each of these categories and some examples will be described below. In the next chapter, the actual performances of these examples are compared and analyzed in view of risk management as well as policy making.

#### **Scope and Categories of Voluntary Approaches**

Several criteria have been proposed to characterize various types of voluntary approaches: for example, individual or collective, local or global, binding or non-binding, open or closed access to third parties, and target-based or implementation-based.<sup>35</sup> Voluntary initiatives by firms have been into three broad categories, depending on the extent of governmental intervention involved in initiating them: public voluntary programs designed by regulators, negotiated agreements between a firm and the regulator, and unilateral commitments by firms to demonstrate environmental stewardship.<sup>36</sup> In the same way, the OECD distinguished among four types of approaches, in increasing order of the importance public authority plays in their application in its assessment of voluntary approaches in environmental policy.<sup>37</sup> These consisted of unilateral commitments made by polluters, private agreements between polluters

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<sup>35</sup>OECD (1999) 19-20.

<sup>36</sup>Carlo Carraro and François Leveque, *Voluntary Approaches in Environmental Policy* (Dordrecht, Holland: Kluwer Academic Publishers, 1999) 1-3.

<sup>37</sup>OECD (1999) 16-18.

and pollutees, environmental agreements negotiated between industry and public authorities, and voluntary programs developed by public authorities, to which individual firms are invited to participate.

Furthermore, Khanna added a new category, “information provision,”<sup>38</sup> to the above as after analyzing some examples of information disclosure strategies, such as the Toxics Release Inventory (TRI)<sup>39</sup> in the United States.

Considering the objective of this paper, which examines the effectiveness, including the precautionary aspect and the economic efficiency of voluntary approaches from the general aspect of environmental policy, it is useful to focus on the extent of governmental intervention in the same way. On the other hand, some types of voluntary approaches are set aside – for example, private agreements, which are not very widely reported, or local Pollution Control Agreements in Japan, which need some regulations as their prerequisite.<sup>40</sup> Therefore, in this paper, the focus is on the extent of government intervention, that is, four types of voluntary approaches: regulated frameworks such as information provision, negotiated agreements, public participation programs, and unilateral commitments.

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<sup>38</sup>Khanna 297.

<sup>39</sup>TRI is a database of releases of more than 300 toxic chemical substances released publicly by the U.S. EPA. The Emergency Planning and Community Right-to-Know Act requires firms to report the locations and quantities of releases and transfers of certain toxic chemicals from industrial facilities, and the EPA and the states to make the collected data available to the public in the TRI.

<sup>40</sup>OECD (1999) 46. According to the OECD, several examples do exist, though, namely in Japan, where approximately 2,000 agreements at the local level have been signed between residents’ associations and companies and other examples reported mainly concern contracts between workers’ organizations and firms that deal with health and safety conditions.

## Regulated Frameworks

As mentioned in Chapter 3, this is one of six measures prescribed in the Basic Environmental Plan in Japan, which defines it as “instead of directly imposing, prohibiting, or restricting specific activities, imposing only achievement of targets proposed by the government or requiring compliance of specific procedures.”<sup>41</sup> That is, instead of command-and-control regulations, only an outline of the activities the firms should be subject to, such as submitting reports and publishing, is regulated.

This category includes right-to-know requirements such as TRI in the United States and the Pollutant Release and Transfer Register (PRTR) in some OECD countries. For example, in the case of Japan, the total amount of release that was reported in fiscal 2002 decreased by 7.1 percent, corresponding to 22,000 tons, compared to that in fiscal 2001 when the first reports were submitted and published.<sup>42</sup>

Khanna classified this type of policy as “information provision.”<sup>43</sup> These laws require industry to publicly and periodically disclose information about pollution and potentially hazardous products. Right-to-know laws are based on the idea that public concern about pollution will encourage industry to voluntarily reduce the use and release of pollutants and hazardous products.<sup>44</sup> Furthermore, it is emphasized that even though it is impossible to introduce direct regulation due to lack or uncertainty of identification of causes, this measure could be implemented effectively as a precaution.

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<sup>41</sup>Ministry of the Environment, “Kankyo Kihon.

<sup>42</sup>Ministry of Economy, Trade and Industry, “Todokede Haishutsuryo Idoryo ni Kansuru Heisei 14-nendo De-ta to Heisei 13-nendo De-ta to no Hikaku,” 15 February 2005  
<[http://www.meti.go.jp/policy/chemical\\_management/law/prtr/h14kohyo/press/press\\_sankou.pdf](http://www.meti.go.jp/policy/chemical_management/law/prtr/h14kohyo/press/press_sankou.pdf)>.

<sup>43</sup>Khanna 297.

<sup>44</sup>Carnegie Commission 31.

## **Negotiated Agreements**

These measures are initiated based on negotiations between the public authorities and the firms or industrial associations concerning targets and schedules that should be achieved and strategies that both entities should be subject to. In general, they provide regulatory relief or grace in introducing a new regulation or, in some cases, a tax allowance in exchange for commitment and implementation to improving environmental performance. These agreements can be both legally binding and non-binding. Examples of this category include Project XL in the United States. In addition, since negotiated agreements have been more widely used in the EU, one example in the EU is provided below.

### *Project XL (United States)*

Project XL is a national pilot program, initiated by the U.S. Environmental Protection Agency (EPA) in 1995, that tests innovative ways of achieving better and more cost-effective public health and environmental protection. It provides regulatory flexibility to individual firms on a case-by-case basis when they develop innovative strategies to protect public health and the environment. These strategies are required to produce superior environmental results beyond those that would have been achieved under current and reasonably anticipated future regulations or policies, benefits such as cost savings, paperwork reduction, and support by stakeholders. After the EPA, states, firms, and other stakeholders negotiate, final project agreements, which outline the details of the projects and each party's commitments, are signed. By January 2001, 50 such agreements had been completed.<sup>45</sup>

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<sup>45</sup>U.S. EPA, "Project XL – What's New," 15 February 2005  
<<http://www.epa.gov/ProjectXL/whatsnew.htm#news>>. As of January 2003, the EPA is no longer accepting proposals for new XL projects.

For example, Intel Corporation's plan included a facility-wide cap on air emissions to replace individual permit limits for different air emission sources. It also stipulated multi-media, performance-based permits that specify performance levels for each regulated pollutant at new facilities. This allows Intel to make operational changes without permit review and bring products on line faster, a critical aspect in this "quick-to-market" industry. Intel avoided millions of dollars worth of production delays by eliminating 30-50 annual permit reviews in the first year.<sup>46</sup>

On the other hand, it is also believed that these site-specific regulations impose high transaction costs on firms for project development, frequent monitoring, reporting, and evaluations.<sup>47</sup>

### *Environmental Agreement (EU)*

In 1999, the Commission of the EU came to an agreement with the European Automobile Manufacturers Association (ACEA) that addressed the reduction of CO<sub>2</sub> emissions from passenger cars.<sup>48</sup> This environmental agreement was one of the main elements of the EU strategy for CO<sub>2</sub> emission reduction and was issued as the recommendation of the commission. In this agreement, the ACEA declared that it had adopted a commitment on CO<sub>2</sub> emission reductions from new passenger cars, which would collectively achieve a CO<sub>2</sub> emission target of 140 g/km CO<sub>2</sub> for the average of their new cars sold in the European Community by 2009. This

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<sup>46</sup>U.S. EPA, "Project XL: Summary of Current Pilot Projects," 15 February 2005  
<<http://www.epa.gov/projectxl/summary4.pdf>>.

<sup>47</sup>A. Blackman and J. Mazurek, *The Cost of Developing Site-specific Regulations: Evidence from EPA's Project XL*, Discussion Paper 99-35 (Washington D.C.: Resources for the Future, 2000).

<sup>48</sup>The European Commission, "Commission Recommendation of 5 February 1999 on the reduction of CO<sub>2</sub> Emissions from Passenger Cars (1999/125/EC)," 15 February 2005  
<<http://europa.eu.int/comm/environment/co2/99125/en.pdf>>.

recommendation also included clauses about monitoring the commitment, an intermediate target, and the regulatory threat. It also provided that, should ACEA fail to achieve the 2009 goal and other similar objectives, the commission would present a legislative proposal on CO<sub>2</sub> emissions from passenger cars. After that, the same kinds of agreements were concluded with the Japan Automobile Manufacturers Association (JAMA) and Korean Automobile Manufacturers Association (KAMA).<sup>49</sup>

According to the fourth annual report on the effectiveness of the strategy in 2004,<sup>50</sup> ACEA reduced the average specific CO<sub>2</sub> emissions of its new car fleet registered within the EU (petrol + diesel) to 165 g/km in 2002 from 185 g/km in 1995; this represented a cut of about 10.8 percent. JAMA decreased the average specific CO<sub>2</sub> emissions of its passenger cars sold from 196 g/km in 1995 to 174 g/km in 2002; this is an 11.2 percent drop. The commission concluded that ACEA and JAMA showed good progress, having already reached the intermediate target range envisaged for 2003. Thus, both associations can be considered to be on track. On the other hand, KAMA's emissions dropped from 197 g/km in 1995 to 183 g/km in 2002. Because the reduction was mainly attributed to the increased sales of mini gasoline cars on the EU market instead of the development of fuel-efficient cars, however, the commission expressed concern about the improvement during the commitment period.<sup>51</sup> Furthermore, the commission mentioned that KAMA's progress was still unsatisfactory and that there was a real risk that KAMA would not

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<sup>49</sup>The European Commission, "Commission Recommendation of 13 April 2000 on the Reduction of CO<sub>2</sub> Emissions from Passenger Cars (JAMA) (2000/304/EC)," 15 February 2005 <<http://europa.eu.int/comm/environment/co2/00304/en.pdf>>.

<sup>50</sup>The European Commission, "Communication from the Commission to the Council and the European Parliament Implementing the Community Strategy to Reduce CO<sub>2</sub> Emissions from Cars: Fourth Annual Report on the Effectiveness of the Strategy (Reporting year 2002)," 27 April 2005. <[http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004\\_0078en01.pdf](http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0078en01.pdf)>.

<sup>51</sup>The European Commission, "Commission Staff Working Paper Final Reports (COM (2002) 693 final)," 15 February 2005 <[http://europa.eu.int/comm/environment/co2/02693\\_annexes\\_en.pdf](http://europa.eu.int/comm/environment/co2/02693_annexes_en.pdf)>.

meet its 2004 intermediate target range. Finally, the commission concluded that, in order to meet the final target of 140g/km, additional efforts are necessary, as the average annual reduction rate of all three associations will need to be increased.

### **Public Participation Programs**

These programs are organized by public authorities to induce firms to improve their environmental performance contributing to risk reduction. After public authorities provide specified targets for improvement or guidance, firms sign up for these programs. The results of the firms' efforts are monitored through self-reporting and published. Examples of this category include the 33/50 Program in the United States and the hazardous air pollutants reduction program in Japan.

#### *The 33/50 Program (United States)*

The 33/50 Program is the EPA's voluntary approach for reducing the releases and transfers of toxic chemicals; it was launched in early 1991.<sup>52</sup> Its primary purpose was to demonstrate whether voluntary partnerships could augment the EPA's traditional command-and-control approach by bringing about targeted reductions more quickly than would regulations alone. The EPA identified 17 priority chemical substances (hereinafter referred to as "33/50 chemical substances") and set as a goal of this program a 33 percent reduction in releases and transfers of these chemical substances by 1992 and a 50 percent reduction by 1995, measured against a 1988 baseline. The EPA then asked companies to participate. (This program

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<sup>52</sup>U.S. EPA, "33/50 Program: The Final Record," 15 February 2005  
<<http://www.epa.gov/opptintr/3350/index.html>>.

itself has no legal frameworks, though it takes advantage of information gathered by TRI, which is a regulatory measure.)

As a result, nearly 1,300 companies responded with commitments to this program, and the interim 33 percent goal was met one year early, i.e., by the end of 1991. The 50 percent goal was attained a year ahead of schedule, in 1994. In addition, the total reduction from 1988 to 1995 reached 64 percent. Reductions continued at a higher rate for 33/50 chemical substances than for other TRI chemical substances in the year after the 33/50 Program ended.

The EPA believes that this program has been a striking success and analyzes the advantages and limitations compared to regulations as follows:

- Low cost (both the administrative and reduction cost)
- Short time frame necessary for developing the initiative (only three months)
- Provision of the opportunity to improve relations with the community
- Low participation rate of small and medium-sized companies
- Accountability of the data (received from TRI)

Khanna and Damon analyzed the 33/50 Program's impact on toxic releases and economic performance of firms.<sup>53</sup> They reported that the 33/50 Program had a significantly negative impact on the releases generated by firms – an estimated 27.92 percent relative to preprogram levels – even after controlling for sample selection bias and the impact of mandatory regulations and firm-specific characteristics. Based on this analysis, they concluded that program participation led to a statistically significant decline in toxic releases over the period 1991-93.

On the other hand, the OECD has a skeptical view of the results of this and other public participation programs though. The OECD states, “In most cases, factors other than the given

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<sup>53</sup>Madhu Khanna and Lisa A. Damon, “EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms,” *Journal of Environmental Economics and Management* 37 (1999):1-25.

voluntary approach seem to explain the major part of any environmental improvement that has taken place.”<sup>54</sup>

### *The Hazardous Air Pollutants Reduction Program (Japan)*

In 1995, measures on how to manage the risk from a number of hazardous air pollutants such as benzene, vinyl chloride monomer, and so on, were discussed.<sup>55</sup> As a result, it was decided that a voluntary approach was more appropriate than a regulatory approach to solve this problem, and the Air Pollution Control Law was revised in 1996 in order to introduce a framework promoting voluntary activities. In this law, the responsibility of firms to tackle reduction of emissions of hazardous air pollutants was outlined. After the bill had passed the Diet, the Environmental Agency and Ministry of International Trade and Industry requested firms to develop and submit voluntary risk management plans. Both of these bodies annually provided the submitted plans to experts for their review and publication (this scheme is called “check-and-review”). This law involved a reconsideration clause, which required the government to reconsider this voluntary approach in three years based on the results of these activities.

Specifically, 13 hazardous chemical substances were selected between 1997 and 1999.<sup>56</sup> As a result, the actual reduction rate reached 41 percent on average, greatly exceeding the objective reduction rate of 30 percent. On the other hand, the ambient concentration of benzene, which was one of the 13 hazardous chemicals, exceeded the standard at 23 percent of the

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<sup>54</sup>OECD (2003) 62.

<sup>55</sup>Central Environmental Council, “Kongo no Yugai Taikiosen Busshitsu Taisaku no Arikata ni Tsuite: Dai-niji Toshin,” 15 February 2005 <[http://www.epcc.pref.osaka.jp/shidou/chem/edcs/haps/toshin\\_2nd.htm](http://www.epcc.pref.osaka.jp/shidou/chem/edcs/haps/toshin_2nd.htm)>.

<sup>56</sup>Ministry of the Environment, “Kongo no Yugai Taikiosen Busshitsu Taisaku no Arikata ni Tsuite,” 15 February 2005 <http://www.env.go.jp/press/press.php3?serial=1929>.

monitoring venues. Taking this result into account, it was decided not only to continue the voluntary plans, but also to add new voluntary plans for several regions with markedly high ambient concentrations. Seventy-five trade associations drew up new voluntary management plans for 2001 to 2003; their average reduction rate was about 40 percent from 1999. This target was accomplished a year ahead of schedule, in 2002.

### **Unilateral Commitments**

This measure includes activities that firms or trade-associations initiate without direct governmental involvement to improve their environmental performance. Firms or trade associations set up the environmental targets and schedules. In some cases, they communicate to their stakeholders: residents living near the facilities, employees, and so on. Furthermore, Khanna classifies this measure into three types:

- To develop their own plans or management systems to improve their own environmental performance (monitoring by a third party may be involved in order to ensure credibility.),
- To participate in codes of conduct or guidelines developed by trade associations, and
- To meet the environmental performance standards for registering with a certifying organization, such as the International Organization for Standardization (ISO).<sup>57</sup>

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<sup>57</sup>Khanna 296.

Examples of each type include voluntary action plans for global warming in Japan, the Responsible Care Initiative implemented by the chemical industry in the United States and ISO 14001 (Environmental Management System), respectively.

As to the Voluntary Action Plans for Global Warming in Japan, in 1996, ahead of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Kyoto (COP3), the Japan Federation of Economic Organizations (hereinafter “Keidanren”) committed itself to drawing up a voluntary action plan, which promoted effective activities for the prevention of global warming by industries.<sup>58</sup> The Keidanren Voluntary Action Plan<sup>59</sup> was published in 1997. Currently, 57 trade associations participate in this plan, the goal of which is to ensure that the emissions of CO<sub>2</sub> from the industrial and energy-converting sectors in fiscal 2010 are below those of fiscal 1990. The plan incorporates voluntary action plans developed by all major industrial sectors, representing approximately 82.2 percent of the total amount of CO<sub>2</sub> emitted by the country’s industrial and energy-converting sectors in fiscal 1990.

Keidanren chose this voluntary activity with the idea that, since the cause of global warming is related to all kinds of industrial activities and our daily life, it is impossible to restrict industrial activity uniformly and it is not adequate to address it with traditional regulatory approaches or economic measures such as taxes. Keidanren asserts that a voluntary approach is most effective because firms that know their actual circumstances can best plan and implement the most cost-effective measures by themselves.

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<sup>58</sup>The Federation of Economic Organizations, “Results of the Fiscal 2004 Follow-up to the Keidanren Voluntary Action Plan on the Environment,” 15 February 2005  
<<http://www.keidanren.or.jp/english/policy/2004/091/index.html>>.

<sup>59</sup>This title was changed to “The Keidanren Voluntary Action Plan on the Environment” in fiscal 2002 when waste recycling measures were added to its scope.

The progress of the Keidanren Voluntary Action Plan has been followed up precisely and published every year by Keidanren itself. Furthermore, the relevant governmental councils, such as the Industrial Structure Council of the Ministry of Economy, Trade and Industry (METI), have reviewed this progress. Because of its background and the monitoring scheme, the Keidanren plan probably shares some features of public participation programs. In addition, since fiscal 2002, the system of appraisal by a third-party council, the Evaluation Committee for the Voluntary Action Plan on the Environment, was introduced in order to further increase transparency and reliability for follow-up of the voluntary action plan. Some comments made by this committee were reflected in the fiscal 2004 follow-up, i.e., the need for greater clarification of performance based on an international comparison of intensity evaluation and energy efficiency and verification of the possibility of achieving the common goal for 2010.

According to the results of the fiscal 2004 follow-up, in spite of the increase in production resulting from Japan's economic recovery, CO<sub>2</sub> emissions in fiscal 2003 were 502.39 million t-CO<sub>2</sub>, which is a 0.6 percent decrease compared to fiscal 1990.<sup>60</sup> The emission reduction target, i.e., below the level of fiscal 1990, was achieved for the fourth straight year. Moreover, Keidanren stated that "calculations based on the CO<sub>2</sub> emissions forecast by the main industries found that achieving the goal of 'below the level of 1990' by 2010 is well within the bounds of feasibility."<sup>61</sup>

In addition, on March 14, 2005, a bill to amend the Law Concerning the Promotion of Measures to Cope with Global Warming was submitted to the Diet.<sup>62</sup> This bill includes the

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<sup>60</sup>Keidanren 1.

<sup>61</sup>Keidanren 7.

<sup>62</sup>Ministry of the Environment, "Chikyu Ondanka Taisaku no Suishin ni Kansuru Horitsu no Ichibu o Kaisei Suru Horitsuan no Kakugi Kettei ni Tsuite," 27 April 2005/04/28 <<http://www.env.go.jp/press/press.php3?serial=5788>>.

introduction of a new regulated framework that requires the firms to report the amounts of their emissions of greenhouse gases and publishes the aggregated data. This system aims to promote firms' voluntary activities to achieve emission limitations. When the amended law enters into force, government intervention in the Keidanren Voluntary Action Plan would be strengthened.

## **CHAPTER 5**

### **ENVIRONMENTAL EFFECTIVENESS AND ECONOMIC EFFICIENCY OF VOLUNTARY APPROACHES**

As mentioned in Chapter 4, several types of voluntary approaches have been developed and applied to real environmental issues. Diversity of voluntary approaches is thought to derive from their adaptation to the variation and complexity real issues have. Therefore, benchmarking each category of voluntary approach by the same criteria might not be appropriate without evaluating them together with the contexts of the environmental issues addressed. Comparing each category through the same aspects would be useful, however, for extracting their advantages and disadvantages and obtaining some guidance on initiating a voluntary approach in the future.

From the empirical evidence in Chapter 4, the advantages and disadvantages of voluntary approaches as policy measures are summarized as below.

#### (1) Advantages

- Promptitude of implementation (less need for scientific certainty)
- Broad and flexible options for reducing risks (finding less expensive solutions or shortening the production lead time)
- Lower administrative costs (including compliance costs)

#### (2) Disadvantages

- Equity (existence of free riders)
- Sureness (reduction level, non-legally binding scheme, and no sanctions)

On the other hand, the OECD established seven criteria for the evaluation of voluntary approaches: environmental effectiveness, economic efficiency, administrative and compliance

costs, competitiveness implications, soft effects, innovation and learning effects, and viability and feasibility.<sup>63</sup> These are classified broadly into two major categories, that is, environmental effectiveness and economic efficiency.

This paper, based on the empirical evidence mentioned above, focuses on more significant features in environmental effectiveness and economic efficiency, that is, for environmental effectiveness, promptitude, accountability of data, and sureness, and for economic efficiency, flexibility and administrative costs, respectively.

## **Environmental Effectiveness**

### *Promptitude*

Promptitude of policy options contributes to environmental effectiveness by means of preventing adverse effects before they happen or become more serious. Its importance grows, particularly in cases in which there is little scientific certainty and considerable time is required to clarify the cause-effect relation.

For example, as to the Kyoto protocol for protection against global warming, it took about 10 years after the UNFCCC came in force to get to the Kyoto protocol, compared with the one year required for the Keidanren Voluntary Action Plan. It is much the same for environmental agreements in the EU.

The degree of promptitude depends on the negotiation period among stakeholders and the speed of the decision-making process. It is obvious that it will be faster in voluntary than regulatory approaches, because voluntary approaches can be initiated before scientific certainty

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<sup>63</sup>OECD (1999) 99-102.

is established. Moreover, legislative processes are not needed for implementation, except for the regulatory framework. If the length of the negotiation period depends on the extent of government intervention, promptitude could increase in inverse proportion to that of intervention, that is, corresponding to unilateral commitments, public participation programs, negotiated agreements, and regulated frameworks, in that order.

### *Accountability of Data*

Weakness of accountability of data is inevitable for voluntary approaches except regulated frameworks because, by their nature, they have no sanction or penalty. Some devices have been developed in order to cover this shortcoming. For example, in the case of negotiated agreements, the government commits itself to refrain from introducing new legislation unless the agreement fails. Thus, stringent legislative threats are incorporated into the agreement. It is possible that a certain type of legislative threat is implied in public participation programs, as well as in unilateral commitments. In addition, public pressure through releasing the firms' progress publicly is usually employed. The Keidanren Voluntary Action Plan, for example, incorporates an appraisal system by a third-party council, even though it is a unilateral commitment. Moreover, as with the 33/50 Program, it might be possible to be complement this with a regulated framework, such as TRI.

### *Sureness*

Because they are legally non-binding and no sanctions are involved, voluntary approaches lack a guarantee that firms will comply with their commitments or be accountable for their data. Similar to the accountability of data, legislative threats are generally taken advantage of in order to cover this shortcoming. Moreover, public pressure through releasing the firms'

progress publicly, is used not only in regulated frameworks, but also in other measures. The more the general public is concerned about environmental issues, the more effective it is to get firms to comply with their commitments.

Furthermore, there is doubt about the contribution of voluntary approaches to the fulfillment of a given target. As mentioned with regard to the 33/50 Program in Chapter 4, the OECD maintains that the contribution of the 33/50 Program alone is not a major part of the improvement. It needs to be certain that a business-as-usual trend will be scrutinized carefully before setting the risk reduction targets, but it is obvious that this program will promote firms' emission reductions as Khanna and Damon discovered. In addition to that, factors other than this program, which are mainly identified by the impact of mandatory regulations and firm-specific characteristics, could have been effective. In other words, it is thought that there is no reason to totally deny the effectiveness of this program. Khanna stated that the theoretical literature showed that the efficiency and effectiveness of voluntary approaches could be enhanced if there were stringent legislative threats.<sup>64</sup> If it is assumed that the degree of sureness depends on legislative threats and public pressure, sureness could increase corresponding to negotiated agreements, public participation programs, unilateral commitments, and regulated frameworks, in that order.

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<sup>64</sup>Khanna 318.

## **Economic Efficiency**

### *Flexibility*

The degree of flexibility depends on how and by whom the risk reduction targets are set. Regulated frameworks do not directly require the setting of specific targets. Only firms or trade associations create unilateral commitment. Both of them, therefore, have more flexibility than with the other measures. In the case of public participation programs, public authorities tend to set some quantitative risk reduction targets and a schedule; they do not, however, restrict the firms from finding solutions on their own. Although negotiated agreements also have quantitative risk reduction targets and schedules, they may designate specific solutions or not according to the results of negotiations. Thus, the degree of flexibility could increase corresponding to unilateral commitments, regulated frameworks, public participation programs, and negotiated agreements, in that order.

### *Administrative Costs*

Administrative costs are affected by the extent of government intervention or the number of firms participating. Since public participation programs usually set the same risk reduction targets and schedule, they can streamline administrative costs more than negotiated agreements, which are generally developed by an individual firm or industry. Glachant, for example, suggests that, when there is informational asymmetry and a large number of firms, a voluntary approach is more costly than either a standards or a tax policy.<sup>65</sup> From this standpoint, an industry-wide program or agreement seems to be utilized in many cases. On the other hand, as to transaction

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<sup>65</sup>Matthieu Glachant, "The Cost Efficiency of Voluntary Agreements for Regulating Industrial Pollution: A Coasean Approach," In Carraro and Leveque (eds), *Voluntary* 75-89.

costs for monitoring or reporting to public authorities after implementation, there are legal requirements on firms in the case of a regulated framework. When the compliance scheme is strengthened in cases of unilateral commitment or public participation programs, the transaction costs seem to be roughly equivalent. The order of advantage is likely to be unilateral commitments, public participation programs, regulated frameworks, and negotiated agreements.

In concluding this chapter, it is emphasized that voluntary approaches could be policy options that have both environmental effectiveness and economic efficiency to the extent that they are appropriately designed. The above comparison is comprehensively indicated in Table 2. When public authorities actually design any voluntary approaches, they should deliberate the pros and cons in the light of the character of risks and social circumstances.

### **New Framework for Environmental Policy Making**

Based on the analysis above, a new framework for environmental policy making can be developed, as shown in Figure 1. It consists of seven steps: defining the problem, collecting information, analyzing the risks, examining various management options, decision, implementation, and review. What makes this framework so special is that there are two branches after risk assessment depending on whether the quantitative goals to manage the risks can be set or not. In order to avoid “paralysis by analysis” in cases where there is considerable uncertainty, examining the use of voluntary approaches should be positively incorporated.

## CHAPTER 6

### ECONOMIC ANALYSIS OF VOLUNTARY APPROACHES

Unlike economic measures, such as taxes and tradable permits, voluntary approaches do not arise from economic theory. For this reason, economic analysis is thought to be useful for recognizing the features or limitations of the application of voluntary approaches. Furthermore, the economic perspective indicates not only the motive of the firms for preferring voluntary approaches, but also the perception of the general public.

#### **Effectiveness in Minimizing Total Abatement Costs**

In environmental economics theory, minimization of total abatement costs is one of the key issues in view of the maximization of economic welfare for society as a whole. Economic instruments such as taxes or tradable permits were theoretically developed with such factors in mind. The BCA mentioned above was devised as a tool to determine whether the supply of public good satisfied such a situation or not, the so-called Pareto standard.<sup>66</sup>

Minimizing total abatement costs implies that the marginal costs of abatement should be equal among all polluters, i.e., all facilities and all mobile emission sources cause the same amount of pollution. Equalization of marginal abatement costs can be achieved by providing all polluters the same costs at the margin. For example, a tradable permits system can provide such conditions through the market mechanism, but traditional command-and control-regulations, which require all polluters to comply to same standards, cannot do that. Taking into account equity among polluters, regulatory authorities tend to impose the same standards on groups of polluters that pollute in equal amounts.

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<sup>66</sup>Oka 84.

Figure 2 shows a simple comparison of an equal emission reduction requirement with equal costs at the margin. It is assumed that each firm is emitting equal amounts at the beginning, but the marginal abatement costs of firm A are larger than those of firm B. When the regulatory authority requires the same emission reduction,  $E$ , the two firms bear different abatement costs, indicated by areas of BEO and AEO in the figure. In the case of a tradable permits system, assuming that permits in which prices would be  $P$  per unit of emissions are supplied, firm B would increase its reduction from  $E$  to  $E'$  and sell the permits. At the same time, firm A would decrease its reduction from  $E$  to  $E''$  and purchase the permits. When the both variations of reduction,  $EE'$  and  $EE''$ , are equal, the decrease of costs,  $AEE''C$ , is larger than the increase of costs,  $DE'EB$ . That is, the total abatement costs in a tradable permits system are smaller than would be the case without the system.

Voluntary approaches do not automatically include a mechanism to minimize the total abatement costs. Instead, they sometimes have the potential to impede this mechanism. For example, in industry-wide agreements, abatement targets for certain industries are often set as a form of percentage reduction, and the same targets are applied to each member firm. Marginal abatement costs are seldom used as targets, because it is difficult to gather the information about abatement costs from each firm and monitor them. On the contrary, like the Keidanren Voluntary Action Plan, the integration of a number of industry-wide abatement plans could get around this disadvantage to some extent. It takes into account the circumstances confronted by each industrial sector, so that they can set their abatement targets independently instead of adhering to a uniform target. Although “the result of such internal negotiations will depend on the relative negotiating strength of each participant,”<sup>67</sup> it is supposed that there would be more opportunities

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<sup>67</sup>OECD (2003) 68.

to avoid this sort of inhibition of minimization of total abatement costs in voluntary approaches than in regulatory approaches.

### **Effectiveness in Flexibility to Improve Environmental Performance**

As mentioned in the previous chapters, giving flexibility to firms that commit themselves to voluntary actions leads to improvement of the economic efficiency of firms' abatement activities. This is because this allows firms to find cost-effective solutions. The abatement costs to reduce the environmental burden with flexibility could be lower than without it as long as the firms' abatement levels are kept equal. Figure 5 represents firms' abatement costs depending on the risk reduction level implemented by firms. It is assumed that marginal abatement costs increase with the increase of the risk reduction level, and flexibility decreases marginal abatement costs at the same risk reduction level. If regulatory authorities plan to introduce a new regulation and the risk reduction target is set at reduction level R, abatement costs are indicated as AR in the regulatory approach and as CR in the voluntary approach, respectively. It is obvious that AC illustrates the effectiveness of flexibility in the figure.

In addition to flexibility, the OECD examined another regulatory gain, the lower risk reduction target associated with the voluntary approach.<sup>68</sup> It does not seem to be actually easy, however, to attain such a lower target due to pressure from the general public; this issue will be examined in a later section.

The benefits of voluntary approaches involve not only flexibility or a lower reduction target, but also improving stakeholder relations, such as product differentiation and an improved

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<sup>68</sup>OECD (1999) 25.

reputation among local residents.<sup>69</sup> These improvements would have a strong influence on firms' profits and can be comprehensively described as firms' utility.

Figure 4 conceptually shows the utility function of the voluntary approach and the regulatory approach for firms. Both utility functions are thought to decrease with an increase in the degree of risk reduction. Higher utility can be obtained by the voluntary approach (B) than the regulatory approach (A) at the same risk reduction level. In other words, the voluntary approach has the potential to attain more risk reduction than the regulatory approach at the same utility (C).

### **Effectiveness and Risk Aversion**

The environmental effectiveness and economic efficiency of voluntary approaches depend not only on which option is chosen, but also how the risk reduction targets achieved by a given voluntary approach are set. In general, these targets are established only by firms or through negotiations between firms and public authorities. Public opinion, however, is not necessarily irrelevant. Especially in the case of regulated frameworks, pressure from the general public is intentionally applied, playing an essential role as a driving force for such measures. Therefore, it is believed to be useful to analyze how public opinion could affect target-setting or negotiations between firms and public authorities from that economic standpoint.

Figure 5 shows the utility curve for the general public. It is appropriate to assume that the general public is risk averse because most of them are skeptical or suspicious of firms'

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<sup>69</sup>See, for example, Khanna 298, which states that: "Participation in voluntary programs provides a variety of benefits to firms, such as public recognition through press releases, newsletters, and awards. This may enable firms to increase market share or charge higher prices for their products, now differentiated by their environmental attributes."

commitments and tend to think that firms will not comply with their commitments without legal obligations or sanctions. In this case, the utility curve becomes concave.

The expected utility for the general public to accept a voluntary approach, EU (voluntary approach) can be described as below.

$$EU (\text{voluntary approach}) = EU (\text{CE}) = p U (\text{A}) + (1-p) U (\text{B}) < U (\text{R}) < U (\text{A})$$

Where, CE: certainty equivalent

The situation before considering the effect from the general public is shown in black plots in Figure 5, where A is the fully achieved reduction level, B is the original state (no reduction), and R is the expected reduction level.

In such a case, the risk-averse general public would prefer the certainty of a regulatory approach aiming at risk reduction R to the voluntary approach aiming at risk reduction A. This means that not only the target of risk reduction in a voluntary approach could be originally higher than that required in a regulatory approach, but also that risk-averse behavior among the general public could make the target even higher. In such a case, if the abatement costs at the higher target exceed the benefit from the voluntary approach, this voluntary approach could not be economically more efficient than the regulatory approach.

## CONCLUSION

Risk management has been applied in many policy fields including environmental regulation to protect human health and the environment. Regulatory approaches represented by command-and-control regulations have contributed to progress in improving their quality. Although risk assessment could give regulatory approaches legitimacy and accountability based on scientific knowledge, these approaches inherently have technical and institutional limitations. To this end, the need for a new approach to broaden risk management beyond the regulatory approach has increased for addressing issues that are more complicated and in which scientific uncertainty remains.

In recent years, a number of non-regulatory policy options, particularly various types of voluntary approaches, have been explored and implemented in OECD countries. The positioning of voluntary approaches in the policy frameworks is different by country and the difference seems to be related to the difference in the number of voluntary approaches in force. The policy framework of the United States seems to be affected by welfare economics much more than that of Japan, and it is believed that the policy framework in the United States has more explicit principles and is able to allow more flexibility in risk management options than in Japan.

Given the empirical evidence, it is emphasized that voluntary approaches could be the policy options that have environmental effectiveness and economic efficiency to the extent that they are appropriately designed. That is, voluntary approaches could be considered as one of the risk management options against regulatory approaches. Especially when there is considerable scientific uncertainty, voluntary approaches could be effective because they could be promptly introduced without a long lead-time to implement them and could contribute to avoiding production delays and “paralysis by analysis.” When any of the voluntary approaches are

actually designed, the pros and cons should be deliberated in light of the character of risks and social circumstances. From this viewpoint, a new framework for environmental policy making, in which examining the use of voluntary approaches is positively incorporated, is demonstrated.

Economic analysis has revealed some useful features with regard to voluntary approaches. First of all, voluntary approaches do not automatically include a mechanism to minimize total abatement costs. Second, the prerequisite for voluntary approaches to fulfill their effectiveness is that the firms can take advantage of higher flexibility to implement risk reduction, and they can do this at lower cost than with regulations. Third, the targets of risk reduction in a voluntary approach tend to be more stringent than the rational level affected by the risk aversion of the general public. In this case, the voluntary approach could be less cost effective than the regulatory approach. It is necessary to pay attention to these features when voluntary approaches are actually designed and a risk reduction target is set.

Current environmental issues, especially global environmental issues, require the cooperation and contribution of most countries. To that end, it is vital to develop a common understanding of these issues and to build a consensus promptly. From this viewpoint, it is expected that the new framework for environmental policy making proposed above provides a common platform for risk management in environmental policy and contributes to consensus-building.

**Table 1. Number of Observations and Mean and Median Cost per Life-Year Saved**

Category		n*	Mean (Thousand yen)	Median (Thousand yen)
Safety control	Retrospective**	3	23,000	27,000
	Prospective***	2	75,000	75,000
	All	5	44,000	30,000
Environmental control	Retrospective	14	740,000	190,000
	Prospective	2	3,200,000	3,200,000
	All	16	1,100,000	320,000
Health care (prevention)	Retrospective	19	4,200	3,100
	Prospective	18	3,500	2,100
	All	37	3,900	2,400
Health care (treatment)	Retrospective	22	2,200	610
	Prospective	5	4,300	6,200
	All	27	2,700	760
All	Retrospective	58	180,000	4,100
	Prospective	27	250,000	3,300
	All	85	200,000	3,300

Source Kishimoto.

\*\*n\* indicates the number of observations.

\*\*\*Retrospective study” deals with life-saving interventions that are actually in use.

\*\*\*\*Prospective study” deals with alternative or hypothetical life-saving interventions.

**Table 2. Comparison of Several Voluntary Approaches**

	Public programs	Negotiated agreements	Unilateral commitments	Regulated frameworks
Promptitude	+++	++	++++	+
Accountability of data	++	++	+	++++
Sureness	+++	++++	+	+
Flexibility	+++	+++	++++	++++
Administrative costs	+++	++	++++	++

Note: The number of “+” signs in each column demonstrates the effectiveness of the respective approach.

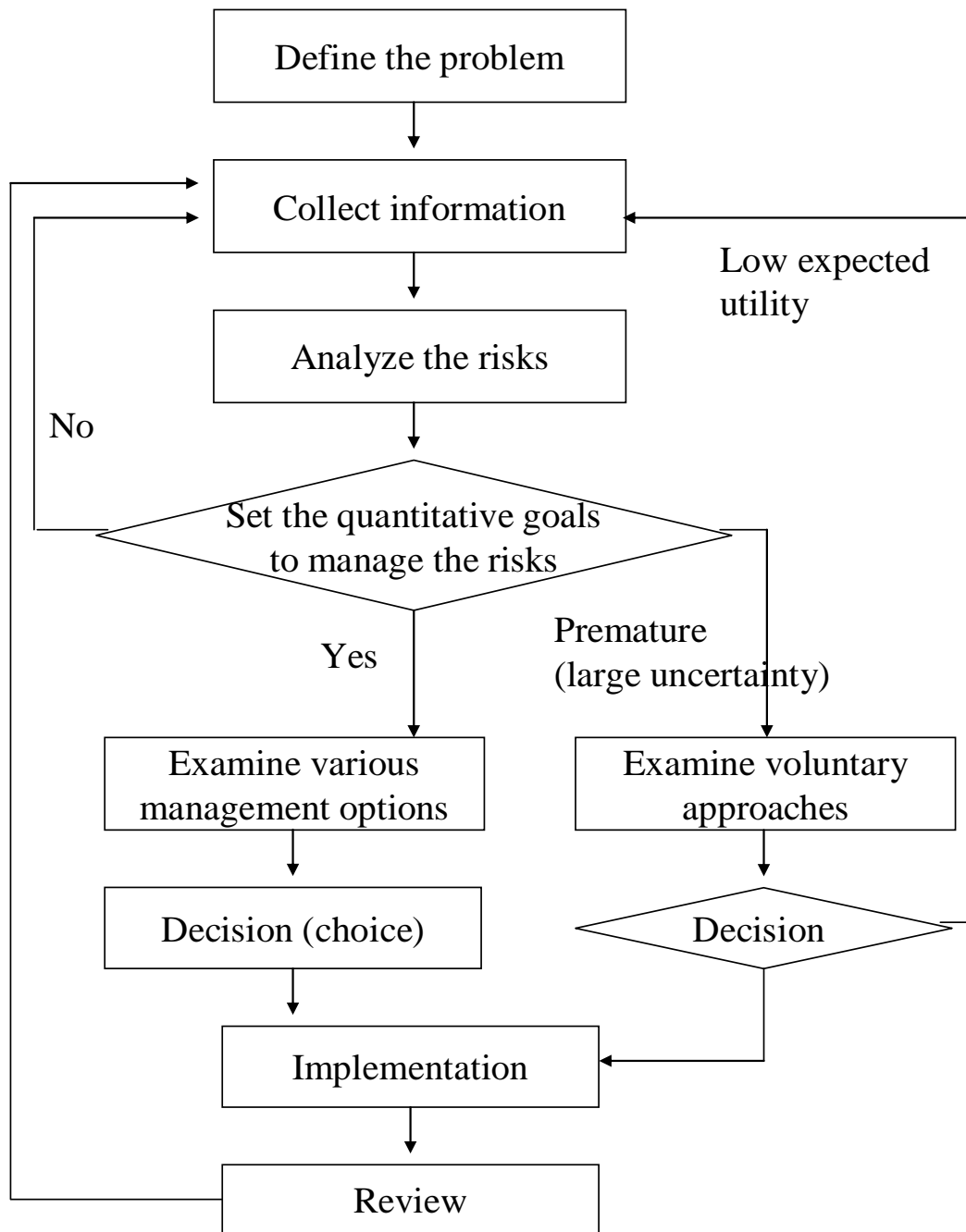
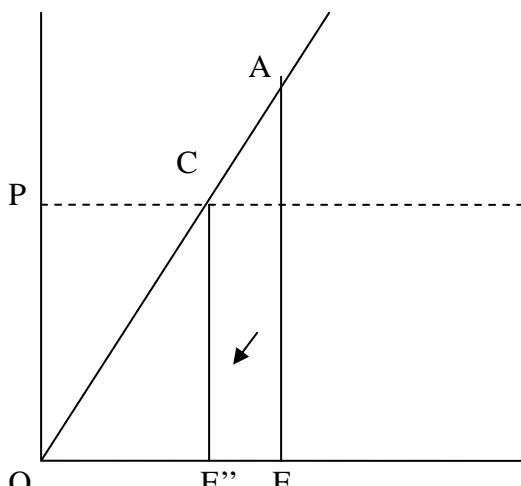


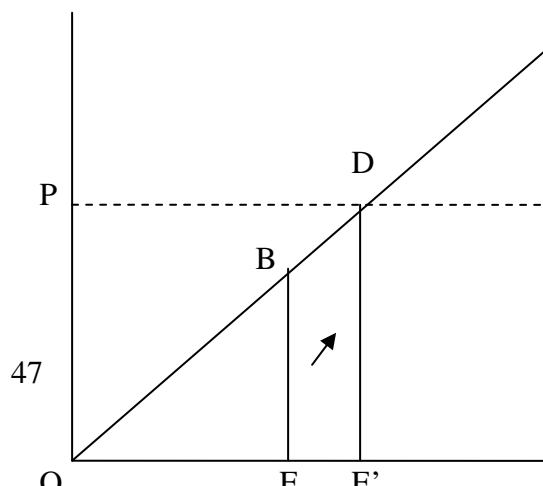
Figure 5. Framework for environmental policy making

**Figure 2. Economic Efficiency of Economic Measures**

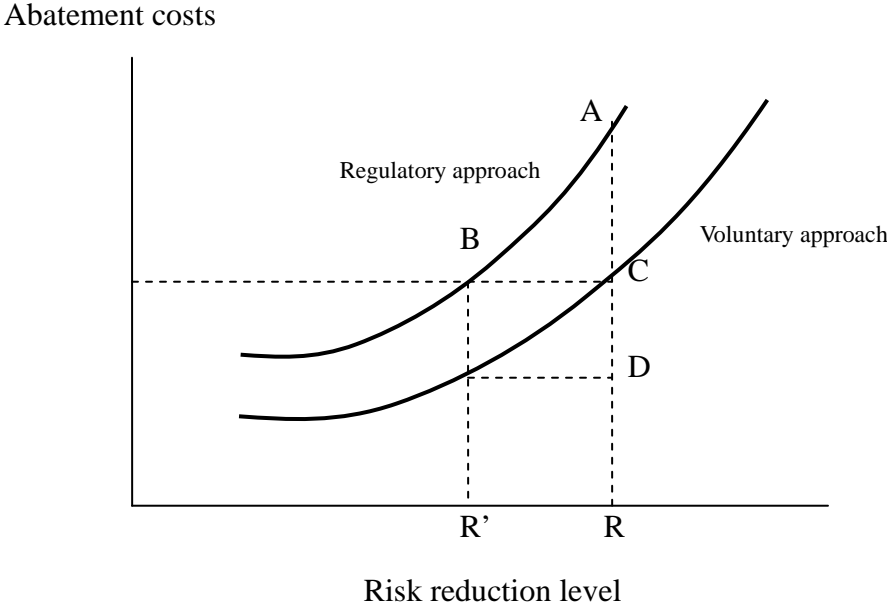
Costs per unit



Costs per unit



**Figure 3. Effectiveness of Flexibility of the Voluntary Approach**



**Figure 4. Utility Function of the Voluntary Approach**

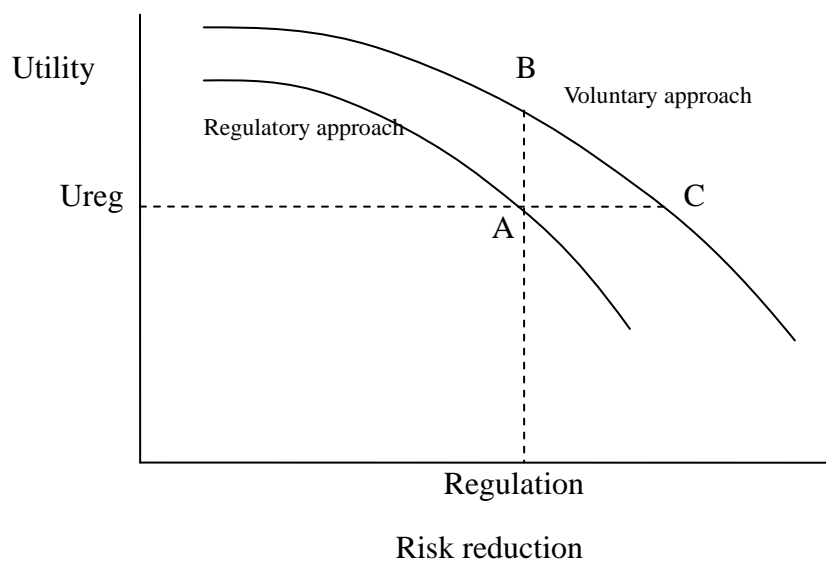
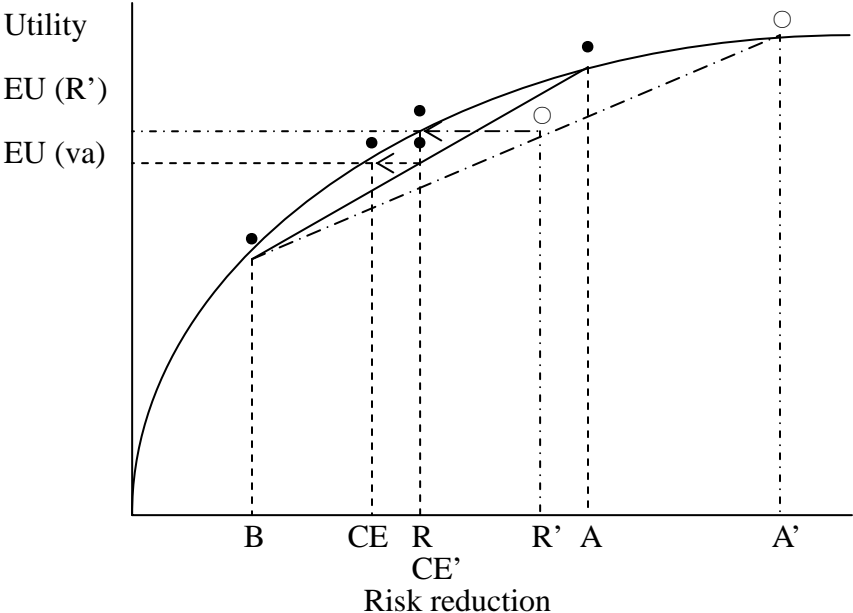


Figure 5. Risk Premium of the Voluntary Approach



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