Environmental Information Management in West European Countries

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Abstract

This paper compares the environmental information management in West European countries. Three major devlopments in environmental administration over the past 10 years are identified: (1).integration of environmental policy, (2).integration of environmental information, and (3).reorganization of environmental agencies. This paper also explores the potentialities of some policy concepts or tools which are now being used by some West European countries and which appear promising or more effective and efficient implementation of environmental policy.

Keywords: Environmental Policy, Information Policy, Information Management, Environmental Information

1. Introduction

Environmental protection is a multidisciplinary, cross-sectional, and cross-national problem. Thess features give great risk as well as opportunity to environmental administration. On the one hand, the field of environmental administration is at risk when trying to manage complicated, or conflicting, environmental issues with simple management tools and out-of-date models. These could make the environment worse rather than better. On the other hand, it urges environmental practitioners and researchers to explore new management concepts which may lead to more promising administration of environmental problems.

1.1 Research Purpose

The consensus in the field of environmental management has been that, in the past 10 years, many countries have acknowledged the importance of sustainable development and have proposed many policy tools to implement this concept. However, there has been growing recognition that environmental policies are not effectively and efficiently implemented. Of particular relevance to our concerns herein are the integration of environmental policy, integration of envirnmental information, and reorganization of environmental agencies. The scenario has encouraged the field to evaluate its environmental efforts and to learn lesson form it. The purposes of this paper were to explore how environmental polices are actually implemented and how environmental information is actually managed in West European countries between 1991 and 1992.

1.2 Research Problems

In order to explore the issues of environmental information management in West European countries, the following four research questions were formulated:

(1). What are the main subjects of national environmental policies in West European countries?

(2). How environmental information is managed in West European countries?

(3). What are the major developments in environmental administration over the past ten years in West European countries?

(4). What are the main concepts and tools of environmental information management which are now being used by some West European countries and which appear promising to give more effective and efficient implementation of environmental policy?

2. Research Method

The research was conducted at two stages. The first stage was to identify the environmental information management in The Netherlands while the second stage was comparative research on other West European countries (namely, the United Kingdom, Ireland, Austria, Norway, Denmark, Germany and France). The research on The Netherlands was completed first in order to form the foundation for a comparison with the other West European countries.

There were two research questionnaires developed for the research. The first was to identify key informants in each country and obtain some general ideas of environmental information policy. The second, with detailed research questions, was sent to each key informant before a field interview was held. Feedbacks form The Netherlands' key informants led to several revisions of both questionnaires. Field interviews in The Netherlands took place between October 1991 and February 1992, while in the other West European countries they were held between February 1992 and June 1992. Twenty-one key informants were interviewed from these countries: The Netherlands 7, United kingdom 2, Ireland 1, Austria 3, Norway 3, Denmark 2, Germany 1, and France 2. Most interviewees were in charge of environmental information at National Government.

The selection of research countries was roughly based upon two criteria: (1)EC country or neighbouring country of The Netherlands for the convenience of transportation on field interview, (2). the "interview availability" of the key informants. Two metholds were used to identify key informants in research countries. Firstly, the first questionnaire was sent to members of the International Council for Information Technology in Government Administration. Secondly, the first questionnaire was sent to members of INFOTEERA which was one of the largest environmental information supply systems sponsored by Unitd Nations Environment Programme.

3. Literature Review

The following literature review covers: four international organizations'

efforts on environmental information management, one scholar's argument on information management, and one public officer's report on geographic information systems (GIS). The literature review is only to pinpoint key concepts of environmental information management, with no attempt to be exhaustive. Use was made of a number of more internal documents provided by the interviewees from visited countries.

3.1 International Forum on Environmental Information

The environment is at the forefront of international focus. However, there is almost no research on environmental information management such as: environmental information policy (EIP), environmental information infrastructures (EII), and environmental information systems (EIS). In response to this research gap, the Prime Minister of Canada proposed at the 1990 Group of Seven (G7) that environmental information should be improved on a worldwide basis, and announced that Canada would take the initiative in organizing the International Forum on Environmental Information for the Twenty-First Century (Canada, Environmental Canada, 1991). The Forum was held at Montreal, Canada May 21-24, 1991. In order to counter the "second generation environment," the Forum identified that decision-makers need environmental information at the following 6 levels:

(1). Information about <u>sustainable development</u> in decisions on how and whether to use resources today and apply technologies through policies, investments and development plans.

(2). Information about <u>natural ecosystems</u> in understanding the human- environment interactions, and the stresses and effects occurring within these ecosystems.

(3). Information about <u>priorities assessment</u> from the standpoint of human life and health, depletion and productivity of resource stocks, capacity of the environment to support and absorb results of human activity, direct and indirect costs, expert/public opinion, and systematic accounting measures.

(4). Information about <u>causes-solutions-uncertainties</u> in attacking environmental problems.

(5). Information about <u>effects-prediction</u> of different interests, including different income and age groups, economic sectors and geographic areas.

(6). Information about <u>access of environmental information</u> for greater public understanding of environmental issues.

The Forum also concluded that action in four major areas is required in order to improve information for environmental decision-making in the 21st century. These four areas are:

(1). Knowledge base–broaden and deepen the base of scientific and technical knowledge concerning the fundamental links between the economy and the environment.

(2). Information management–extend and improve monitoring systems, and increase the cost-effectiveness and appropriateness of information management technologies.

(3). Environmental reporting–widen the accessibility and sharpen the decision relevance of environmental reporting.

(4). Institution partnerships–strengthen and expand partnerships among institutions that currently produce, analyze and disseminate environmental information.

3.2 The Efforts of UNEP

The United Nations Environment Programme (UNEP) was established in 1972 by the UN General Assembly. At present the UNEP coordinates "Earthwatch," an international surveillance network consisting of three main components: (UNEP, 1989)

(1). GEMS (Global Environmental Monitoring System)–based on a network of stations providing information on the ecological state of the world and on changes in climate, water pollution and tropical forest.

(2). INFOTERRA–a computerized referral service to sources for environmental information and expertise.

(3). IRPTC–a database for the International Register of Potentially Toxic Chemicals.

3.3 The Efforts of OECD

The Organization for Economic Co-operation and Development (OECD) was established in 1961. In its 30 anniversary, the third OECD Report on the State of the Environment was presented to Environment Ministers of the OECD countries at their meeting in Paris on 30th and 31st January 1991. The aims of the Report are as follows: (OECD, 1991a)

(1). Assisting member countries in the definition, implementation and evaluation of environmental policies.

(2). Helping member countries to incorporate environmental concerns into economic decision-making in order to progress towards sustainable development.

(3). Providing environmental information to the public.

The report reviewed the lifetime of environmental policies and institutions in OECD countries over the past two decades (1970s and 1980s). It also identified the remaining problems and agenda for the 1990s. Unfortunately, of the environmental information was not emphasized in the Report.

However, since the creation of the Environment Committee in 1970, the OECD has regularly carried out and promoted work on the use of economic instruments in environmental policy. The report of "Economic Instruments for Environmental Protection" in 1989 revealed the rapid growth in the use of economic instruments and called for the development of common guidelines or principles between member countries (OECD,1989). In the 1991 study of "Environmental Policy: How to Apply Econmic Instruments," the use of economic instruments in environmental policy. There are four major types of economic instruments recommended by the OECD: environmental charges or taxes, marketable permits, deposit-refund systems, and financial assistance (OECD, 1991b).

The OECD also set a milestone in developing the "environmental indicators," which are going to have a big impact on the date type of environment to be collected in the future. The "environmental indicators" can contribute to measurement of environmental performance with respect to the level and changes in the level of environment to be collected in the future. The "environmental indicators" can contribute to measurement of environmental performance with respect to the level and changes in the level of environmental

quality, and the related objetives defined by national policies and international agreements (OECD, 1991c).

3.4 The Efforts of European Community

The European Community has been striving to integrate environmental information of its member states on matters concerning environmental protection. The following three main efforts are of particular importance to the development of environmental information systems.

3.4.1 The CORINE Programme

In response to the difficulty of considerable variation of environmental data characteristics (availability, definitions, measurement methods, etc.) between countries, the European Community decided to undertake the CORINE Programme (coordination of information on the environment) to gather, coordinate and ensure the consistency of information on the state of the environment and natural resources. The CORINE Programme had two aims: firstly, to verify the usefulness of a permanent information system on the state of the environment for Community environmental policy, to check the technical feasibility of creating such a system, and to identify the conditions required for its installation and functioning; and secondly, to supply information useful for Community environmental policy on topics of priority concern (biotopes, acid deposition, the Mediterranean environment). Initially planned for a four year period, the Programme was extended by two years. It started from 1985 and ended at 1990. At the end of the Programme, there were 22 thematic contents of the CORINE information system. Most of environmental themes were organized in an operational GIS.

3.4.2 The European Environmental Agency

In light of the achievement of the CORINE Programme, the European Community decided to create a European Environment Agency (EEA) in order to transform the CORINE prototype into a permanent information system. On 7 May 1990, the European Community adopted the Council Regulation to establish the European Environment Agecy and the European environment information and observation network. The objectives of the European Environment Agency is to provide the Community and the member states with:

objective, reliable and comparable informtion at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment; and the necessary technical and scientific support. The EEA is a logical successor of the CORINE Programme. The techniques and databases established under the CORINE have become the cornerstone of the function of the EEA. With regard to European environmental information and observation network, 12 "national focal points" and 6–8 "thematic centres" are going to be established in the EC. That means each member state will have a national focal point to collect and coordinate its own country environmental information, while some countries will have another thematic centre to process a specific type of environmental data for all member states.

3.4.3 The Freedom of Access to Environmental Information

The Council of the European Community issued the EC Directive of 7 June 1990 on the freedom of access to information on the environment. The object of this Directive is to ensure freedom of access to, and dissemination of, information on the environment held by public authorities and to set out the basic terms and conditions on which such information should be made available (EC Council Direcive, 1990). The member states of European Community are asked to bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 31 December 1992.

3.5 Brussaard's Argument on Information Management

Professor Brussaard indicated the importance of information policy and information infrastructure. He argued that information policy should satisfy two a priori conditions:

(1). Policy should be generic by nature to be applicable at all levels of governments.

(2). Responsibility and authority should be perfectly clear to ensure both organization and technical coordination possible.

Professor Brussaard further pointed out that a general framework (information infrastructure) for the description, analysis and planning of information

systems is considered a prerequisite for the implementation of information systems in government. Therefore, the basis of this infrastructure was anorganization independent taxonomy of government information systems, extended by an administrative differentiation between information management and system management. Information systems strategies based on this framework should cover distince levels of government and their interrelations, different stages of technological development in the applications, and eventually structured innovation of public administration if that is what is required politically (Brussaard, 1991).

3.6 Hanley's GIS implementation concept

In the implementation of geographic information systems (GIS) in the U.S. Environmental Protection Agency, Hanley concluded that environmental protection is an integrated whole and efforts to understand and protect the environment on the base of separate media (air, water, land, etc.) are doomed to fail. He suggested that the implementation of GIS needs a non-traditional organization and an integrated data of separate environmental media in order to successfully understand and protect the environment (Hanley, 1991).

4. Research Findings

The depth of data analysis for a researched country depends upon both quantity and quality of data provided by the key informants in each countries. It is recognized that there is a disadvantage for those countries whose data is not in English, since the researcher could not interpret and exploit these non-English materials to its highest potential. However, the following research findings are discussed.

4.1 There is growing recognition that integration of environmental policy is a must.

Integration of environmental policy has three meanings: (1). environmental policy is integrated more effectively into all governmental policy areas, (2). different environmental sectors or media are tied more colsely, (3). the life-cycle of environmental policy is adopted. For example, the Netherlands' Government, on 27 November 1989, announced the environmental policy was the third main element in the government's policy. In June 1990, the Dutch

National Environmental Policy Plan Plus (NEPP-Plus) started considering the establishment of connection between the different environmental sectors, such as air, water, and land. After 1990, environmental protection has evolved from policy planning, to implementation and then to evaluation, which comes to a full cycle of policy life. Obviously, an integrated management through the life-cycle of environmental policy has been recognized. The integration of environmental policy can also be found in other West European countries.

4.2 There is an increasing awareness of the integration of environmental information.

Environmental information from different organizations about different media are in imperative need to be integrated for better environmental decision-makings. For example, the MISAM Programme is for coordination of environmental information in Norway. Its aims are to increase the efficiency of data collection and exchange by standardization, and the establishment of a catalogue reference service. The Programme was started in1988 and is to be completed by the end of 1992 (Nygaad and Mag, 1991). In Denmark, the STANDAT (Standardized Data-exchange) was issued in March 1990 as an exchange format for integration of environmental data.

Similar effort has also been found in The Netherlands. The Netherlands physical planning Information System (INSRON) developed by the National Physical Planning Agency (RPD), under the Ministry of Housing, Physical Planning and Environment (VROM) was to create a central point within national physical planning circles where information is required to fulfil on behalf of the physical research, planning and policy activities. For the interation of environmental informtion, the RPD in 1985 started the technology of Geographic Information System (GIS) and in 1989 it further launched the project of "central geographic database" (de Jong, 1990). In 1991, under the VROM, the Environmental Control Agency (DGM) who responsible for the nationally environmental control also started to develop an information infrastructure for integration of environmental information. Other similar efforts in the integration of environmental information in other West European countries can also be observd.

4.3 There is growing recognition of reorganizing environmental agencies to meet challenges of the ever-changing environmental problems.

The Environmental Protection Act 1990 of the United Kingdom may be taken as an example. A single authority (Her Majesty's Inspectorate of pollution, HMIP) had control releases to all three environmental media (air, water and land) through a single authorization for each process. However, in view of the environmental policy implementation, there are problems of overlap and potential conflict between agncies, such as HMIP, Drinking Water Inspectorate , National Rivers Autority (NRA), and local governments. Firstly, both HMIP and NRA have responsibilities for controlling discharges to water from industrial processed. Secondly, for the waste regulation functions of local authorities, close liaison is needed with NRA in setting licence conditions to prevent contamination of water from waste facilities. Thirdly, there is the need to ensure that decsions about pollution control take full account of the need to select the best practicable environmental option (BPEO). Since trade-offs between the different objectives of the regulatory bodies may not always be established at the right point, it is necessary to create a new environment Agency to take this full responsibility. On October 1991, the UK Government proposed a new independent Environment Agency which will combine the key regulatory pollution control responsibilities of HMIP, NRA and the waste regulation functions of local authorities. The date for the new Environment Agency was set as April 1992.

In Ireland, the 1990 Environmental Protection Agency Bill made similar effort to establish an Environmental Protection Agency in order to exercise environmental control over all activities with major polluting potential. The proposed Agency will also provide important supervisory and support services in relation to other public bodies, including local authorities whose activities concern the environment.

In The Netherlands, under the VROM, the Environmental Control Agency (DGM) who responsible for the nationally environmental control also had an organization reform at the end of 1991. In France, the Institute for the Environment (L'Institut Francais de 1'Environment, IFEN) was created in November 1991 to manage environmental information in an integrated way. The efforts to reorganize environmental agencies in most countries are obviously trying to meet the ever-changng challenges from environmental protection.

4.4 There are many new concepts and tools of environmental administration emerging over the last ten years.

New concepts related to environmental policy are: ecosystem, life-cycle production, and stewardship. New tools related to environmental policy implementation are: IPC, BAT, BATNEEL, BPEO, environmental account, and environmental indicators. New techniques related to environmental information management are: metadata or referral system, public register, and infrastructural integration.

4.4.1 New Concepts in Environmental policy

In the 1987 report of "Our Common Future," the concept of "sustainable development" was formulated as: development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Since then many countries have added new concepts to their environmental policy. In The Netherlands, the concept of "ecosystem" was used to distinguish five levels of environmental scales: local (the developed environment), regional (the landscape), fluvial (the basins of rivers and coastal seas), continental (air and ocean current), and global (the higher air layers). Each level has its own problems, yet they all affect each other.

Another new concept adopted in the Dutch environmental policy is called "life-cycle production" which looks at the entire life cycle of a production (from production to distribution and consumption to disposal) in order to prevent or minimize pollution at all stages. In the United Kingdom, the concept of "stewardship" is the foundation of environmental policy. The British Government recognizes that it is mankind's duty to look after our world prudently and conscientiously because we do not hold a freehold on our world, but only a full repairing lease. We have a moral duty to look after our planet and to hand it on in good order to future generations.

4.4.2 New Tools for Environmental Policy Implementation

In UK, under the Environmental Protection Act 1990, the Integrated Pollution Control (IPC) was introduced on April 1991. A key feature of IPC is to apply the principles of Best Available Techniques Not Entailing Excessive Cost (BATNEEC) and Best Practicable Environmental Option (BPEO) to prevent

or minimize the pollution. The term BATNEEC is gaining increasing occurrence in international legislation and agreements relation to environmental protection. The European Community Directives use the term "best available technology" while the IPC uses the term "best available techniques" to include both technology and any other operational factors. The BATNEEC are used to prevent or, if that is not practicable, to minimize the release of prescribed substances into the medium for which they are prescribed. Where a process releases substances to more than one environmental medium, BATNEEC is supplemented by the principle of BPEO to minimize the pollution whcih may be released to the environment as a whole.

New tools are also developed in the private sectors. For example, the term "environmental account" is getting popular in private companies. Environmental account expresses an organization's environmental impact in financial terms. It can be used to calculate a net value added, representing organizational net return after taking into account its effect on the environment. In addition to an organizational value added, environmental account also has to include the "value lost," which is the cost of the organization's environmental impact less its expenditure to control that impact. Some international organizations also contribute the development of new tools for environmental poliy implementation. For example, the OECD has set a milestone in developing the "environmental indicators," which are going to measure environmental performance with respect to the level and changes in the level of environmental quality.

4.4.3 New Techniques for Environmental Information Management

Metadata or referral system is gaining more attention in most West European countries. For example, the Environmental Information Service (ENFO) established by the Ireland Government in 1990 is to promote knowledge and care of the environment by providing access to wide-ranging and authoritative information. The Nation Reference Centre for Environmental Information (CIMI) started by The Netherlands Government in 1989 is to develop and manage several databases containing references on environmental literature, data and expertise. The CIMI also develops and maintains an environmental thesaurus for the purpose of standardization of environmental information. In UK, the new Public Register of pollution information is to ensure that information must be freely available to the public in order to facilitate pub-

lic participation in environmental protction and increase Public confidence in pollution control. The Public Register is one main feature of the UK environmental Information management.

Environmental information infrastructure (EII) is also getting attention in West Eurpoean countries. The term EII has both technical and organizational meanings. Technically speaking, EII means any technical components which is constructed for the cmmunication of environmental information, for example, the computer network for environmental information. Organizationally speaking, EII means any organizational restructure which is established for coordinating environmental information, for example, the group of environmental information promotion. The Norway's MISAM Programme is typically a technical EII, while The Netherlands' Envronmental Information Exchange Group (WIM) is an organizational EII. Infrastructural integration is also a new tool for environmental information management. One consulting company in The Netherlands is testing an infrastructural integration among Integrated Chain Mangement (ICM), Geographic Information System (GIS) and Computer Integrated Manufacture (CIM). The underlying assumption of infrastructural integration of ICM, GIS and CIM is to tie manufactures (main pollution productrs), lifetime management (cradle to grave production), and geographical information (location of pollution) all together for environmental information management and environmental protection.

4.5 The environmental information management in West European countries can be termed as: complete environmental policy, no environmental information policy, lacking environmental information infrastructure, and independent environmental information systems.

In theory we would expect one country's environmental policy (EP) leads to the formulation of environmental information policy (EIP), which in turn leads to the construction of environmental information infrastructure (EII) and then to the development of environmental information systems (EIS). In practice we found that EP in West European countries is relatively complete, while none of the countries has EIP and a few countries have EII and all countries have independent EIS. In West European countries the history of EIS is much longer than the history of EP, which was developed in late 1980s. This historical development (bottom-up development) has led each countries into a situation where environmental information is segmental and scattering,

which in turn led to inefficiency in information collection (or processing) and ineffectiveness of environmental control. It also has become a bottleneck for data exchange and comparison across borders, which in turn hindered the global efforts of environmental protection.

5. Conclusions

With respect to the research questions, the following three conclusions are drawn from the results of research findings and literature review.

Conclusion 1:

The environmental policies in West European countries are focused upon the concept of "sustainable development." Additional attention is given to concepts such as stewardship, ecosystem, life-cycle-production. New principles used in formulation these policies are: the global view, the scientific base, the precautionary action, and the public participation.

Conclusion 2:

None of West European countries studied has an explicitly formulated environmental information policy (EIP). Different environmental information systems (EIS) have been developed by various organizations in these countries for managing different types of pollution. Environmental information in each of these countries is fragmented and scattered. It is like in a "Babylon Tower," each EIS speaking in different dialects. In specific, when there is no guidance from environmental information policy (EIP) and environmental information infrasturcture (EII), a country is flourished with various environmental information systems (EIS) working in isolated fashion. This author believes that both EII and EIP have to be developed within a country to guide the integration of all EIS. One environmental information infrastructure (EII), the MISAM Programme in Norway, is viewed as a potential solution to this problem.

Conclusion 3:

There are four major developments in environmental administration over the past 10 years: (1). integration of environmental policy, (2). integration of

environmental information, (3). reorganization of environmental agencies, and (4). development of new concepts or tools for environmental administration.

6. Implications

There are several implications can be drawn from the research. Firstly, public awareness of environmental problems, public access to environmental information, and public participation in environmental policy-makings are key to the success of environmental protection. Thus it is important to ask the question of how to bring the concepts of sustainable development, ecosystem, stewardship and life-cycle-production to the public? Three good examples observed by this author are the ENFO of Ireland, Public Register of the United Kingdom, and CIMI of The Netherlands. However, all 3 cases were initiated in the past 3 years. It remains to be seen how they should progress in the future. Researchers may want to study further into these 3 cases.

Secondly, environmental policy has to be integrated within three dimensions: cross-sectoral (social, economical, environmental, and etc.), multimedia (air, water and land), and policy-life-cycle (planning, implementation, evaluation and feedback). The question is becoming critical as how to integrate environmental policy? Lessons learned from this research are: 1. the Green Ministers of the United Kingdom is one example in doing cross-sectoral integration which environmental concerns are across all other policy areas; b. some consulting companies in The Netherlands are doing multimedia integration where the technology of GIS, ICM and CIM are being integrated. However, life-cycle integration of environmental policy needs special attention. Since environmental information on both policy planning and policy implementation are relatively complete, while environmental information on both policy evaluation and evaluation feedback are relatively incomplete, future efforts should focus on the management of latter information.

Thirdly, environmental information systems in most Western European countries tend to be historically developed by different organizations without guidance from environmental information infrastructure (EII) and environmental information policy (EIP). This author assumes that it is more practical to set up EIP and EII for integrating segmentally environmental information. By working top-down approach (setting EIP and EII to integrate different EIS) to meet the historical bottom-up approach (creating EIS without EIP and EII) seems more promising to integrate environmental information. However, this

belief is not grounded on in-depth study. Further inquiry must be done to confirm or reject this assumption.

Fourthly, most West European countries tend to be historically decentralized. This is a main feature of democracy. The local governments traditionally have a big say in environmental issues as well as in other areas which are locally concerned. When most environmental problems can not be solved locally, certain degree of information integration becomes inevitable. While integration of environmental information is not necessarily to become information centralization, the author believes that certain degree of information power is going to shift from the local governments to the central government–such as standardization of concepts, data definition, processing models and etc. Some kinds of mechanism need to be designed in order to overcome the dilemma of retaining political decentralization while achieving environmental information integration.

Finally, it was found that the environmental contact channel of West European countries visited was rather more difficult than expected. If environmental protection is to be a global issue, every country should be expected to open its channel to other countries. Environmental information management is not only a technical matter but also an organizational one. Human contact is of particular importance to the task. It is believed that besides the open system of computer hardware and software, the human side of the environmental information management should also be of open system. This author tentatively coins the word "humanware." An open system of "humanware" is for everyone in the field to behave as an open-minded learners as well as a amicable teacher. In such way, different norms of information from different countries in the world could be utilized and integrated to facilitate a global improvement. In the future, it is important to explore the further significance of "humanware" and to build it up openly and accessibly to every people in the common earth.

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