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WORKING PAPER NO. 7

ENVIRONMENTAL REGULATION OF THE NANTICOKE
INDUSTRIAL COMPLEX

by

J.G. Nelson
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FOREWORD

This study is one of a series commissioned by the Economic Council's Regulation Reference which deals with various aspects of environmental regulation. These studies do not profess to cover the whole field of environmental regulation but they do focus on several important areas of concern.

The following is a list (alphabetically by author) of environmental studies prepared for this series.

Bankes, Nigel and Andrew R. Thompson, An Analysis of the Legal and Administrative Framework for Monitoring and Feedback Systems in Impact Assessment and Management.

- * Dewees, Donald N., Evaluation of Policies for Regulating Environmental Pollution.

Dorcey, Anthony H.J., Michael W. McPhee and Sam Sydneysmith. Environmental Regulation of Timber Harvesting and Log Transportation: Salmon and the B.C. Coastal Forest Industry.

Felske, Brian E. and Associates Ltd., Sulphur Dioxide Regulation and the Canadian Non-ferrous Metals Industry.

- ** Hunt, Constance D. and Alastair R. Lucas, The Impact of Environmental Regulation on Major Oil and Gas Projects: Oil Sands and Arctic.

- * Nelson, J.G., J.C. Day and Sabine Jessen, Environmental Regulation of the Nanticoke Industrial Complex.

Nemetz, Peter, John Sturdy, Dean Uyeno, Patricia Vertinsky, Ilan Vertinsky, and Aidan Vining, Regulation of Toxic Chemicals in the Environment.

Rohlich, Gerard A., The Toxic Substances Control Act; Overview and Evaluation.

Swaigan, John Z., Compensation of Pollution Victims in Canada.

Victor & Burrell, Research & Consulting, Environmental Protection Regulation, Water Pollution, and the Pulp and Paper Industry.

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LIST OF ABBREVIATIONS

Federal Government Agencies

DOT	Department of Transport
DPW	Department of Public Works
DOE	Department of Environment

Provincial Government Agencies

Pre-1972

DMA	Department of Municipal Affairs
DERM	Department of Energy and Resources Management
DH	Department of Health
DLF	Department of Lands and Forests
DAF	Department of Agriculture and Food
DOH	Department of Highways
DTE	Department of Treasury and Economics
OWRC	Ontario Water Resources Commission

Post 1972

MNR	Ministry of Natural Resources
MIT	Ministry of Industry and Tourism
MTG	Ministry of Transportation and Communication
MOH	Ministry of Housing
MOE	Ministry of Environment
TEIGA	Ministry of Treasury, Economics and Intergovernmental Affairs
OMB	Ontario Municipal Board
LPRCA	Long Point Region Conservation Authority

Regional and Local Governments

RMHN	Regional Municipality of Haldimand-Norfolk
CN	City of Nanticoke
TW	Township of Walpole
WT	Woodhouse Township
VJ	Village of Jarvis

Industrial

HEPC	Hydro Electric Power Commission
OH	Ontario Hydro
Stelco	The Steel Company of Canada, Ltd.
Texaco	Texaco Canada, Inc.
CNR	Canadian National Railways
CPR	Canadian Pacific Railways
UG	Union Gas
BC	Bell Canada

Other

NEC	Nanticoke Environmental Committee
NEMP	Nanticoke Environmental Management Committee
EPA	Environmental Protection Agency (U.S.)

RÉSUMÉ

La présente étude consiste en une évaluation du système de protection de l'environnement mis au point pour le complexe industriel de Nanticoke, lequel comprend une usine sidérurgique intégrée, une raffinerie de pétrole et une centrale thermique. Ce complexe, dont la construction a été commencée au milieu des années 60, est situé sur la côte nord du Lac Erie, dans la région de Haldimand-Norfolk, en Ontario.

Cette monographie présente un bref historique de ce projet dont le coût s'est élevé à environ cinq milliards de dollars. Les ententes et procédures complexes, sur le plan de la réglementation, selon lesquelles les diverses étapes de ce projet ont été fixées, analysées et approuvées sont décrites et évaluées, de même que les arrangements particuliers qui ont servi à coordonner la part jouée par les gouvernements de niveau fédéral, provincial et municipal, ainsi que par les groupes d'industriels et autres personnes intéressées.

L'évaluation se fonde sur quatre principaux types de données : (1) la portée et la nature du programme de recherche, et la façon dont les résultats ont été utilisés dans la réglementation et la planification visant la

protection de l'environnement; (2) les arrangements institutionnels et les techniques adoptées pour protéger l'environnement, et les preuves de changement, ou de dommage à l'environnement, jusqu'à ce jour; (3) les renseignements pertinents contenus dans les dossiers de ratification des gouvernements et de l'industrie; et (4) les faits et les opinions recueillis au cours d'entrevues.

Dans l'analyse de l'efficacité, l'accent est placé sur le temps nécessaire à la réalisation de la tâche, ainsi que sur la cohérence, le dédoublement et le gaspillage des efforts. L'efficacité sous-entend la réalisation d'objectifs, mais il est difficile d'en faire l'évaluation, surtout en raison du fait que les buts visés ne sont pas toujours bien précisés ou classés par ordre d'importance par les sociétés ou les organismes publics. En outre, la façon de juger de l'efficacité, des coûts et des bénéfices varient selon les utilisateurs et les groupes d'intérêt. La présente étude comporte deux types de jugements : (1) les opinions de divers groupes d'intérêts ou de personnes ayant participé au projet; et (2) les conclusions de l'auteur, fondées sur tous les renseignements disponibles, y compris une quantité restreinte de données comparatives provenant d'autres études.

Une des conclusions importantes de l'auteur est

que le procédé a été raisonnablement efficace, si l'on considère les circonstances en jeu à l'époque. Certaines injustices sont cependant apparues, dans le cas, par exemple, de certains agriculteurs de la région touchée par les développements industriels. Il est difficile d'en arriver à des conclusions finales au sujet de l'efficacité, puisque la qualité de la gestion dont bénéficiera bientôt le complexe au moment de sa pleine exploitation influera grandement sur les résultats obtenus jusqu'à présent. Il faudra, en réalité, attacher un intérêt particulier au contrôle de la qualité de l'air, et compenser pour le manque de planification coordonnée au sujet des terres avoisinantes, des eaux, du poisson, et autres ressources qui étaient si importantes pour les personnes qui habitaient la région de la baie de Long Point avant la réalisation du projet. Si on veut tirer des bénéfices de Nanticoke, sans entraîner des coûts futurs pour l'industrie existante, les résidents et les autres utilisateurs de l'environnement, il est essentiel que les responsables s'engagent au plus tôt dans des travaux de surveillance continue et dans des recherches complètes, qu'ils instaurent une meilleure gestion d'ensemble, en vue d'augmenter les occasions de participation de la part de l'administration locale et du public. A cet égard, l'Ontario et le Canada pourraient probablement tirer profit de l'étude des efforts déployés par les États-Unis pour une gestion côtière d'ensemble

depuis l'adoption, en 1972, de la Coastal Zone Management Act.

Summary

This study is an assessment of the environmental protection system for the Nanticoke Industrial complex, an integrated iron and steel plant, oil refinery, and thermal generating station. Begun in the mid-1960's, the complex is located on the north Lake Erie shore in the Haldimand-Norfolk Region, Province of Ontario. In this monograph, a brief history of this approximately \$5 billion project is presented. The complex regulatory arrangements and procedures used to identify, analyze, and approve the various phases of this development are described and evaluated as are the often ad hoc arrangements which were utilized to coordinate the roles of the federal, provincial, and local governments, as well as industrial and other groups.

The assessment is based upon four main types of evidence: (1) the scope and character of the research program and the way the results were used in regulating and managing for environmental protection; (2) the institutional arrangements and the technology introduced to protect the environment and evidence of environmental change (damage) to this date; (3) relevant information in government and industry approval files; and (4) facts and opinions obtained through interviews.

In analyzing efficiency, stress is placed upon the time involved in task completion, as well as on consistency, duplication, and waste of effort. Effectiveness refers to the reaching of goals and objectives, and is difficult to assess largely because these are not always well-defined or ranked by corporations or government agencies. Judgments on efficiency, effectiveness, costs and benefits, also vary among users and interest groups. In this study, judgments are of two types: (1) the views of various actors or interest groups; (2) the authors' conclusions based on all available information, including a limited amount of comparative data from other studies.

Among the major conclusions are that the process has been reasonably efficient, considering the circumstances of the time. Certain inequities have however arisen, for example for some farmers in the area affected by the industrial developments. It is difficult to make final conclusions about effectiveness as much depends upon sensitive management in the impending full-scale operational phase. Of particular concern in this regard is the management of air quality, and the lack of comprehensive, coordinated planning for the coastal lands, waters, fish, and other resources so vital to pre-project residents in the Long Point Bay area. Commitments to undertake continuous monitoring and comprehensive research, and to establish better overall management, including more opportunities for local government and public participation are urgently required if Nanticoke benefits are to be achieved at potentially avoidable future costs to existing industry, residents, other users and the environment. In this regard, Ontario and Canada can probably benefit from study of the comprehensive coastal management efforts of the U.S. since passage of the Coastal Zone Management Act in 1972.

EXECUTIVE SUMMARY:

ENVIRONMENTAL REGULATION OF THE NANTICOKE INDUSTRIAL COMPLEX

J.G. Nelson, J.C. Day, Sabine Jessen

1. The Nanticoke development is of interest mainly because it provides information on the application of Federal, Provincial, and local government environmental regulations for a large new industrial complex in one place, the Haldimand-Norfolk region, about 50 miles southwest of the Hamilton-Toronto area, Ontario.
2. The research began in May 1979 with field study, literature reviews, and interviews occupying three workers up to September 1979. A first draft was circulated to about 40 interviewees in January 1980; 21 subsequent replies have been taken into account in preparing this final report.
3. The focus here is on three major industries. The Stelco steel plant (1 of 4 phases) will begin producing 1.35 million tons of steel annually in spring 1980. The Texaco oil refinery has a capacity of 95000 bbls/day and has been in production since fall 1978. The Ontario Hydro coal-burning power plant has an ultimate capacity of 4000 MW although it has not operated at more than about one-third capacity since starting in March 1973. An industrial plant, a new town (Townsend), highways, waste disposal facilities, and other aspects of the Nanticoke complex are not considered in detail in this study.
4. Dramatic population increases of up to 300,000 by 2000 AD were forecast after announcement of the major Nanticoke plants in the 1960's. Changes in economic conditions, company plans, and other factors have resulted in a lowering of these projections to 107,000 to 118,000 for 1986 and 170,000 to 200,000 for 2000 AD. Present population in the study area is about 87,000.
5. The Nanticoke development led to a local government transformation with 2 counties and 29 municipalities merging into the Regional Municipality of Haldimand-Norfolk consisting of 6 new Area Municipalities. The Regional Planners have completed an Official Plan and are working with the Area Municipalities on District Plans. Many inefficiencies in the regulatory system have been worked out through Canada-Ontario agreements and cooperation among agencies at 3 levels of government.
6. The Nanticoke project has had many social effects;

however the prime focus in this study is on environmental impacts in the relatively narrow sense of biophysical elements and processes: air; water; sediment; visual, odour, and noise aesthetics; site conditions; flooding and erosion; animals; and vegetation. This study also provides a better understanding of land use regulations although such regulations are to be treated more fully in the Land Use section of the Economic Council's overall study of regulation in Canada.

7. More than 20 Acts apply to the Nanticoke complex and many Federal, Provincial, Regional, and local government agencies have responsibilities in the environmental field including the Federal Department of Environment, the Provincial Ministries of Environment, Natural Resources, and Housing, and Regional and local governments through Official and District Plans and other measures.
8. This is an appropriate time to assess the efficiency, effectiveness, costs and benefits of the environmental protection regulatory system at Nanticoke. With the completion of the Stelco plant this spring, the major planning and construction phase has ended. Environmental planning and management measures can be assessed, and future risks, potential problems, and requirements identified.
9. In analyzing efficiency, stress is placed upon the time involved in task completion as well as on consistency, duplication, and waste of effort. Effectiveness refers to the reaching of goals and objectives and is difficult to assess largely because these are not always well defined or ranked by corporations or government agencies. Judgments on efficiency, effectiveness, costs, and benefits also vary among users and interest groups. In this study, judgments are of two types: 1) the views of various actors or interest groups; 2) the authors' conclusions based on all available information, including a limited amount of comparative data from other studies. The findings are presented in such a way that readers can form their own conclusions.
10. The key overall question can be put as follows: Were the environmental protection measures implemented in a reasonable time, at reasonable cost, and without undue adverse effects on the resource base and so on pre-project users and residents, notably farmers, fishermen, and recreationalists.
11. The assessment is based upon 4 main types of evidence: 1) the scope and character of the research program and the way the results were used in regulating and managing

for environmental protection; 2) the institutional arrangements and the technology introduced to protect the environment and evidence of environmental change (damage) to this date; 3) relevant information in government and industry approval files; 4) facts and opinions obtained through interviews.

12. A comprehensive wide-ranging research program has been conducted by industry and government on environmental, social, technical, and other aspects of the Nanticoke project. However, no pre-project government research was undertaken on the environmental or social suitability of the Nanticoke site for heavy industrial development. Government-industry coordinating committees were established first for research on water quality and the aquatic environment (NEC) and later for air quality (NEWP). Monitoring programs were introduced and costs shared. Many research recommendations were incorporated into planning, regulation, and management, for example into the Regional government's Official Plan. Ultimate effectiveness here depends, among other things, on implementation through Area Municipality or District Plans which are in process.
13. Gaseous pollutant and suspended particulate matter concentrations are now generally low in the Nanticoke area but a number of air quality concerns have been identified including: 1) rare exceedences of SO₂ standards; 2) difficulty in measuring and delimiting air quality effects; 3) fumigation of chimney plumes which can result in high ground-level pollutant concentrations; 4) the impact of Nanticoke operations on air quality elsewhere in Ontario and the U.S. Research is currently underway on all of these concerns.
14. Much sophisticated environmental technology has been used at Nanticoke in an attempt to control projected emission rates, for example of SO₂, which is projected at 300,000 tons per year, the second highest in Ontario. SO₂ levels could be reduced by installing scrubbers at the Ontario Hydro generating station like those now required in the similar new U.S. plants. However, the cost has been estimated at \$400 million for a plant which originally cost about \$787 million. Furthermore scrubber installation may not significantly reduce pollution downwind from Nanticoke because of pollution from other sources outside the Nanticoke area. Methods other than technology can be used to control emissions including controlling industrial siting in relation to environmental constraints, changing output, fuel types, land use regulations, and other factors.
15. Construction of the three major plants and associated facilities reportedly has led to no significant changes

in air or water quality to this date. However, some concerns previously have been noted about air quality and some also exist for water quality and the aquatic environment. Some small potentially significant shifts in water quality reportedly could be occurring as could changes in fish populations, although the latter may be short term and not attributable to the project. Perch are under pressure for example from overfishing as well as entrainment and other industrial effects. Additional unanticipated adjustments may be needed as new industries and other projects come into operation together and interactive effects develop. Increased shipping, dredging, slag and solid waste disposal, oil and other spills all pose problems. Spills are of special concern to fish and waterfowl populations of the nearby Long Point marshes.

16. In the light of the foregoing uncertainties, an overall monitoring and research management program is desirable based upon NEC (water) and NEMP (air). No evidence of comprehensive planning, regulation, and management has been found for Long Point Bay and nearby waters. This is in contrast to the land where an Official Plan has been prepared by the Haldimand-Norfolk Region in cooperation with senior government. Complicated federal-provincial jurisdictional arrangements probably are largely at fault in the case of the Bay; to avoid uncertainty the Ontario Ministry of Natural Resources should lead in planning, regulating, and managing nearshore waters.
17. Note previously has been made of major institutional changes in the Nanticoke area; another innovation is a 3-kilometre buffer zone proposed in the Region's Official Plan and supported by Ministry of Environment. This buffer is intended to limit residential and other development near the plants and control industrial emission effects in that high risk area. Problems with the buffer include difficulty in delimiting its appropriate extent, failure to prevent possible impacts on farmers and other current residents of the zone, and possible damage to crops as well as health risks to buyers of produce from the zone. More detailed studies of zoning, compensation, insurance, land purchase, and other possible adjustments to industrial as well as natural hazards elsewhere in the world would be helpful in making the difficult regulatory and management decisions for the new plant area at Nanticoke.
18. Approval files have been analyzed in terms of commentators, their concerns, dates of submission and approval, length of approval process, and comments, for example on special coordination mechanisms. Different Ministries have used different procedures, sometimes

involving many commentators from outside the agency, sometimes involving a few commentators in an essentially internal technical review. No evidence was found that approval procedures caused any significant delays in plant construction. Some projects were changed during the approval process; a good example is the Stelco dock which was modified to allow for greater water, sediment, and fish circulation beneath the structure. Many approvals for the plants or for major components thereof took less than a year, less time indeed than many residential and cottage approvals for the Lakeshore zone. A negotiation process generally was employed by government and industry in implementing regulations, a process similar to that now advocated by some parties in the U.S. as a possible solution to regulatory issues there. In the Nanticoke case, negotiation generally did not involve local governments or interest groups, such as the fishermen who sent a petition to the Minister of Natural Resources about the Stelco dock and other impacts. If the negotiation process is used more frequently it probably would be more effective if all government levels and major affected parties were involved from an early stage.

19. Forty-three interviews were conducted with persons having administrative or other relevant experience in government (32), industry (4), and interest groups (7). With one exception the industry interviews included 3 or more people in a group meeting as well as subsequent correspondence and questionnaire completion. The interview data were analyzed in some detail to assess opinions on adequacy of research, equipment, technology, and institutional arrangements, as well as equity, changes in plans or requirements, and overall effectiveness. Among the more significant findings were the following: 1) members of senior governments and industry displayed the most positive attitudes toward research, many interviewees commented on the need for more study of spawning beds and other critical areas as well as more long-term integrated research on an ecosystem or other holistic basis; 2) concern that the low level of Federal involvement might be more efficient than effective especially in research; 3) concern for more coordinating mechanisms to provide information and assistance on environmental regulatory requirements; 4) respondents generally expected change although it caused problems for industry and government when introduced by one or the other; 5) concern about apparent inequities, for example in the proposed buffer zone or in the capability of small and medium-sized organizations to meet environmental regulatory requirements; 6) attitudes to overall effectiveness were generally positive, although uncertainty existed about ability to control environmental degradation under full scale development.

20. The cost and benefit data in this study are limited because of lack of appropriate accounting procedures in some cases, little previous research on the question, time availability, and other constraints. Stelco, Texaco and Ontario Hydro reported that each spent between \$70 million and \$83 million (subsequently \$96 million for Stelco) on environmental protection or between 9 and 15% of each companies total project expenditures. Secondary costs to government agencies totalled about \$133 million or 6% of total project costs of approximately \$2.2 billion by Summer, 1980. Much of the latter will be recovered through various user charges. Little data is available from other studies for comparison with these findings. Social effects were not part of this study but many residents of the Region and wider area perceive a negative Nanticoke project impact on living costs, taxes, political conditions, and lifestyles. On the other hand, massive investment has occurred and about 2,900 jobs reportedly will be created in the three major industries and the industrial park by 1981. Some of this may be transfer employment from Hamilton, Port Credit, or other areas. The technically advanced plants should make industry more competitive in Canada and abroad. Other benefits include development of better techniques, for example for fish protection during construction, institutional innovations such as NEC and NEMP, and new technology, all of which can be used elsewhere.
21. The key question is whether environmental protection and other measures have been implemented in a reasonable time, at reasonable costs, and without undue effects on the resource base, pre-project users, and residents? It is difficult to arrive at a firm conclusion on costs. It is our view that they have not been unreasonable given the current level of protection and other benefits. However, Stelco for one, has concluded that they are "significant". The project and its various impacts have been regulated and managed quite efficiently and without any significant known adverse effects to date. Comparison with a limited amount of available data from the U.S. and elsewhere supports this conclusion. More comparative information and better and more consistent methods of assessing regulatory efficiency and effectiveness are needed. Systems like that developed in this study could be used regularly by government and industry. Uncertainties about the future make it difficult to be firm about the ultimate benefits of the Nanticoke development. Of major concern is the management of air quality and the coastal lands, waters, fish, and other resources of the Long Point Bay area. Continuous monitoring, more comprehensive research, including social studies, and better overall management

are required if Nanticoke benefits are not to be achieved at potentially avoidable costs to fishing and other pre-project industries as well as residents and other renewable resource users living outside the Region. Attention must be paid to the cumulative impact of the full range of interacting activities and influences. In this regard Ontario and Canada can probably benefit from studies of the comprehensive coastal management efforts of the U.S. since the passage of the 1972 Coastal Zone Management Act.

INTRODUCTION

This assessment of the new Nanticoke industrial complex in Southern Ontario is one of the Economic Council of Canada's studies of environmental protection regulatory systems. These environmental protection studies are part of the Council's larger research project on the effects of regulation on many aspects of Canadian society. The regulatory studies were referred to the Economic Council by the Prime Minister and Provincial Premiers in 1978 in response to growing concern about regulations in Canada (Economic Council of Canada, 1978 and 1979).

Environmental, marketing, communications, and other regulations were seen by critics as having proliferated unduly, becoming unnecessarily complex and costly in terms of benefits received. Few objective studies of the effectiveness, efficiency, costs, and benefits of environmental or other regulations have been undertaken in Canada or other parts of the world. This and associated Economic Council studies are intended to help provide a firmer basis for future Canadian regulatory policy.

The Nanticoke industrial complex is of special interest in two regards. First, it provides information on regulatory effects on massive new iron and steel, oil

refining, and coal-burning power plants. Second, it provides information on the way environmental regulations have been applied in one place; that is, on how environmental and associated land use regulations have been coordinated among major industries and local, provincial, and national governments, as well as citizens of the Nanticoke area. In this sense it combines elements of environmental and land use regulations and is thus significant to both the environmental and land use phases of the Economic Council regulation project.

The development of a regulatory and governmental process adequate to resolve the many resource conflicts caused by new large-scale industrial complexes is a vital need for Canada. New industry is essential to continued regional and national economic prosperity. Yet it often conflicts with important pre-existing resource uses. The result has been widespread, growing, and often acrimonious conflict over the effectiveness of present systems for guiding economic development.

While the large scale of the Nanticoke complex is not representative of industrial developments elsewhere in Ontario or Canada, the magnitude of potential environmental impacts provides a major test of the regulatory system's ability to deal with problems and conflicts in a comprehensive, effective, and efficient manner. This includes impacts on: the coastal area generally;

significant fish spawning areas in the vicinity of the development; ecologically significant habitat for wildfowl within the Turkey Point and Long Point marshes; land-use conflicts; air and water pollution; flood and erosion hazard management; and conflicts with pre-existing resource users such as farmers, fishermen, and recreationists.

The research began in May 1979, with literature reviews and interviews occupying most of time of three workers up to 1 September 1979. Compilation and analysis were undertaken in Fall 1979. A first draft report, was completed on 31 of December, and circulated to about 40 interviewees for comment and return by 29 February. The present paper incorporates many of the suggestions made in the 21 replies that were received prior to its presentation at the Professional Workshop on Regulation Research, sponsored by the Economic Council of Canada and the Centre for Regulated Industries, McGill University, Montreal, 17-18 April 1980. Where it seems appropriate, reviewers' comments are identified as such in the text.

This is an excellent time to assess the efficiency, effectiveness, costs, and benefits of the regulatory system for environmental protection at Nanticoke. The impending completion of the first phase of the Stelco plant marks the end of the major planning and construction phase and the beginning of large scale multi-industry operation. Efficiency and effectiveness of the environmental planning

and management can be assessed to date, and future risks, potential problems, and requirements identified (Munn, 1975).

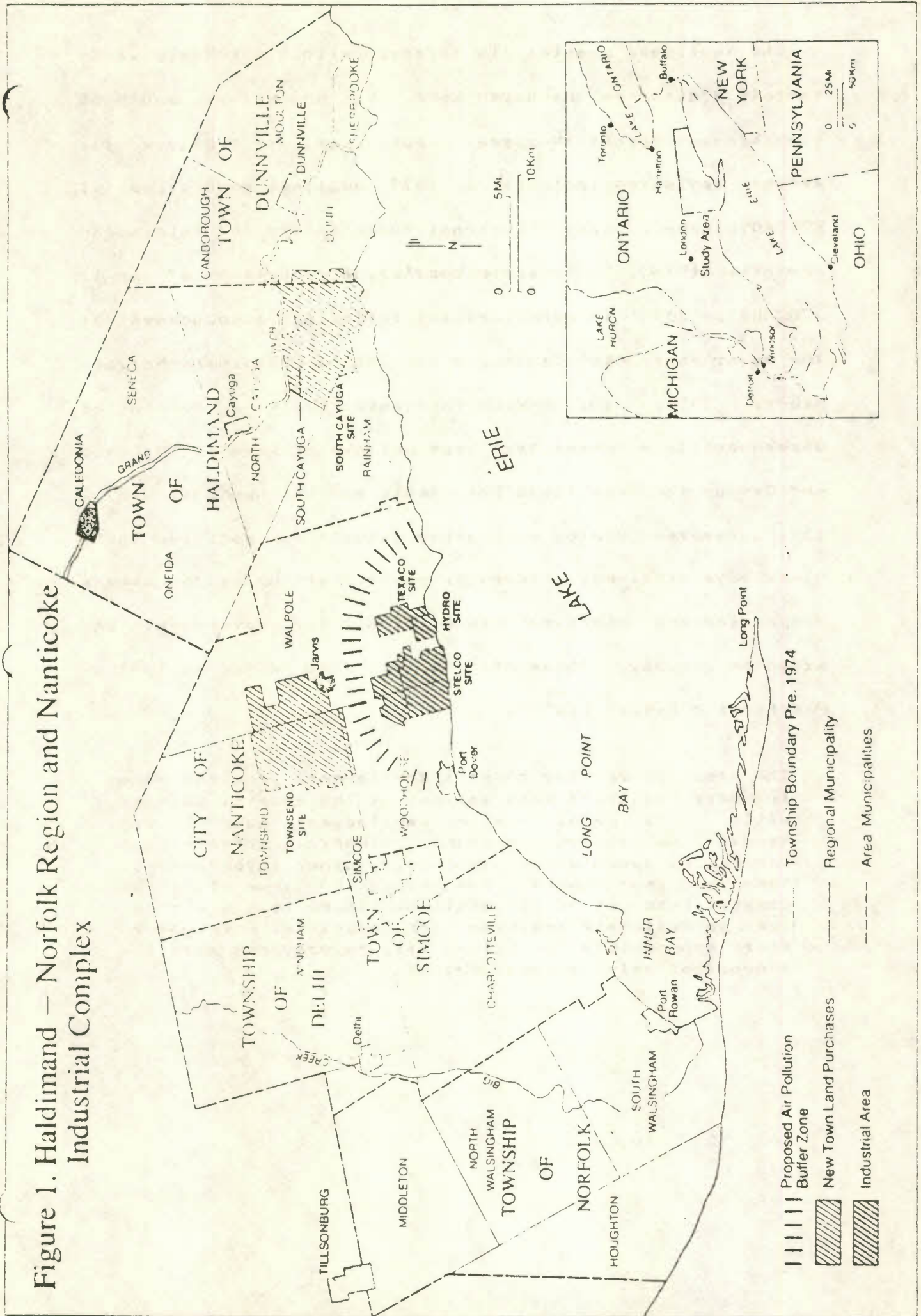
ENVIRONMENTAL SETTING AND DEVELOPMENT OF THE COMPLEX

The Nanticoke complex includes large iron and steel, oil refining, and coal burning power plants (Ontario Hydro, 1977; Eisler, 1975; Chessell, 1978). The iron and steel project (Stelco) is a four-phase enterprise. The first phase will be complete in Spring 1980 and will produce about 1.35 million tons of steel annually. The oil refinery (Texaco) has been in production since November 1978 and has a capacity of 95,000 barrels/day (Chessell, 1978). The coal burning power plant (Ontario Hydro) has an ultimate capability of 4000 MW, although it has not produced at more than about one-third capacity since starting operation in March 1973. An industrial park (Stelco) with 70 sites is incorporated into the industrial complex. A new town (Townsend) is under construction nearby. The complex also has triggered many other projects or potential projects; for example airports, highways, residential developments, and waste-disposal facilities. It is beyond the scope of this research to analyze more than the three major industries. Other associated or induced projects are too complicated for detailed study given available time and resources.

The Nanticoke complex is located within the Haldimand-Norfolk Region on the north Lake Erie shore just south of the Windsor-Toronto-Montreal urban corridor (Figure 1). Recent estimates indicate a 1977 Regional population of 87,040, largely rural (Regional Municipality of Haldimand-Norfolk, 1978). Dramatic population increases of up to 300,000 by 2000 AD were forecast following announcement of the major Nanticoke plants in the 1960's (Haldimand-Norfolk Study, 1971, 4). Such forecasts led the Provincial Government to purchase two large blocks of land at Townsend and Cayuga for new towns (Rigenwald and Richardson, 1975, 11). However Stelco and other industries modified their plans several times, delayed proposed start-up dates, making projection and planning more difficult for governments and affected groups. These difficulties were noted in 1971 by Fischer and Davies (1979):

The stage is set for coastal development problems when industry can shift into and out of the coastal zone at will. The on/off Stelco development has already tended to thwart coastal planning efforts by increasing speculation, inhibiting other investment in land and improvements and taking a large block of coastal land out of circulation. There is now a great need to designate enclaves for industrial development where appropriate facilities will be provided with the support of private contributions.

Figure 1. Haldimand - Norfolk Region and Nanticoke Industrial Complex



A regional population of 107,000 to 118,000 is now projected for 1986 and 170,000 to 210,000 for the year 2000 (Regional Municipality of Haldimand-Norfolk, 1978, 4). Such changes are expected in a region where agriculture, fishing, recreation, and some mining have been the socio-economic mainstays for decades (Burgess Graham Securities Limited, 1978 and Canadian Bechtel Limited, 1970). A major concern, therefore, is the adequacy of the regulatory system as well as other management measures to protect the environment and resources upon which these activities are dependent.

Agriculture

In 1975 Haldimand-Norfolk farms produced approximately \$185 million worth of crops, livestock, and livestock products. In the same year total investment in land, buildings, machinery, and livestock exceeded \$850 million. Tobacco is by far the most important agricultural component in Haldimand-Norfolk; the average annual crop value has been about \$100,000,000 during the late 1970's. Slightly in excess of half of the Ontario tobacco is grown in the former County of Norfolk where approximately 2000 tobacco farms comprise approximately 43,000 acres. In 1977, 109,339,000 pounds of tobacco grown in Norfolk were sold for \$119,978,000 (Burgess Graham Securities Limited, 1978, 5).

Haldimand-Norfolk is also known for fruit and vegetable production. About 10% of the Ontario apple crop is grown in the Region and the production of peaches, pears, plums, and

cherries increased substantially in recent years. Other important cash crops include potatoes, asparagus, cabbage, peppers, and other market garden produce (Burgess Graham Securities Limited, 1978, 5).

Prior to the Nanticoke development, tobacco and white beans in the area had been damaged by ozone and possibly other emissions from the U.S. Prevailing southwesterly winds carry pollutants across Lake Erie. This situation has existed for at least three decades and causes \$5-10 million annual losses to the tobacco industry; the total loss to Ontario is \$200-400 million per year. Tomatoes and potatoes are also impaired but the extent of this loss has not been quantified (MacFarlane, personal communication, August, 1979).

Fishing

The Lake Erie eastern basin is fished by vessels from Ports Rowan, Dover, and Maitland on the Haldimand-Norfolk shoreline. Approximately 40 modern steel, diesel-powered fishing tugs operate out of these ports using trawling gear for smelt and gillnets for yellow perch and other species. Trawl fishing is the most important economically. The licensed commercial fishermen in the Region declined from 236 in 1961 to between 150 and 200 in 1974.

The fisheries are of special interest in this study for two reasons: 1) their long-term earning potential; and 2)

possible industrial development impacts on the resource base upon which commercial and sport fisheries depend. According to Hamley and MacLean (1979, 89):

Long Point Bay is a rich source of fish and recreational employment. The commercial fish harvest, with dockside value of \$1,000,000 annually, is an important source of income to the local communities. The Outer Bay fishing fleet consists of modern smelt trawlers and perch gillnetters based in Port Dover. It operates through most of the year and accounts for most of the smelt harvested from Lake Erie. The Inner Bay fishery, centered in Port Rowan, uses small boats, nets and 400 yard long seines to fish hoop (fyke). Trawls and gillnets are prohibited there and in the adjacent part of the Outer Bay. They take a mixture of species and operate only in spring and fall, leaving the Inner Bay to anglers during the summer holiday season, May 13 to August 31, by regulation.

Long Point Bay is one of the few areas of Lake Erie suitable for a small-boat recreational fishery. Its potential is 383,000 angler-days per year, 318,000 in the Inner and 65,000 in the Outer Bay (MNR, 1976). The value of its current sport fishery was estimated at \$3,700,000 by Melski (1972).

Mining

Haldimand-Norfolk possesses an abundance of structural materials such as stone, sand, gravel as well as gypsum and natural gas. In 1974 the total regional crushed stone production was 2,100,000 tons, mainly in the former Haldimand County. The Norfolk Sand Plain provides abundant low-grade construction sand. Regional gravel reserves amount to 5.3 million tons compared to 2,400-4,150 million tons of potentially available stone reserves. Much of Canada's gypsum is also produced in the Region.

Extensive natural gas fields underlying the Region were first tapped in the 1870's in the former Haldimand County. In recent years gas has also been produced in Lake Erie south of Norfolk County. Regional gas fields are locally significant, generating 31% of Ontario's current gas production. However, the total production in southwestern Ontario accounted for just 10% of Provincial use in 1973 (Ontario Ministry of Natural Resources, 1978, 26).

ENVIRONMENTAL PROTECTION SYSTEM

More than 20 Federal and Provincial Acts apply to the Nanticoke complex and many Federal, Provincial, Regional, and local agencies have responsibilities in the environmental field (Table 1). The principal role of the Province is largely exerted through the Ministry of the Environment (MOE) and the Ministry of Natural Resources (MNR). The Provincial Ministry of Housing (MOH) also has considerable influence through the Planning Act and its land use planning mandate, as do Regional and local governments through Official and District Plans. These plans specify land use policies and procedures, including measures for

TABLE 1: THE NANTICOKE REGION ENVIRONMENTAL PROTECTION REGULATORY SYSTEM

AGENCY	LEGISLATION	LICENCE OR PERMIT	COMMENTS
Federal Ministry of Transport	Navigable Waters Protection Act	Navigable Waters Work Permit	Any work which interferes with navigable water eg. Stelco dock
Dept. of External Affairs	International Boundary Waters Treaty Act		Established IJC to review activities which influence boundary waters
Dept. of Fisheries and the Environment	Canada Wildlife Act Wildlife Area Regs.	Permit	Control removal or deposit of substances in National Wildlife Areas
	Fisheries Act		Administered by MNR in Ontario. No alteration of fish habitat without approval. No licence or permit exists. Work must have fishway
Dept. of Public Works	Public Works Act		Carry out dredging for MOT. Must obtain permit from MOT and MNR. All dredging subject to EARP
Dept. of Regional and Economic Expansion	Agricultural and Rural Development Act		
Provincial Ministry of the Environment	Environmental Assessment Act		No other permits issued until environmental assessment done, if required
	Ontario Water Resources Act		Deposition of waste regulated
	Environmental Protection Act	* Certificate of Approval	Certificate needed before building permit is issued
Ministry of Natural Resources	Beach Protection Act	Beach Protection Licence	Applies to commercial extraction. Municipal activities exempt. Ontario resident only needs Municipal and MNR approval for private use
	Beds of Navigable Waters Act		Reserves bed of Navigable water for Crown
	Endangered Species Act		Protects endangered species habitat
	Lakes and Rivers Improvement Act		Regulates stream diversions
	Public Lands Act	Licence of Occupancy	Crown-owned water-lot must be leased before construction occurs. Also must own land next to waterlot - Refer to MOT if navigable water
Conservation Authorities (L.P.R.C.A.)	Conservation Authorities Act		Restricts dumping of fill in scheduled areas subject to Lakes and Rivers Improvement Act and Ontario Water Resources Act
			May appeal Drainage Schemes. Controls diverting or interference with channel in scheduled area
Ministry of Housing	Planning Act		Amendments to by-law for subdivisions, and Official Plan amendments are reviewed by Minister
Ministry of Agriculture and Food	Drainage Act Tile Drainage Act		Lend money for construction Drainage works may undergo EIA if requested and CA and MNR can comment on proposal
Ministry of Energy Ministry of Transportation and Communications	Ministry of Energy Act		Roles of these two Ministries in regulation process unknown
Ministry of Treasury, Economics, and Intergovernmental Affairs	Shoreline Property Assistance Act		Loan money for construction work on dykes, groynes, etc.
Regional Municipality of Haldimand-Norfolk	Regional Municipality of Haldimand-Norfolk Planning Act Regional Official Plan		Develop Regional Official Plan which sets out broad zoning guidelines - regulates urban development
Town of Nanticoke	Municipal Act Nanticoke District Plan (completion of this Plan not known)	Building Permit	Develop zoning by-laws in District Official Plan which developments must adhere to. Building Permit obtained from Region before construction starts - need certificate of approval first
Non-government Ontario Hydro Stelco MOE MNR Texaco	Power Corporation Act Nanticoke Environmental Committee		Direct and approve environmental study program
Naturalist Club Local Residents			Public participation and review of proposals may be undertaken by these groups

protection of vegetation, animal life, or other aspects of environment. Zoning bylaw, subdivision approval, and building permits may also be used to provide environmental protection.

In theory, the Federal Government has major environmental protection responsibilities at Nanticoke under the Clean Air Act, the Navigable Waters Protection Act, the Canada Wildlife Act, the Fisheries Act, and their respective regulations. The Federal Department of the Environment (DOE) also is responsible for the Environmental Assessment Review Process (EARP) for projects under Federal jurisdiction. EARP is an administrative process rather than a legislative requirement as is impact assessment in Ontario. The Federal Government, however, relinquished to the Province responsibility for many of the preceding obligations.

The Ontario Provincial Planning Act Review Committee (PARC) commented on potential overlap and conflict between the Provincial Planning Act and the new Ontario Environmental Assessment Act. Attempts to resolve these problems involved: (1) exemption of small-scale municipal projects from environmental assessment by MOE; (2) making natural environment concerns an integral part of the Planning Act administration; and (3) applying the Environmental Assessment Act only to those undertakings where it is clearly in the Provincial interest to do so

(Ontario Ministry of the Environment, 1979, Appendix I). According to an MOE official, "the Environmental Assessment Act is to prevail in situations where both it and the Planning Act apply" (Caplice, personal communication, 12 March 1980).

Establishment of the Nanticoke complex led to a major local government transformation. Prior to the Nanticoke development the government structure was characterized by a fragmented system of political authority and decision-making. In 1974, the Regional Municipality of Haldimand-Norfolk was created. The two Counties of Haldimand and Norfolk were merged and the 28 local municipalities were consolidated into six Area Municipalities. Planners on the Regional Government staff prepared an Official Plan for the Region and are working with Area Municipalities in preparing District Plans, and with senior government on other aspects of resource and environmental management.

The Nanticoke environmental protection system is clearly complex. Many redundancies and inefficiencies have been worked out through Canada-Ontario accords and through other agreements among Provincial agencies with apparently overlapping responsibilities. These agreements are not always comprehensive or effective however; an example to be discussed involves the management of Long Point Bay.

Much of the environmental protection system in Ontario and Canada evolved since 1968, the period during which the

Nanticoke project was developed (Smithies, 1974). These changes presented many opportunities for misunderstandings, delay, and conflict. Yet the record suggests that the evolving system has worked reasonably well to this time.

TERMS OF REFERENCE AND METHODS

As in many new industrial or technological developments, numerous impacts and issues are social in nature. Large new projects increase demand for housing, schools, hospital beds, roads, and other services. Taxes tend to rise, as does the cost of living. Local people also tend to lose power to bureaucrats and to newcomers. These social effects are not however, within the terms of reference of this study which focuses on the environment. This term is used in a relatively narrow sense and refers to biophysical elements and processes: air; water; sediment; visual, odour and noise aesthetics; site conditions; flooding and erosion hazards; animals; and vegetation.

Several methods were employed in this assessment of the Nanticoke regulatory system. The first method consisted of reviews of government, industry, and scientific literature, reports, and other documents. Hundreds of industrial, government, and cooperative research projects of varying scale and complexity have been undertaken in association with the Nanticoke industrial development. These reports are not always available to outside investigators. Much research was undertaken to solve environmental, economic,

social, technical, and design problems directly or indirectly associated with the Nanticoke development. Certain research projects are of fundamental significance to an understanding of the environmental aspects of the development. These research projects are:

Date Due

Sept. 15/81

1. Water quality and aquatic environmental studies by the Nanticoke Environmental Committee (NEC, 1973 and 1978; Effer, 1971)
2. The Haldimand-Norfolk Study by a Department of Municipal Affairs Study team (1971 and 1972).
3. The Haldimand-Norfolk Environmental Appraisal commissioned by the Haldimand-Norfolk Study team (Chanasyk, 1970).
4. A Lakeshore Study of Haldimand and Norfolk Counties as an Ontario Local Initiatives Project (1974).
5. Canada-Ontario Great Lakes Shore Damage Survey (1976).
6. Air quality studies by the Nanticoke Environmental Management Committee (NEMP) (Lusis, 1980).
7. Technical Report on the Haldimand-Norfolk Region by the Ontario Ministry of Natural Resources (1976).

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The second research method consisted of 43 interviews with government and industry personnel, and as well as members of interest groups, such as farmers, fishermen, local politicians, cottagers, and labour representatives. Some field work also was carried out in the Nanticoke area.

The key overall question to be addressed in this study is whether environmental protection measures have been implemented within a reasonable time, at reasonable cost, and without undue adverse effects on the resource base and so the pre-existing users and residents of the Nanticoke

area. In addressing this question an effort has been made to assess other benefits, such as improved institutional arrangements and technology. Time, financial, and other constraints have not permitted a comprehensive, quantitative assessment of these latter aspects of the study.

EFFICIENCY AND EFFECTIVENESS

At the outset it is necessary to discuss briefly the meaning of the term efficiency and effectiveness since these vary among users. Efficiency has been defined as the ability to produce the desired effect with a minimum of effort, expense, or waste (Stanbury, 1978; Hartle, 1979). The definition therefore overlaps with effectiveness, and also with consideration of costs and benefits. In this analysis of efficiency, stress is placed on the time involved in completing tasks, as well as consistency, redundancy, duplication, or waste of effort (Bosselman, Feurer, and Siemon, 1976, 78).

Effectiveness refers to the reaching of goals or objectives. Study of effectiveness is difficult because goals and objectives are not always explicitly defined although they may be understood well enough to take into account in assessment. Another difficulty in measuring effectiveness is dealing with multiple and sometimes conflicting goals or objectives within and among agencies. These difficulties were encountered in this study, with many interviewees being unable to specify, rank, or coordinate

goals and objectives clearly, thereby making any judgments on effectiveness difficult.

It must also be noted that activities or programmes need not be both efficient and effective. Goals and objectives may be reached after lengthy and acrimonious procedures. For many observers effectiveness, or success, is nevertheless more important than efficiency with little or low effectiveness. Clearly judgments on efficiency and effectiveness as well as costs and benefits, will vary among observers or interest groups. Success in achieving one group's goals can mean failure for another.

Attempts to reach a consensus or a more objective view of whether or not a programme has been efficient or effective would be eased if more studies of these factors had been completed for iron and steel or other projects or programmes. Few studies of the efficiency and effectiveness of environmental regulations for any type of enterprise have been completed to date. Some interesting research results are beginning to appear in the U.S., for example from the Conservation Foundation (Noble *et al.*, 1977; Meyers, 1974a and 1974b; and Little, 1974).

Interpretations or conclusions on efficiency and effectiveness in this study are of two types. First, the views or perceptions of various actors or interest groups are noted, particularly, on Tables 9-14 which summarize the interview results. Second are the authors' conclusions

which are based on judgments of all available information. An attempt is made throughout to be as clear about sources of information and interpretations as possible so that readers can form their own opinions.

In particular this assessment is based on four classes of evidence:

1. The scope and character of the research programme undertaken for the Nanticoke complex and the way in which the results were used in regulating and managing for environmental protection. Were the research projects selected well and conducted expeditiously? Were the funds used well in protecting and planning to protect air and water quality and other aspects of environment?
2. The institutional arrangements and the technology introduced to protect the environment and evidence of environmental changes (damage) since the start of the project. Were changes in government agencies and procedures, official plans, or other measures completed relatively quickly and coordinated well? Have the results been useful in planning or achieving environmental protection? Was advanced control equipment utilized? What changes in air and water quality and other aspects of environment have occurred to this time? What potential changes may occur? Do we understand the situation well? Are current institutions, technology, and other tools likely to be

sufficient to meet future challenges quickly and adequately? What costs and benefits associated with environmental control at Nanticoke have occurred to date and do they seem reasonable?

3. Relevant information in permit approval files regarding implementation of the regulatory system. Both government and industry maintain files which can be analyzed to provide information on: a) the nature of a project or programme; b) consistency in selection of commentators; c) the nature of their environmental or other concerns; d) the reaction of relevant government departments and industries; e) the time required to respond, and f) other indicators of efficiency and effectiveness (Tables 2-5). For various reasons such files have infrequently been analyzed as a means of gaining a fuller understanding of the regulatory processes. Yet, they clearly offer a potential means of securing the kind of comparative information needed to formulate more generally acceptable conclusions on efficiency and effectiveness in different kinds of situations and enterprises. They also provide the basis for regular compilation and publication of standardized reports on efficiency and effectiveness by industry and or government.
4. Facts and opinions provided in interviews with government, industry, and other interest groups. A set of similar questionnaires were prepared and used in

interviews with members of the different agencies and interest groups (Appendix A). The results of these interviews have been used throughout this study. The interviews also revealed the diversity of perceptions, attitudes, and values involved in reaching conclusions on efficiency, effectiveness, costs, and benefits of environmental protection regulations. A summary of this information is presented in Tables 6-11.

RESEARCH

Originally, the three industries at Nanticoke were not considered as part of a planned, integrated complex. Hydro independently took the decision to build a 4000 MW plant, one of the largest in the world, in the early 1960's. Stelco and Texaco subsequently decided to locate near this power source as well as to take advantage of access to Lake Erie, low land costs, and other characteristics of the Haldimand-Norfolk area (Eisler, 1975). Some informal consultations occurred with senior Provincial politicians and perhaps with Provincial government agencies, but no consultation with local government or local people is known to have taken place until land had been assembled for the plants. No pre-project government research was undertaken on the environmental or social suitability of the Nanticoke site for heavy industry and associated growth.

Numerous technical studies have since been conducted on plant design and construction. Certain major studies were

also completed on demographic, social, political, and planning implications of the industrial complex (Haldimand-Norfolk Study, 1971, 1972a and 1972b) as well as on water quality, fish, and other aspects of the aquatic environment of Long Point Bay and Lake Erie (Effer, 1971; Nanticoke Environmental Committee, 1973 and 1978). Shoreline erosion and deposition rates, flood and other hazard areas, soil types, woodlot, scenic, and other special resources were all investigated in several major research projects (Chanasyk, 1970; Haldimand-Norfolk Joint Study Committee, 1974; Ontario Ministry of Natural Resources, 1976; Canada-Ontario, 1975 and 1976).

To promote greater efficiency and effectiveness, and reduce costs, an industrial and governmental committee, the Nanticoke Environmental Committee (NEC), was created in 1967 to coordinate studies on water quality and the aquatic environment. Very little monitoring of water or other resources had been done prior to the industrial development. It was necessary therefore, to begin to identify chemical, physical, biological, and other characteristics of these resources as well as to measure changes in characteristics through time. Theoretically, changes due to development could be identified and appropriate regulatory, technological or other management measures taken to control adverse impacts.

NEC is composed of representatives of the Provincial

Ministries of Environment, Natural Resources and the three major industries. Although funding arrangements may not always have been satisfactory, this Committee designed and coordinated a relatively comprehensive water and aquatic research programme. The data produced have made it possible to monitor industrial impacts so far (Effer, 1971; and Nanticoke Environmental Committee, 1973 and 1978), although some observers have raised questions about the areas of emphasis, the length of record, the comprehensiveness of the research, and the changing nature of the research design.

A comparable coordination committee, the Nanticoke Environmental Management Programme (NEMP), was not established for air quality studies until 1975, in spite of some background studies on air quality since the 1960's and evidence of pollution damage to tobacco and other crops from U.S. industry. There is an obvious deficiency in the composition of both committees; no members of the Regional Government nor the municipalities have been appointed to NEC or NEMP. Greater involvement of local people, and representatives of other affected groups, for example agriculture, may have led to earlier coordinated research in Nanticoke air quality. Concerns about air quality are now highlighted by widespread awareness of "acid rain" effects in northeastern North America.

A recent MOE report on Nanticoke air quality studies (Lusis, 1980) indicates that gaseous pollutant and suspended

particulate matter concentrations are now generally low in the Nanticoke area. However, a number of concerns are identified and research is underway on some of these, including: 1) rare exceedences of SO₂ standards; 2) difficulty in measuring and delimiting local air-quality effects; 3) fumigation of chimney plumes under onshore or lake-breeze flows which occur roughly 25% of the time in the growing season, and can result in high ground-level pollutant concentrations; and 4) the impact of Nanticoke operations on air quality elsewhere in southern Ontario and surrounding communities in the United States. Research is also underway to determine the extent to which other distant sources contribute to air quality deterioration in the Nanticoke area.

NEC and NEMP undoubtedly contributed to a more efficient and effective research programme than would have occurred in their absence. However, an overall research coordinating committee would have been, and still is, a desirable means of integrating the air, water quality, aquatic, and other research.

Hundreds of recommendations have been made in the various research projects related to the Nanticoke development. These recommendations can be classified into a number of major groups: 1) air and water quality; 2) trout and sport fishing stream protection; 3) countryside protection; 4) agricultural land protection; 5) hazard-zone development

control; 6) woodlot protection; 7) "natural", "ecological", or "heritage" area protection; and 8) fish, waterfowl, and wildlife habitat protection, especially in marsh and coastal areas. One way to measure the effectiveness of this research is to assess its impact on the new Regional Official Plan which establishes social, land use, environmental, and other policies for Haldimand-Norfolk.

Many research recommendations are included in the Official Plan which was approved by Regional Council within four years of Regional Government formation in 1974. For example, a Lakeshore Policy and a system of Environmentally Sensitive Areas (ESA) are established in the Plan. These provisions are intended to avoid problems such as encroachment on coastal and floodplain hazard areas or valuable wetlands. A high level of agricultural land protection is also potentially attainable through designation of better class soils as agricultural land under the Official Plan.

Some potential efficiency and effectiveness problems are associated with certain clauses in the Official Plan. For example, much of the effectiveness of the ESA policy depends upon how well Environmentally Sensitive Areas and other environment and resource protection designations are actually delimited on the ground by the Area Municipalities in their District Plans. A number of different Provincial and local government agencies are also involved in hazard-

zone delimitation and management. A simpler administrative system could promote greater efficiency but might reduce effectiveness by allowing the Area Municipalities to encroach on high-risk flood plains. Under these circumstances, higher flood damages tend to be passed on to the wider community, for example through flood loss relief payments to land owners suffering damages.

The Lakeshore Policy aims are to: 1) reduce resource conflicts and environmental damage by encouraging industrial development in growth nodes or suitable areas; 2) protect the natural environment, and 3) enhance areas suitable for public open space and recreation. The policy has the potential to reduce adverse effects of developments stimulated at least in part by Nanticoke. However studies on regulation of recreation and residential developments in the Lakeshore Policy area between 1975 and 1977 indicate approval periods are lengthy and that a very large proportion of applications are approved. Politicians tend to endorse more projects than are recommended by planning staff (Jessen, 1979; and Jessen and Day, 1980).

TECHNOLOGY AND INSTITUTIONAL ARRANGEMENTS FOR ENVIRONMENTAL PROTECTION AND EVIDENCE OF ENVIRONMENTAL CHANGES SINCE NANTICOKE BEGAN

Technology

Another indicator of research efficiency and effectiveness is the relatively sophisticated nature and

amount of environmental protection technology introduced at Nanticoke. Examples at Stelco include a company-designed coil box which loops steel as it moves through the hot strip mill for rolling. This process saves energy, materials, and space. Other equipment developed in Japan will collect waste gases during the basic oxygen stage for later re-use, thereby cutting energy costs and protecting the environment. Moreover, Nanticoke plants tend to be highly automated. Stelco will ultimately be able to produce steel at substantially reduced labour and operating costs at Nanticoke in comparison to older facilities at Hamilton (Heneault, 1978; Eisler, 1975; and Ontario Report, 1978).

Evidence of Environmental Change

Construction of the three plants and associated facilities, and the operation of Hydro and Texaco up to Summer 1979, reportedly have led to no significant changes in air quality, although a number of concerns are being studied (Lusis, 1980). A similar situation holds for water quality, aquatic biology, currents, and erosion and deposition patterns near the Haldimand-Norfolk Lake Erie shore, although some small and potentially significant shifts in water quality and the aquatic environment could be occurring (Nanticoke Environmental Committee, 1978). Certain modifications in fish populations have been observed, but these may be short term, or not attributable to the project. The significance of fish entrainment in the

Hydro water recycling system is uncertain. Perch do not seem to be affected as much as other commercial species such as smelt (Hamley and MacLean, 1979). However, perch are vulnerable to other processes such as overfishing. Certain commercial fishing regulations are currently being reviewed in an attempt to rectify this situation.

Although evidence of significant negative industrial development impacts on air and water quality and other aspects of environment is lacking to date, some major uncertainties remain about the future. One not mentioned so far is how decisions will be made on equipment installation for which the case was doubtful at project approval time. For example, Stelco proposes to extend waste-disposal pipes further into Lake Erie if effects on water quality after the beginning of operations justify this change.

Additional unanticipated adjustments may be needed as the new industries come into operation together and interactive, or synergistic, effects develop. Such effects can be anticipated through the interaction of Hydro, Texaco, Stelco and other industrial, municipal, and agricultural wastes. Further pollution also is likely from increased shipping. Dredging could disturb sediments. Slag, or other solid waste, may be deposited in Lake Erie waters although Stelco indicates that "this will only occur in designated spoil areas located far from shore in deep water" (Eisler, personal communication, 11 March 1980). Oil or other spills

pose a major risk, especially for waterfowl or other wildlife at nearby Long Point marshes (Hamley and Maclean, 1979).

The foregoing evidence indicates that while much research has occurred, and useful equipment has been introduced, continued monitoring and cooperation is necessary to adapt to potential negative effects of industrial and associated development. In this regard, no evidence has been found of comprehensive planning and management of Long Point Bay and nearshore waters during the study. This is in marked contrast to the land, where an Official Plan has been prepared by the Haldimand-Norfolk Region and various other programmes are being conducted in consultation with the Region by Provincial agencies.

The reasons for lack of a comprehensive approach to the management of Inner Bay and nearshore Lake Erie waters are not clear. But a major factor appears to be complicated jurisdictional arrangements. Several Federal Departments, including Transport and Fisheries, have legislative responsibilities for these waters as do the Provincial Ministries of Environment (MOE) and Natural Resources (MNR). To avoid uncertainty, MNR should take the lead role in planning and management of the Inner Bay and nearshore waters.

Even though detailed data are not yet available from NEMP, further comment on air quality is useful because it

illustrates a basic reason for not introducing environmental protection equipment more quickly; its cost is high relative to benefits perceived by industry, government, and other interested parties. The prime Nanticoke example is air quality control at Hydro. This plant was designed in the 1960's before development of the present environmental protection regulatory system as well as current levels of concern about impacts of SO_2 at Nanticoke (Lusis, 1980, 1).

Although the nature and magnitude of atmospheric loading is still uncertain, in part because the Hydro plant has not operated at full capacity, an idea of its character can be gained from Lusis (1980):

The projected emission rate for the fully developed industrial complex could be as high as 300,000-500,000 tons/year, and thus Nanticoke is expected to be the second largest source of sulphur dioxide in Ontario after Sudbury. Nitrogen oxide emissions (again primarily from the generating station) are also expected to be appreciable, at an estimated 100,000 tons/year, making Nanticoke the largest single source of this pollutant in Ontario. Particulate matter emissions are difficult to estimate, but they are expected to be considerable and Stelco will probably be the major local contributor. Also, coal handling operations at Hydro and Stelco are expected to contribute to the dustfall loadings relatively close to these plants. Other pollutants directly emitted by the Nanticoke operations - mainly Stelco and Texaco - are hydrocarbons, various other gases (hydrogen sulfide, carbon monoxide), and fluorides and polynuclear aromatic hydrocarbons (in gaseous and particulate form). In addition to the primary emissions, there exists the possibility of secondary pollutants such as ozone being generated from primary pollutants by atmospheric chemical reactions under certain meteorological conditions.

One way to reduce SO_2 levels further would be to install scrubber technology like that now in use in new U.S. plants.

The capital cost reportedly would be \$400 million or about half of the \$787 million required to build the Hydro plant (MacFarlane, 1979; Science, 1976). A by-product of scrubbing is large quantities of lime sludge and other waste which represent an additional major disposal problem. Furthermore, scrubber installation at Nanticoke may not significantly reduce the pollution problem downwind from the complex. This leads to the point that much of the air pollution damage in Ontario and the nearby U.S. may be attributable to relatively small contributions from many coal-burning and other sources: the result is the dilemma of the insignificant increment. Thus, to require scrubbers or other new technology at high cost at any one locality will not necessarily lead to a significant reduction in pollution at that or other locations. Yet not to attempt costly controls at many localities will lead to perpetuation or worsening of pollution overall.

Technology is not, of course, the only way to control emissions to the environment and their effects. A comprehensive approach would involve more control of industrial siting in relation to environmental and social constraints. Operational methods can also be used to reduce pollution. These methods involve changing load factor, output, fuel types, or other influences on emission levels. These methods can be voluntary, they can be required through the plant approval certificate, or subsequently by changing the point of impingement requirements. An attempt is now

being made to place Hydro plant emissions in the context of further industrial growth in the Nanticoke region, United States pollution exports, and Ontario pollution exports to eastern Canada and the U.S. northeast. The result could be a new requirement for scrubbers, changes in operating procedures, land use regulations, or a combination of such management methods.

Institutional Arrangements

Note was previously made of major institutional changes which were at least partly intended to protect the environment. Worthy of further comment is the recommendation in the Regional Official Plan for a 3-kilometre buffer zone around the Nanticoke complex. The purpose of the buffer is to control impacts of industrial emissions in the relatively high-risk area near the plants by preventing residential and related development there. Essentially land use in the area would be confined to existing uses, primarily agriculture, although MOE has recently commented that some commercial or light industrial uses would be appropriate (Hewings, personal communication, 12 March 1980).

Some industrial and government personnel strongly support the creation of a buffer zone. Indeed, permits for some of the equipment in the plants have been issued with the idea that such a zone would supplement environmental control equipment by limiting the number of people who could be

affected by noise, odour, and other near-plant effects which are difficult to control technically (Table 6). Basically the buffer would be a means of limiting residential and other encroachment into areas near the plants where man-made hazard risks are higher. However the buffer has not yet been approved in the Official Plan because of objections by some affected land owners.

Data from pollution complaint distribution studies in Hamilton and other Canadian industrial centres have been used as a guide in delimiting the size and shape of the buffer zone (Hewings, 1978 and 1980). Data from the Nanticoke area are insufficient to calculate these characteristics with much accuracy. The data from complaint studies in the other industrial centres shows considerable variation (Hewings, 1980).

Other problems are associated with the buffer zone idea and near-plant effects. Farmers and other residents remaining in the zone would continue to be subjected to higher nuisance and health risks associated with industrial development which is beneficial to the larger society. Sales of property are possible, perhaps for light industry or commercial purposes, but this opportunity is limited by the presence of other suitable land in the industrial park or in nearby urban centres. Decline in quantity and quality of agricultural produce could also occur in the near-plant area, creating an inequality for affected farmers, and also

posing a potential health risk for buyers of produce from the buffer zone. However, MOE notes that "if any unforeseen damage should occur to crops, farmers can obtain compensation through the Board of Negotiation under the Environmental Protection Act, 1974" (Mills, personal communication, 14 March 1980).

More detailed studies of zoning, compensation, insurance, greater land purchase, and other possible adjustments to man-made hazards resulting from heavy industrial development in various parts of the world would be helpful in making the difficult regulatory and management decisions for industrial sites such as Nanticoke. The issues are similar to those encountered in natural hazard situations. Studies of the approaches used to assist managers in coping with floods and natural hazards could result in learning applicable to Nanticoke and other industrial developments (Burton, Kates, and White, 1978).

INFORMATION IN APPROVAL FILES

Approval files have been analyzed in terms of commentators, their concerns, dates of submission and approval, length of approval process, and comments, for example on special coordination mechanisms (Tables 2-5). The Ministries of Housing and Natural Resources used a complex and somewhat inconsistent process involving a relatively large number of commentators from outside these agencies. In contrast, the Ministry of the Environment

basically adopted an internal technical review process with few commentators. Aside from some Housing files, Regional and local commentators have rarely been involved. It is important to note that so far as can be determined the regulatory process caused no significant construction delays for any of the three major plants.

Few environmental concerns were raised in the early Official Plan amendments for Stelco and Texaco (Table 2). A number were examined in the Official Plan amendment for the industrial park. These environmental concerns were treated in more detail during Ontario Environment and Natural Resources reviews for other permits under their jurisdiction.

In spite of possible overlaps in approval arrangements, the Official Plan amendments for the Stelco site and dock, and the Texaco site, were approved in six months or less. The industrial park required two years and three months for approval for a variety of reasons, some of which are apparent from the files and some from interviews. There was general concern about the scale of the Stelco industrial park proposal and the various possibly synergistic environmental effects arising from a mixture of many steel-related industries there. Interviews indicate local concern about the impact of this large industrial park on

TABLE 2 : ANALYSIS OF MINISTRY OF HOUSING FILES

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Amendment of Official Plan for Stelco site in Walpole Township	1 Federal DOT	Flood and erosion hazard lands	May 1968 to June 1968	1.5 months	2 letters of objection sent to OMB
	5 Provincial DNA	Equipment approval by DH prior to construction			Letter between Minister of Lands and Forests and Municipal Affairs Departments
	DERM	Buffer around village of Jarvis			
	DH (2)	Cottage owners concerned about effect of industrial development on their property			
	OWRC DLF				
Official Plan Amendment for Texaco Site	2 Regional & Local TW VJ				
	2 Citizens				
	7 Provincial DNA	Potential water supply and sewage disposal problems	January 1970 to June 1970	4.5 months	Texaco offered to buy cottages over 5-year period
	DAF	A 3 mile buffer around industries recommended			One public meeting held
	DH	Questions concerning status of area between Texaco and Stelco sites, which includes Village of Nanticoke			Zoning Bylaw change made together with Official Plan Amendment
2 Industrial HEPC CNR	DERM (2)	Concern regarding effect of industries on lakeshore and cottages			Circulation to LPRCA for comment via MNR
	DTE (2)				
	OWRC				
	2 Regional & Local RMHN WT				

TABLE 2 Continued

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Official Plan Amendment for Stelco dock	1 Federal ENV	Effect of dock on recreational lake-shore lands	September 1974 to March 1975	6 months	Government coordinator involved
	6 Provincial MNR (3) MIT MOE (2) CMB MOH LPRCA	Effect of dock construction on fish Levels of noise and dust resulting from conveyor system on dock and ships in area			2 meetings held with government and industry representatives Stelco met with citizen objectors MOE letter to Stelco outlining the contacts within MOE for different aspects of project
	2 Regional & Local RMJIN CN				MOE and MNR write construction guidelines for the dock
	1 Industrial OII				Zoning Bylaw change made together with Official Plan Amendment
	10 Citizens (Objectors)				
Industrial Park Subdivision Plan	7 Provincial TEIGA (3) MNR (2) MTC ONB MIT MOE MOH (2)	Need to plug old wells on the property Environmental and socioeconomic effects of the large scale proposal Questioning of Stelco assumption that the Provincial Government had made prior commitments with respect to industrial park	August 1974 to November 1976	2 years and 3 months	6 or more meetings held at Provincial and Regional Government levels Plan approval on reduced scale Separate circulation by the Region to 6 agencies Provincial Coordinator involved
	2 Regional & Local CN / RMJIN				
	5 Industrial CNR/CPR/OH/UG/BC				
	1 Other				
Official Plan Amendment for Ontario Hydro Site					

----- A land use designation change was never made for Ontario Hydro -----

the economic potential of nearby towns and communities.

As in other cases, the Ministry of the Environment used a negotiation process to screen the Texaco oil refinery (Table 3). Originally application was made in July 1969 for a Port Credit site. After discussions with politicians and following agreement to locate at Nanticoke, approval in principle for the refinery was given six months later in January 1970. The subsequent approval process involving plant components of varying complexity was phased throughout planning and construction of the plant. The entire screening process took seven years and six months and was completed in June 1977.

The lengthiest approval at Texaco was five years and seven months for the water-treatment facility. This complex project was permitted with a number of conditions including a performance evaluation within six months of beginning operations and a programme outlining how necessary additions would be made. A number of plant components involving noise and odour problems were accepted on the basis of the establishment of a buffer zone around the plant. Failure of the Region to establish a buffer zone of the type and magnitude anticipated by the Ministry of the Environment could lead to problems near the plants. On the other hand, the establishment of such a buffer involves technical and other problems discussed previously.

TABLE 3: ANALYSIS OF MINISTRY OF THE ENVIRONMENT FILES FOR TEXACO PLANT

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Section A Tank Farm			February 1974 April to 1975		Air Certificate issued
Section B ^a Marketing Area	1 Provincial MOE		August 1974 to April 1975	8 months	Air Certificate issued
Section C ^a Tank Car Loading Area	1 Provincial MOE	Possible odour problems beyond industrial property due to lack of positive control methods	January 1976 to April 1976	3 months	Air Certificate issued but if effects of emissions contravene EPA the company will be required to comply with regulations
Section D ^a Effluent Treatment Plant Area	1 Provincial MOE		February 1976 to March 1976	1 month	Air Certificate issued
Section D ^b	1 Provincial MOE (8) 2 Others	Possible necessity for tertiary treatment Concerned with protection of Lake Erie water quality	November 1972 to June 1977	5 years and 3 months	Water Certificate issued with conditions: 1. Performance evaluation 2. Analyses of effluent 3. Fish toxicity and tainting 4. Program to implement further measures if necessary Visit by MOE staff to US facilities Information requested by MOE from US EPA and Ralph M. Parsons Co. Meetings held November 1972 and October 1973

^aCertificate issued under Environmental Protection Act, Part II, Sect. 8 and Reg. 15^bCertificate issued under Ontario Water Resources Act, Sect. 42.

TABLE 3 Continued

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Section 1 ^a Combustion Equipment	1 Provincial MOE		July 1975 to July August 1976 September	12 to 14 months	14 Air Certificates issued for various heaters and boilers
Noncombustion ^a Equipment	1 Provincial MOE	Possible odour problems due to lack of positive method of control	July 1975 to January 1977 April	4 and 7 months	2 Air Certificates issued on basis that: 1. No significant amount of air pollution would be released 2. Plant located in industrial area
Sulphur Plant ^a Incinerator	1 Provincial MOE 1 Other Texas Air Control Bd.	Concern whether 1200 ⁰ F high enough temperature for conversion of H ₂ S to SO ₂	March 1976 to August 1976	5 months	Meeting held November 1976 Air Certificate issued with conditions: 1. Stack testing to determine if 1200 ⁰ F sufficient 2. That if results indicate, further abatement may be required
Section 7 Potable Water Treatment System	1 Provincial MOE (2) 1 Other	Concerned whether 5-minute residence time of water in potable system hold-up tank satisfactory	July 1975 to March 1977	1 year and 8 months	Water Certificate issued Initial meeting July 1975 between MOE and Texaco Approval in principle August 1976 2 parameters required: 1. Continuous monitoring 2. Residual chlorine and turbidity

^a Certificate issued under Environmental Protection Act, Part II, Sect. 8 and Reg. 15

^b Certificate issued under Ontario Water Resources Act, Sect. 42.

TABLE 3 Continued

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Section E ^a Dock and Area South of Treatment Plant	1 Provincial MOE	Concerned about possible air pollution from ship loading	February 1976 to April 1976	2 months	Air Certificate issued on basis that 1. any emissions would be quickly dispersed 2. location within industrial zone
Section F ^a Flares	1 Provincial MOE (2)	Concerned that adjacent land remain with current freeze on rezoning as expected noise levels exceed guide-lines	October 1975 to October 1976	12 months	Air Certificate issued on basis of proposed buffer zone and on Texaco 20-year option on lands to east September 1976 meeting
Cooling Towers					
Butane Spheres and Methanol Storage	1 Provincial MOE		October 1975 to December 1976	14 months	
Section G ^a Administration and Laboratory Building	1 Provincial MOE		January 1976 to May 1976	4 months	
Section H Unused Texaco Property and Sludge Farm					Application returned to Texaco (October 1975) - as there would be no emissions, a Certificate of Approval was not required until such time as the company wished to build on this portion of the property.

^a Certificate issued under Environmental Protection Act, Part II, Sect. 8 and Reg. 15.

TABLE 3 Continued

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval	Length of Approval Process	Comments
Entire Texaco Plant					
1) Burlington Site	1 Provincial NOE (1)	Concern about additional refinery installation in Burlington-Oakville area	January 1970 to June 1977 (last certificate issued)	7 years and 6 months	Meeting held July 1969
2) Nanticoke Site		Based on past experience at Burlington, necessity to monitor design, construction, and maintenance of plant			As noted elsewhere in these Tables many meetings and negotiations conducted during these 7.5 years

The Ministry of Natural Resources review of the Stelco dock and associated water lot lease was a complex process involving more than fourteen commentators from agencies at all four government levels. Due to concern regarding effects of the original design on littoral drift and fish movement, Stelco redesigned the dock to provide for a bridged section close to the shore (Table 4).

The Nanticoke approval process is similar to the negotiated development process now being advocated by some observers as a possible solution to many delays, conflicts, and problems with U.S. environmental regulation. Negotiated development involves early discussion of proposals with affected parties. Discussions may include informal hearings prior to formal hearings on a proposal. Modifications and adjustments can occur at this early stage and prospects for conflict and damage can be reduced. Consultants or mediators may be retained by the proponent, yet assist all parties in the course of their design and mediation work. Most related U.S. experience has been with large shopping centres (Rivkin, 1977). Not much detail is available on cost and on the possible utility of the approach to other types of development.

In the Nanticoke case, negotiations did not generally involve the Regional and local governments, nor local interest groups such as the fishermen who at one time sent a

TABLE 4 : ANALYSIS OF MINISTRY OF NATURAL RESOURCES FILES

Proposal	Commentators	Commentators' Concerns	Dates of Submission and Approval ^b	Length of Approval Process	Comments
Stelco dock and associated water lot lease ^a	3 Federal DOT (3) DPW (2) ENV (3)	Protection of navigation Effect of dredging and dumping of spoils on fish spawning areas and on fishermen's nets	April 1974 Application submitted for lease of crown water lot		12 meetings held by government and industry representatives between January 1974 and June 1976
	7 Provincial MNR (11) MOE (6) MIT MTC MOH TEIGA (2) LPRCA	Effect of dock on littoral drift and fish movements Interference of dock with piping and well-heads in area and existing leases	June 1974 Resubmission of application due to revision of dock design	18 months	3 reports written by MNR between January 1974 and July 1976
	1 Regional & Local RMN	Effects of construction blasting and shipping activity on fisheries, recreation, petroleum resources, and water quality	February 1975 Lease sent to Stelco for authorization		March 1974 petition from Norfolk & Haldimand Gillnetters and Trawlers to Minister of Natural Resources protesting dock and requesting compensation
	1 Industry Stelco (8)		October 1975 Letter Patent for water lot Lease issued		November 1974 MOE and MNR issued construction guidelines for Stelco dock
2 Other					December 1974 MNR & MOE appointed representatives to monitor Stelco dock construction
					July 1975 agreement between MNR and Stelco whereby Stelco provided funding for MNR environmental studies and monitoring during dock construction

^aReviewed under Public Lands Act.^bGeneral Stelco Project description submitted to MNR August 1973.

petition about the construction and location of the Stelco dock to the Minister of Natural Resources. The fishermen were concerned about impacts on significant spawning grounds, damage to their nets from dumping, and other interferences from dredge spoil disposal. As a result of such concerns, special blasting and other methods were used in the Stelco dock construction, and in redesigning it to allow passage of water and fish along the shore. If the negotiated development process were used more frequently in project approvals, it probably would be more effective where all government levels and major affected parties are involved from an early stage.

INFORMATION FROM INTERVIEWS

Forty-three interviews were conducted with 58 individuals having administrative responsibilities or relevant experience in governments, industries, and other interest groups. The large number of government interviews (32), as compared to industrial (4) and interest groups (7), is partly an indication of the complexity of the regulatory system. With one exception, the industrial interviews involved three or more people in a group meeting as well as subsequent correspondence and questionnaire completion (Table 5).

TABLE 5
THE DISTRIBUTION OF INTERVIEWS

	Number of Interviews	Number of People Interviewed
- Federal	5	5
Government - Provincial	20	25
- Regional/Local	7	7
Industry	4	11
Interest groups	7	11
TOTAL	43	58

The interview data were analyzed in some detail to assess attitudes concerning the efficiency and effectiveness of the Nanticoke environmental protection system (Tables 6-11). The assessment involves interviewee's opinions on adequacy of research, adequacy of equipment and technology, adequacy of institutional arrangements, equity, changes in plans or requirements, and overall effectiveness. As used here adequacy denotes time involved in approval, duplication of effort, attainment of goals or objectives, and other factors relating to efficiency and effectiveness.

The opinions and interpretations recorded in these interviews are not always in agreement. Nor do they consistently accord with our own views. Nevertheless, they clearly must be taken into account by planners, managers, politicians, and others interested in environmental effects of the Nanticoke complex.

Research

Members of senior governments and industry displayed the most positive attitudes toward the value of research in formulating adequate environmental protection policies (Table 6). Regional and local government employees, as well as interest group respondents often did not comment on research. Although some respondents believed good research cooperation occurred between industry and government, a variety of suggestions were made for improvement. Funding was thought to be inadequate by some Provincial respondents. Many interviewees commented on the need for more study of critical environmental areas such as spawning beds. Some respondents favoured more long-term, integrated research conducted on an ecosystem or other holistic basis.

Technology

Attitudes concerning the adequacy of environmental control technology were mixed (Table 7). Provincial agencies and industrial representatives accounted for the majority of positive replies. Industrial respondents indicated pride in technology and equipment. Others commented on possible equipment deficiencies when all three plants and other facilities begin operating together.

TABLE 6 : ADEQUACY OF RESEARCH

	Federal	GOVERNMENT Provincial	Regional & Local	INDUSTRY	INTEREST GROUP	TOTAL
Positive	3	10	1	4	1	19
Neutral	-	4	1	-	1	6
Negative	-	-	-	-	1	1
No Comment	-	4	4	-	2	10
Not Analyzable	2	2	1	-	2	7
TOTAL	5	20	7	4	-	43
Comments	Supportive of research and need for greater Federal involvement in acid rain and toxic substances problems. Need for a more holistic ecosystems approach to research and long-term monitoring. There is a need for more coordinated research.	Inadequate funding for NEC. Some problems of continuity in the NEC program, especially for the fish study. In particular, different sampling techniques under different directors was a problem. Areas requiring research include spawning areas and critical habitats. More emphasis on preoperational conditions and better coordination necessary. NEC and NEMP are good examples of cooperative efforts between industry and government. Need for more comprehensive environmental and social research.	Lack of orientation and usefulness of present research programs (NEC and NEMP) to regional concerns. No contact between NEC and NEMP with Regional or local governments. Inadequate research for identification of environmentally Sensitive Areas. Differences exist between ESA's identified by MNR and Chanasky studies.	Good cooperation and coordination among industry and government in NEC and NEMP. Generally satisfied with arrangements in NEC and NEMP. Research should be practical, useful, and problem oriented.	Suspicion of industrial motives for conducting research.	

TABLE 7 : ADEQUACY OF INSTITUTIONAL ARRANGEMENTS

	Federal	GOVERNMENT Provincial	Regional & Local	INDUSTRY	INTEREST GROUP	TOTAL
Positive	1	1	4	3	-	9
Neutral	1	11	1	1	-	14
Negative	-	5	1	-	4	10
No Comment	1	1	-	-	1	3
Not Analyzeable	2	2	1	-	2	7
TOTAL	5	20	7	4	7	43

Comments

There is a need for a more comprehensive view of the environment.

Regulatory arrangements should be subjected to socioeconomic analysis.

More coordination and planning are needed, especially for Long Point Bay and coastal areas.

Greater Federal involvement in toxic wastes and acid rain management is needed.

Stress on implementation problems. Generally favoured ad hoc negotiations between government and industry.

Better coordination among government agencies needed.

Some overlap and duplication exists between MOE and MNR responsibilities.

Greater Federal involvement in the regulatory process favoured.

The buffer zone concept was seen as a unique opportunity to reduce future land use conflicts.

Insufficient funds, time, and manpower to monitor environmental changes.

Generally favourable towards the effectiveness of the Regional Government.

Need for comprehensive environmental management.

Support for Environmental Assessment Act.

Industry needs approval procedure guidelines.

Coordinator did a good job

For environmental expertise, must rely on provincial agencies.

Concern about Environmental Assessment Act and costs to the Region.

Concern about implementation of Regional Official Plan, District Plans, Environmentally Sensitive Areas, Lakeshore Policy, and buffer zone.

Lakeshore development concerns.

Some problems in relationship with Provincial and Federal Governments.

Advocate a one-window approach to governmental regulatory process.

Ontario regulatory system superior to many others in both Canada and the United States.

Indicate concern about the application of the Environmental Assessment Act to private developments.

Favour negotiation between industry and government.

Indicate little Regional or Federal Government involvement at Nanticoke.

Generally satisfied with coordinator at Provincial level.

Favour consistent regulations.

Indicate some overlap in responsibility of government agencies.

Concerned with overlaps and lack of coordination among government agencies.

Perceive Regional Government as distant and as taking control away from rural areas.

Institutional Arrangements

There was a neutral to negative attitude towards the adequacy of institutional arrangements to control environmental degradation (Table 8). The most common concern, especially among government personnel, was difficulty in implementing regulations. Recommendations were made for a more comprehensive environmental protection approach. A number of industrial and government respondents favoured the negotiation approach to regulations adopted at Nanticoke rather than formalized, legalistic environmental impact assessment procedures like those in the U.S.

There was some concern that while the low level of Federal involvement was efficient, it may not have been effective. Some felt that Federal involvement should have been greater, especially in support of research of potential national significance. The limited role of Regional and local governments in many air and water-quality matters was noted, as was their reliance on Provincial expertise. The effectiveness of this arrangement was questioned. It was suggested that a Provincial coordinating mechanism somewhat like that undertaken for a time during the Nanticoke development by a Provincial Government official, or a "one-window arrangement", could be helpful in providing information and assistance on environmental regulatory

TABLE 8 : CHANGES IN PLANS OR REQUIREMENTS

	GOVERNMENT		INDUSTRY	INTEREST GROUP	TOTAL
	Federal	Provincial			
Positive	1	11	2	-	18
Neutral	-	-	-	-	-
Negative	-	-	1	-	1
No Comment	2	7	1	4	16
Not					
Analyzable	2	2	-	2	7
TOTAL	5	20	4	7	43

Comments The development of environmental regulations is an evolving process and therefore, the possibility of change exists. Concerned about the synergistic effects with more industries in the area.

Generally anticipate changes in plans or requirements. Changes must be anticipated with a system of incremental decisions and negotiation. Changing of the timing of Stelco's plans caused problems for some agencies but no inconvenience for others. Since no permanent permit exists, the onus is on the industries to accept a certain risk that regulation changes will occur.

Many different ways of managing the allocation of emissions.

Industrial employment forecasts led to purchase of large townsites.

Generally anticipate change based on greater knowledge and research.

General anticipation and recognition of need for changes. Accept as inevitable.

Concern was expressed that as one issue is resolved, others keep arising because regulators keep looking at different substances and at smaller quantities.

requirements and programmes to industrial and other concerned parties. A one-window type approach was used to a considerable degree in the Texaco plant approvals and was favourably commented upon by a number of interviewees.

Adapting to Change

Respondents often had a positive attitude toward change: they expected it but noted that it caused problems (Table 9). Thus, changes in Stelco and other industrial plans created difficulties for approval agencies. On the other hand, industrialists were concerned with modifications in government regulations but seemed to accept a certain amount of change as inevitable.

Equity

A number of inequities were recognized (Table 10). Some respondents felt that the buffer zone concept placed an undue burden on affected land owners and residents. Others suggested the regulatory process discriminated against small-to-medium-scale industries which lack the resources to meet requirements as readily as larger firms. Many respondents expressed differing opinions on public participation. Some felt ample opportunity had been provided but people had not taken advantage of it. Respondents were uncertain as to the most efficient

TABLE 9 : ADEQUACY OF EQUIPMENT AND TECHNOLOGY

	Federal	GOVERNMENT Provincial	Regional & Local	INDUSTRY	INTEREST GROUP	TOTAL
Positive	1	5	1	4	1	12
Neutral	1	7	4	-	-	12
Negative	-	-	-	-	-	-
No Comment	1	6	1	-	4	12
Not						
Analyzable	2	2	1	-	2	7
TOTAL	5	20	7	4	7	43

Comments

Concern about structures in coastal zone.

Satisfied that arrangements at Nanticoke were adequate to this time.

Pollution control equipment should be cost effective equipment as it is a questionable investment from the industrial standpoint.

Equipment and technology at Nanticoke was considered to be of a high standard, above that required by current regulations.

Disagreement exists as to whether it is adequate to allow the 3 industries to meet air regulations together.

Synergistic effects could lead to future problems.

There is concern about Hydro's once-through cooling system which was approved before the current regulatory process.

There is great pride in the technology and pollution control equipment used at Nanticoke.

Generally feel they have done more than required by regulations.

Only one comment was made. It was indicated that the Nanticoke industrial facilities are very modern and better than required by Provincial standards.

TABLE 10 : EQUITY

	GOVERNMENT		INDUSTRY		INTEREST GROUP	TOTAL
	Federal	Provincial	Regional & Local			
Positive	1	10	5	1	2	15
Neutral	-	3	2	2	-	7
Negative	-	1	1	1	1	4
No Comment	2	4	-	-	-	7
Not Analyzable	2	2	1	-	2	7
TOTAL	5	20	7	4	7	43

Comments This issue was generally not discussed. The public should be more involved and at an earlier stage.

Implementation problems posed by the buffer zone were recognized. However the inequity of the zone to residents within it was not recognized in general. Buffer seen as a solution to minimizing future new-plant impacts.

Due to the infrastructure requirements resulting from the industrial area, inequities were recognized for the local area.

Inequities to fishermen were mentioned.

Regulatory process not equitable for medium to small-scale industries.

Public participation comments included

- favouring public information
- unsure about how to implement
- need for public education
- not enough participation took place in the early stages of the Nanticoke development.

Question ability of public to participate effectively.

Feel that government and industry have neglected their responsibilities in not compensating residents who live in the buffer zone.

People were naive about Nanticoke development when first proposed.

Buffer zone is little more than an agricultural area.

Regulatory process is inequitable for small and medium-scale industries.

Public should have voice in development decisions.

Both Texaco and Stelco indicated that offers were made to buy out all cottagers in the area.

All agreed that the public should have, and did have, the opportunity to voice their concerns over the proposed Nanticoke development.

While all favoured the buffer zone concept, not all companies recognized the inequities resulting to people living in the zone.

There was a general consensus that ample opportunities for public participation were not used.

This may have been related to the formal nature of participation mechanisms adopted.

The public was not adequately informed about opportunities to participate.

Buffer zone inequitable to farmers and others in the area. The concept deprived them of their development rights.

means of achieving participation.

Effectiveness

Attitudes towards overall effectiveness of the environmental regulatory process were generally positive, presumably because no significant adverse effects have been recognized to date (Table 11). There is, however, considerable uncertainty about the adequacy of research, institutional arrangements, and technology to control environmental and resource degradation under full-scale production at Nanticoke.

COSTS AND BENEFITS

Costs

Cost data were compiled from government and industrial submissions. Lack of appropriate accounting procedures, little previous research on the question, time availability, and other factors were barriers to accurate cost and benefit estimation in some cases. The following data are indicative rather than precise (Tables 12-15).

TABLE 11 : EFFECTIVENESS

	Federal	GOVERNMENT Provincial	Regional & Local	INDUSTRY	INTEREST GROUP	TOTAL
Positive	1	6	4	4	1	15
Neutral	-	6	1	-	-	7
Negative	-	4	1	-	3	8
No Comment	2	2	-	-	-	4
Not						
Analyzable	2	2	1	-	2	7
TOTAL	5	20	7	4	7	43

Comments

Regulatory system has been environmentally effective to date but some uncertainties regarding its future effectiveness exist.

The acid rain problem is so widespread that its effects are impossible to control.

Reservations were expressed about greenfield developments on the basis of environmental and social impacts.

There is concern about the effects of Hydro's dredging and disposal of materials on spawning beds.

Environmental quality has not deteriorated to date, but social and economic impacts have occurred.

Future environmental problems are anticipated when full operation is reached.

Special concern was expressed about development effects on Long Point Bay and the lakeshore, especially the recreation and fisheries.

Concern was expressed about the effects of waste disposal and the need for development control in marshes and hazard lands.

Concern was expressed about the incremental impacts of development on the Region.

Full operation of the complex in future was perceived as having possible negative environmental impacts, although no significant effects have occurred to date.

Generally, only social impacts have been experienced to date.

There have been no significant biophysical environmental effects to date.

The social impacts on the area were acknowledged.

Generally, negative environmental effects were perceived as a result of the industries.

They are very conscious of social impacts. There is widespread concern about the possible future environmental impacts.

TABLE 12 : ENVIRONMENTAL PROTECTION COSTS FOR THE NANTICOKE INDUSTRIAL COMPLEX 1967-79^a

(\$ x 10 ³)				
Primary Costs	Environmental Protection Costs ^b	Total Project Costs	Environmental Protection %	Man-Years
Stelco	75,159	800,000	9.4	248
Texaco	70,000	483,115	14.5	68
Ontario Hydro	82,629	826,290	10.0	78 ^c
Primary Total	227,788	2,109,405	Average 11.3	394
Secondary Costs				
Ontario Government				
Environment	92,395	92,395 ^d	100.0	31
Natural Resources	641	641	100.0	80
Treasury, Economics	140	140	100.0	12
Housing	172.5	30,172 ^f	0.6	
Transportation	13 ^e	8,529	0.1	
Provincial Coordinator	25	25	100	1.5
Haldimand-Norfolk Region	1,475	1,475 ^g	100	48
Long Point Region Conservation Authority	66	66	100	6
City Of Nanticoke	0	0	0	0
Secondary Total	93,627.5	133,271		178.5
Grand Total	321,411.5	2,242,671		
Secondary Total Cost %		6%		
Primary Total Cost %	41%			

^aTwo major environmental studies programs pertaining to the Nanticoke Environmental Monitoring Program (\$3.17 million from 1977-79) and the Nanticoke Environmental Committee (\$1.48 million from 1967-79 are included in the Stelco, Texaco, Hydro, MOE and MNR expenditures.

^bIncludes salaries, office and research space, monitoring, legal and contract, and equipment costs.

^cAssuming 6 man-years annually from 1967-1979.

^dThis includes preliminary estimates of \$37 million for a water works system and \$54 million for sewage control facilities; interim financing costs are not available.

^eEnvironmental study component of the Highway 6 Joint Use Study technical report.

^fReported cost for Townsend and Cayuga land banks but not housing land in existing communities.

^gCertain road capital costs unknown.

Stelco, Texaco, and Ontario Hydro each spent between \$70 and \$83 million¹ million on environmental protection (Table 12). These sums include salaries, office, legal, capital, and miscellaneous costs. The expenditures constitute between 9% and 15% of each company's total project expenditures. Aggregate construction costs for the complex up to Summer 1980 will be approximately \$2.2 billion. Secondary costs induced by the industrial development were experienced by a variety of government agencies. Including estimated new-town land-acquisition costs, these amounted to about \$133.3 million or approximately 59% of the total environmental protection costs to the industries, or 6% of their total project costs. Much of this expenditure will be recovered by government from repayable loans and service charges to users of pollution control and water supply facilities. Little data from other studies are available with which to compare these various costs. It was suggested that some major petroleum companies have a current rule-of-thumb that 15% of total new project costs are normally expended on environmental protection measures.

Stelco

The Steel Company of Canada provided the most detailed assessment of environmental protection costs experienced by

¹ Stelco has amended their total environmental costs to \$96 million (Eisler, personal communication, 11 March 1980) although our overall figures (Tables 15-16) have not been changed to include this addition.

Industries at Nanticoke (Table 13). Approximately 264 man years and \$79.6 million or approximately 10% of the Stelco investment at Nanticoke will have been spent on environmental protection by the time of initial production in Spring 1980. To this time there is little indication that environmental protection entails major increases in industrial staff and operation costs. Indeed at Stelco the introduction of environmental protection measures is part of the construction of a highly automated plant with lower staff and operating costs per ton of production. This same conclusion likely also applies to Texaco and perhaps Hydro.

Ontario Ministry of the Environment

A major environmental regulatory role at Nanticoke was played by the Ontario Ministry of the Environment (MOE). The magnitude and duration of their efforts are displayed in Table 14. Over the 12 year period, 1967-1978, in excess of 31 man-years were devoted to the project at a cost of \$1.4 million. This includes \$786,000 which MOE contributed to the NEMP air monitoring program. In addition, MOE assisted the Regional Government by providing \$91 million for regional water supply and sewage control projects made

TABLE 13: ENVIRONMENTAL PROTECTION COSTS FOR THE STELCO NANTICOKE PLANT 1968-1980

Year	1 Full-Time Employees (Man-Years)	2 Salaries and Benefits \$	3 Monitoring Office, Laboratory Field Inspection \$	4 Contract Research \$	5 Legal (Man-Years)	6 Other Capital x \$106
1968	-	-	6,000	-	0.1	-
1969	2	50,000	7,000	-	0.1	-
1970	3	75,000	20,000	-	0.1	-
1971	-	-	34,000	-	0.1	-
1972	-	-	17,000	-	0.25	-
1973	2	50,000	17,000	-	0.50	-
1974	8	240,000	23,000	50,000	0.50	1.8
1975	36	1,080,000	57,000	150,000	0.50	10.2
1976	35	1,070,000	57,500	100,000	0.25	9.8
1977	37	1,100,000	100,500	100,000	0.25	10.0
1978	46	1,390,000	80,000	100,000	0.25	13.0
1979	76	2,270,000	161,000	53,000	0.25	21.8
1980	16	480,000	160,000	-	-	3.9
SUB-TOTAL	261	7,805,000	740,000	553,000	3.15	70.6

TOTALS : 1. Total Man-Years = 264.15 (sum of columns 1 & 5)

2. Total Expenditures = \$79,638,500 (sum of columns 2, 3, 4, 6)

**TABLE 14: ONTARIO MINISTRY OF THE ENVIRONMENT REGULATORY COSTS:
1967-1978**

Years	Man-Years	Salaries ¹
1967-1968	7.76	\$ 205,791
1974	3.64	131,224
1975	4.56	177,109
1976	4.36	183,587
1977	4.40	207,969
1978	6.63	489,443
TOTAL	31.35	\$1,395,123
¹ Salary expenditures are increased 100% to account for office, laboratory, and field inspection expenses.		

TABLE 15: ONTARIO MINISTRY OF THE ENVIRONMENT CAPITAL COSTS

Water Works	
Filtration plant	\$17,000,000
Storage and distribution	20,000,000
	<u>\$37,000,000</u>
Sewage Works	
Treatment plant, trunks, pumping stations	\$54,000,000
TOTAL	<u>\$91,000,000</u>

necessary by the industrial complex (Table 15).

Benefits

Social changes were not part of the terms of reference for this study. However comments by government, industry, and interest groups suggest that many residents of the Region and the wider area perceive that the Nanticoke complex has had a negative social impact by increasing living costs, taxes, and generally changing political conditions and lifestyles. By other standards, the Nanticoke complex has been beneficial to the Region as well as other parts of Ontario and Canada, although determining the extent of such benefits is beyond the scope of this study.

Massive investment has occurred. In 1980-81, the primary employment generated by Hydro, Texaco, Stelco, and the industrial park has been estimated at approximately 2,900 (Hamley, 1979). These new jobs will induce secondary and tertiary employment of unknown magnitude. There is a question, however, as to how much employment will be new and how much will be transferred from Hamilton or other areas. For example, Texaco has indicated its Port Credit facility will be phased out. New lower cost steel production at Nanticoke may lead to reductions in Hamilton production. On the other hand, technically advanced plants such as Stelco should make industry a stronger competitor in Canada and abroad. More information on the benefits of the Nanticoke

environmental protection system can be presented in terms of research, institutional arrangements, and technology.

A variety of benefits related to environmental protection were identified by government and industry personnel. For example, basic fish research can be used to enable more rapid detection of future environmental shifts and assist in more sensitive management of the fishery than would have been possible previously. Fish-protection methods developed during blasting for and construction of the Stelco dock can also be applied elsewhere.

The Nanticoke development led to experimentation with a variety of innovative institutional arrangements. Environmental coordinators and specialists were hired or retrained by industry. Industrial committees and other systems were also developed to manage environmental issues. Similarly the new Haldimand-Norfolk Regional Government can manage many environmental regulatory concerns in an informed and consistent manner over an area that extends far beyond the Nanticoke site. Considerable interest has also been expressed by other industries and governments in NEC and NEMP, the organizations which coordinated government and industrial research on air and water quality and aquatic environments.

Technical innovations at Nanticoke will benefit many people and areas. Improved state-of-the-art pollution technology will be patented, sold, or transferred to other

plants. The advanced technical nature of the Stelco plant in particular has been of great interest to industrialists from around the world.

SUMMARY AND CONCLUSIONS

The key overall question in this study is whether environmental protection measures have been implemented in a reasonable time, at reasonable cost, and without undue adverse effects on the resource base and so the pre-existing users and residents of the Nanticoke area. In light of the available data and analytical limitations, it is difficult to arrive at a firm conclusion on costs. It is our tentative view that they have not been unreasonable, given the level of protection achieved so far and the other substantial benefits to both the companies and society. However Stelco has recently indicated that environmental protection measures have increased their costs by 8% overall, a cost that they consider to be "significant" (Eisler, personal communication, 11 March 1980). On the other hand, certain major concerns noted below about air quality and coastal lands, waters, fish and other resources of the Long Point Bay area probably will necessitate further substantial costs in future.

So far as efficiency and effectiveness are concerned, to this date the authors consider that the project and its various impacts have been regulated and managed relatively efficiently and without any significant known adverse

effects on the environment and resources of Haldimand-Norfolk or other areas. This judgment on efficiency has been aided somewhat by the limited data available in reports on projects undertaken elsewhere. Information on length of review time, or other aspects of regulation, are unevenly presented in these reports. No consistent methodology is used making it difficult to compare them. Findings from some of these studies are presented below.

A Bank of Hawaii study of government approval times in Oahu reports a 19-20 month cumulative minimum time required for residential development. Most of this was due to city and county rather than state procedures (Meyers, 1974b, 82; Bank of Hawaii, 1974, 12). In the New Jersey coastal zone, single family developments required 24 months to secure government approvals and 23 months for multi-family developments. The most visible state environment control, the Coastal Area Facility Review Act, accounted for only 2 and 4 months respectively of these approval times (Healy, 1977, 11). In California, the State's environmental impact statement requirement has been criticized for causing delays. However, a study of 32 San Diego developments found only 6 were delayed by these requirements more than the 3 to 4 months already required for other planning approvals (Healy, 1977, 11). A local study of approval times under the Haldimand-Norfolk Region Lakeshore Policy found approval times averaging over thirteen months for single residential and cottage developments, including simple additions and

extensions to existing structures (Jessen, 1979).

Review of these studies supports the conclusion that the environmental regulatory process at Nanticoke has been relatively efficient. The review also makes it clear that more studies of this type are required to develop the methods, and secure the data, needed to understand efficiency and effectiveness of environmental management more fully. The methods developed in this study are, we believe, a step in this direction.

Having concluded that the Nanticoke complex has been managed in a reasonably efficient and effective way to this stage, it is important to note that some major reservations remain about the future. Of particular concern is the management of air quality and the lack of comprehensive coordination and planning for the coastal lands, waters, fish, and other resources of the Long Point Bay area. Commitments to undertake continuous monitoring and comprehensive research, and to establish better overall management are urgently required, if Nanticoke benefits are to be achieved at potentially avoidable future costs to pre-existing industries, residents, other users and the environment, as well as to people living outside the Nanticoke region. As interacting old and new activities build up in complex developments, the tendency is to search out and blame one factor or another, and not to give due regard to the cumulative impact of the full range of

(influences. In this regard, Ontario and Canada can probably benefit from study of the comprehensive coastal management efforts of the U.S. since the passage of the Coastal Zone Management Act in 1972 (U.S. Department of Commerce, 1976 and 1979).

APPENDIX A

QUESTIONNAIRE FOR GOVERNMENT AGENCIES

QUESTIONNAIRE FOR GOVERNMENT AGENCIES

NANTICOKE INDUSTRIAL COMPLEX STUDY

FACULTY OF ENVIRONMENTAL STUDIES

UNIVERSITY OF WATERLOO

WATERLOO, ONTARIO

N2L 3G1

(519) 885-1211 EXT. 2884

Contacts: J. G. Nelson

J. C. Day

S. Jessen

NAME _____ DATE _____

POSITION _____ LOCATION _____

AGENCY _____ INTERVIEWER _____

CONFIDENTIALITY _____ COMMENTS _____

Ontario and other Provincial governments, and the Federal government have jointly requested the Economic Council of Canada to arrange for studies of the costs, benefits, efficiency, and effectiveness of environmental protection regulations in this country. As part of this study, the Council has requested that we prepare a report on the environmental protection regulations for the industries which have recently developed at Nanticoke. It would be helpful to us in preparing our report if you would answer

the following questions. In this report, environmental protection refers to the management of air; water; sediment; visual, odour, and noise aesthetics; site conditions; flooding and erosion hazards; animals; and vegetation. With regard to the questions please respond in terms of your varying responsibilities, past or present. We are mainly interested in principles of environmental regulation and development and examples that could be used to illustrate these. Answers will be of varying length; kindly place them on separate sheets.

1. How long have you or your agency been involved with the Nanticoke industrial development? _____ years, from _____ to _____
2. What have been your major responsibilities?
3. What aspects of environmental regulations has your agency been involved with concerning the Nanticoke industrial development?
4. Please describe your total environmental protection programme at Nanticoke.
5. Who is in charge of the administration of your environmental protection programme?
6. What major changes in environmental protection requirements do you anticipate in future?
7. Name and briefly describe the committees or other mechanisms established to coordinate environmental protection requirements at Nanticoke.
8. Are these arrangements satisfactory? If not, please explain.
9. What special problems were caused for your agency by the development proposals at Hydro, Stelco, and Texaco?
10. Do you think environmental considerations were adequately taken into account in industrial siting at Nanticoke?
11. What was the sequence of events which led to the

establishment of the Nanticoke industrial complex?
(selection? decision-making? timing?)

12. What kinds of population projections or background studies did you prepare or use in planning or regulating:
- a. the Stelco site
 - b. the Texaco site
 - c. the Hydro site
 - d. the industrial park
 - e. port facilities
 - f. the multi-service corridor
 - g. other?

Legislation

13. A list of the Canadian and Ontario legislation and certain other arrangements which can be used to protect the environment is compiled on the attached sheet (Table 1).
- a. Are there other Acts which you use omitted from the list?
 - b. Indicate on the list the Acts your agency uses as the basis for its environmental regulations at Nanticoke.
 - c. Are any changes in legislation desirable in your view?
14. Briefly, how have environmental regulatory procedures at Nanticoke differed from what would normally be followed for similar steel, petrochemical and thermal generation plants elsewhere in Ontario?
15. Has the industrial environmental regulation process in Ontario changed as a result of the Nanticoke experience?

Costs

16. Could you estimate for the Nanticoke development (see table):
- a. How many of your people have been involved in environmental protection regulatory work?
 - b. What proportion of their time or how many full-time equivalent positions have been involved?
 - c. Their annual salaries including benefits?
 - d. Office and laboratory costs?
 - e. Field inspection and monitoring costs?
 - f. Contract research costs?
 - g. Legal expenses?
 - h. Other?
17. How do you inspect for compliance with regulations at Nanticoke? (frequency, location, tests, procedures,

NANTICOKE INDUSTRIAL COMPLEX

<u>EMPLOYEES</u>	<u>FULL-TIME EQUIVALENTS</u>	<u>SALARIES AND BENEFITS</u>	<u>OFFICE AND LABORATORY COSTS</u>	<u>FIELD INSPECTION</u>	<u>MONITORING</u>	<u>CONTRACT RESEARCH</u>	<u>LEGAL</u>	<u>OTHER</u>
1967								
1968								
1969								
1970								
1971								
1972								
1973								
1974								
1975								
1976								
1977								
1978								
1979								

follow-up)

18. Has your agency hired extra staff or incurred special costs to secure compliance with environmental protection regulations at Nanticoke?
19. Was lack of funding a serious impediment to performing tasks essential to a sound regulatory process? If so, please explain.
20. Were tax or other incentives provided to assist the companies with environmental protection at Nanticoke?

Benefits

21. What are the goals of your environmental regulation programme associated with the Nanticoke industrial development?
22. What are the means used to achieve these goals?
23. Did these goals and means change during the course of development at Nanticoke? How and why?
24. Were special environmental protection arrangements made for the industries at Nanticoke?
25. What fees, if any, do the companies pay for monitoring services at Nanticoke?
26. Can the magnitude of the environmental protection benefits be measured? In what terms?
27. How do you determine the degree of success or failure of your work?
28. Have any user groups experienced major advantages or disadvantages as a result of the Nanticoke development? (How? When? Why?)
29. Have any areas experienced major advantages or disadvantages as a result of the Nanticoke development? (How? When? Why?)
30. Has the process had any significant benefits for your agency? For instance, has the Nanticoke project revealed any overlaps, redundancies, or inefficiencies in the distribution of tasks and responsibilities among divisions in your agency? If so, what has been done about them?
31. In regard to the above, has there been an efficient and effective distribution of responsibility for

environmental protection among:

- a. the Federal departments?
- b. the Provincial ministries?
- c. the Federal, Provincial, Regional, and Local agencies?

- 32. Has there been an efficient and effective distribution of responsibility between industrial developers and government?
- 33. How was the public involved in environmental protection arrangements for the Nanticoke area?
- 34. What role should the public play in the decision to create new industrial complexes like Nanticoke, and the establishment and implementation of regulations?
- 35. a) When industries such as those at Nanticoke wish to construct major plants, how do they find out what environmental protection regulations are required by your agency?
 b) What kind of instructions do they get concerning requirements which must be met?
 c) Are written specifications of this process and these regulations available?
- 36. What are the strengths of the regulatory approach taken at Nanticoke?
- 37. With the advantage of hindsight, what steps could be taken to improve the environmental regulation of another large industrial complex if such a facility were proposed today? Why?
- 38. Who should decide on the location of major industrial facilities such as Nanticoke:
 a. Governments?
 b. Industry?
 c. Public?
- 39. Finally, could you discuss any problems of implementing environmental regulations at Nanticoke and make any suggestions for removing obstacles?

Elaboration of Question 4

- 40. How do you plan to regulate or otherwise manage for the disposal of waste, especially slag or other solid or toxic materials?
- 41. Will the system be similar to that in Hamilton or other centres?

42. What regulatory requirements have been established in regard to solid wastes?
43. How much limestone or other mining do you anticipate in future in the Nanticoke area?
44. How do you plan to regulate or otherwise manage the environmental impacts of these activities?

APPENDIX B:
PERSONAL COMMUNICATIONS:
REVIEW OF FIRST DRAFT REPORT

PERSONAL COMMUNICATIONS RE: REVIEW OF FIRST DRAFT REPORT

- Bigenwald, C.A. 3 March 1980. Ontario Ministry of Treasury and Economics, Economic Development Branch.
- Caplice, D.P. 12 March 1980. Ontario Ministry of the Environment, Environmental Approvals Branch.
- Cooper, Ian. 25 February 1980. The Regional Municipality of Haldimand-Norfolk, Department of Planning and Development.
- Dodge, Douglas P. 29 February 1980. Ontario Ministry of Natural Resources, Fisheries Branch, Environmental Dynamics Section.
- Effer, W.R. 26 February 1980. Ontario Hydro, Environmental Studies and Assessment.
- Eisler, H.H. 11 March 1980. The Steel Company of Canada, Limited, Environmental Control.
- Francis, George. 19 February 1980. University of Waterloo, Department of Man-Environment Studies.
- Grove, Eric. 20 February 1980. Ontario Ministry of Housing, Local Planning Policy Branch.
- Hale, P.R. March 1980. Long Point Region Conservation Authority.
- Hewings, J.M. 12 March 1980. Ontario Ministry of the Environment, Air Resources Branch, Environmental Assessment, Criteria Development, and Program Planning Section.
- Jeffs, D.N. 22 February 1980. Ontario Ministry of the Environment, Water Resources Branch.
- LeDrew, Ellsworth. 19 February 1980. University of Waterloo, Department of Geography.
- Lusis, M. 10 March 1980. Ontario Ministry of the Environment, Air Resources Branch, Technology Development and Appraisal Section.
- McGuire, Katherine. 6 March 1980. Canadian Labour Congress, Research and Legislative Department.
- Mills, G.H. 14 March 1980. Ontario Ministry of the Environment, West Central Region.
- Omand, D.N. 29 February 1980. Industrial Training Council.

Richardson, N.H. 19 February 1980. Ontario Ministry of
Treasury and Economics, Economic Research Branch.

Rimington, P.G. 12 March 1980. Ontario Ministry of Housing,
Operations and Development Control Branch.

Shaw, John. 21 February 1980. Fisheries and Oceans Canada,
Research and Development Division.

Shikaze, K. 28 February 1980. Environment Canada, Ontario
Region.

Teleki, Geza C. 20 February 1980. Ontario Ministry of
Housing, Local Planning Policy Branch, Lakeshore
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