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Achieving Sustainability through Legislation, Public Involvement and Training

Abstract

The principle of Sustainable Development has been the basis of environmental policies and practices in the developed countries over the last few decades. In Canada, sustainability forms the basis of governance structure that is in place for the protection of the Great Lakes basin ecosystem. Along with the promulgation of a myriad of legislation and national and bi-national agreements, all levels of governments having jurisdictions have comprehensive public involvement and environmental training programmes in place to achieve sustainability for these very precious bi-national (Canada-US) natural resource. The article briefly describes this trioka of measures, legislation, public involvement and environmental awareness training, which form the basis of means and methods employed to manage the Great Lakes and its ancillary resources. Of the three, the environmental awareness training of the decision makers in various governments in the Great Lakes watershed remains the important ingredient in the successes achieved to date.

The International Navigation Association (PIANC) has also embarked on the journey to accomplish sustainability for its global membership, especially from the developing countries. The Environmental Commission (EnviCom) and the Commission for Cooperation (CoCom) of PIANC have undertaken to develop an environmental awareness training programme for the emerging economies. The article provides a description and status of PIANC's environmental training programme. It concludes with a summary discussion of the pros and cons associated with the methods outlined for achieving sustainability for valued aquatic environments.

The information here is primarily based on the experience of the author as a senior environmental manager for over two decades in the Canadian Government's Ministry of Public Works and Government Services Canada (PWGSC), Ontario Region.

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The province of Ontario is home to the Canadian sections of the Great Lakes. There has also been material used here from PWGSC and other Ministries' documents and reports and from various Great Lakes publications.

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Figure 1. Above, the Great Lakes, close up.



Figure 2. Left, the Great Lakes, in perspective.

Introduction

Since the early 1990s, Sustainability and "Sustainable Development" have formed the basis of environmental policies and programmes in many nations, particularly in the developed countries. Amongst the western nations, Canada has been on the forefront of enshrining and integrating the principle of sustainable development in all of the activities pertaining to the conservation of its resources, and protection of the natural as well as built environments. The holistic, long-term and life-cycle considerations which underpin the concept of sustainability have been critical in Canada's efforts at preserving and enhancing one of the coveted natural resources, the Great Lakes. In the process, Canada has

acquired a considerable level of expertise in the practical application of principles of sustainable development which it is always willing to share with its global partners in achieving their own respective sustainability goals and objectives. Also, keeping with its long tradition of helping and partnering with developing countries, Canada has been a participant in many initiatives and programmes aimed at the emerging economies of the world.

Canada was one of the founding members of the Environmental Commission (EnviCom) of the International Navigation Association (PIANC) when it was first established in early 1990s. While participating in all of EnviCom activities, Canada has been entrusted with the task of leading environmental programmes that would be of direct benefit to developing countries.

Canada has utilised various means and methods to achieve sustainability and environmental goals in the context of managing the water quality, near shore and coastal zone environments and ancillary resources in the Great Lakes basin. The emphasis in the beginning of the "environmental movement" in North America was solidly in favour of the use of laws and regulations, both of preventative and punitive types, to implement and achieve the desired environmental objectives. A comprehensive legal framework has been created and put in place by various jurisdictions to protect and enhance the ecosystems in Canadian sections of the Great Lakes. In addition, because of the bi-national

Table 1. The Great Lakes – Facts & Figures.

Lake	Elevation (m)	Maximum Depth (M)	Volume (km ³)	Water Area (km ²)	Drainage Area (km ²)	Retention Time (Years)
Superior	183	406	12,100	82,100	127,700	191
Michigan	176	282	4,920	57,800	118,000	99
Huron	176	229	3,540	59,600	134,100	22
Erie	173	64	484	25,700	78,000	2.6
Ontario	74	244	1,640	18,960	64,030	6

nature of these bodies of water, there are also Canada-US, federal-provincial, federal-state agreements in place to make keep the Great Lakes sustainable. The promulgation of these regulatory instruments and agreements has resulted in achieving significant and measurable successes in terms of preserving the Great Lakes basin ecosystem.

The focus over the past few decades, however, has also been on enhancing public and stakeholder involvement in the management of these precious resources. More importantly, there have been concerted efforts made by all levels of governments in educating and raising the environmental awareness of government officials involved in the formulation and implementation of various programmes and projects impacting on the environment. As a result, at least at the federal government level, numerous environmental and related training programmes for employees have been created and implemented.

The EnviCom, since its inception, has been charged with the task of “greening” PIANC as an organisation. In that vein, one of the primary EnviCom goals has been to share know-how and seek greater participation of PIANC membership from developing countries. More recently, EnviCom and PIANC Committee for Development and Cooperation (CoCom) have embarked on the creation of an environmental awareness training package for those involved in the management of resources pertaining to the waterborne navigation sector in developing countries.

THE GREAT LAKES – A PRECIOUS NATURAL RESOURCE

The Great Lakes constitute one of the largest fresh water systems on earth, containing 18% of the world's freshwater. Spanning more than 1,200 kilometres from west to east, the Great Lakes comprise five large and one small lake joined by connecting channels which ultimately discharge into the Atlantic Ocean through the St. Lawrence River. The Great Lakes basin cover an area of 772 thousand square kilometres of which two thirds is land and one third is water (Figures 1 and 2, and Table I).

The Great Lakes basin was first settled by explorers from France and Britain in the 16th and the 17th centuries. It has since become a major population and economic centre with some 40 million people of Canada and the US living in the watershed. By all standards, the Great Lakes basin is rich in resources. Its waters have diverse and abundant fish communities, of which many species are used as a food source. Lands draining into the lakes support extensive forests, huge mineral and aggregate resources, abundant and diverse wildlife populations, and some of the most fertile lands in the North America. They also accrue immense benefits in the form of industrial and municipal water supply, hydroelectric power, commerce, recreation, shipping and navigation.

The Great Lakes provide a water transportation route from the Atlantic seaboard reaching 2750 km into the industrial heartland of Canada and the US. In short, these vast inland fresh water seas have played a major role in the ecology, climate, culture and economy of both Canada and the United States.

ENVIRONMENTAL DEGRADATION

The Great Lakes basin was shaped by glaciers thousands of years ago but the most significant changes occurred within a period of the last 200 years. The landscape of the basin has been dramatically reconstructed by human activities. The exploitation of the lakes for the economic gains and betterment of its inhabitants had resulted in severe degradation of the entire lakes' ecosystem. The environmental impacts have been significant and long lasting.

As early as the mid 19th century, public health issues began to appear in major cities as a result of microbial and other contamination of the Great Lakes. By the middle of the 20th century, lakewide pollution problems in the form of excessive algae growth were evident in several lakes. The expansion of shipping and navigation in mid 1950s led to the invasion of exotic species in the Great Lakes. An estimated total of 139 species of plants, fish, algae and mollusks have been introduced to the Great Lakes ecosystem. In addition, widespread contamination of the lakes by persistent

toxic substances was being documented in the 1960s. Soon after, the link to humans and potential for human health effects became evident.

THE GROWTH OF PUBLIC CONCERN

The rather rapid degradation of the Great Lakes resulted in a grass roots level environmental consciousness and movement for the restoration of the lakes. This awareness quickly became institutionalised in governments with the formation of various environmental councils, ministries and departments on both sides of the Canada-US border.

On the Canadian side, a number of legislative and regulatory controls and measures were developed and promulgated by jurisdictional authorities at all levels, federal, provincial, and municipal. Also, because of the bi-national and shared nature of the Great Lakes, Canada and the US entered into a number of treaties and agreements starting in the early 1900s. The most notable and recent measure of the joint efforts by the two countries was the first signing of the Great Lakes Water Quality Agreement (GLWQA) by Canada and the United States in 1972. The GLWQA was subsequently revised in 1979, and in 1987, a Protocol was added to the Agreement.

THE REGULATORY FRAMEWORK

In Canada the federal and provincial governments share jurisdiction over the control and regulation of environment and natural resources. In terms of environment, the federal government has constitutional powers over fisheries, federal administered lands and inter-provincial and bi-national matters. The provinces control and regulate resources, property and intra-provincial issues that lie within their respective boundaries.

Great Lakes are a prime example of where all three levels of controls, federal, provincial and bi-national (Canada & US) are exercised by the respective jurisdictions.

At the federal level, there are a number of policies and legislation that pertain to environmental planning which require that an environmental assessment of an undertaking be carried at very early stages. Minimising of potential adverse impacts and sustainability are the key considerations of the legislation. Pollution prevention and pollution controls measures are also part of the legislative suite.

The pertinent legislation is based on sustainable development and precautionary principle with the main focus on pollution prevention. Also included in the federal acts is a law exclusively aimed at protection of fisheries and fisheries resources. Destruction of fish

habitat is strictly prohibited and there are severe fines and penalties for non-compliance (Figures 3 and 4).

Similarly there are parallel legislation on the provincial side which control and regulate water quality, coastal environments and the activities in the watershed which could adversely affect the ecosystem. Canada and the province of Ontario work very closely and cooperatively in managing the Great Lakes resources.

Canada and US have entered into a number of bi-national agreements to protect and restore water and ecological quality in the Great Lakes basin. The Great Lakes Water Quality Agreement (GLWQA) has the two governments working closely through the adoption of common objectives, development and implementation of programmes and other measures aimed at achieving sustainability for the Great Lakes.

PUBLIC INVOLVEMENT

The concept of sustainability inherently implies public participation and involvement in the environmental and related decision making processes. With the enshrining of sustainable development as the basis of environmental policy and legislative development since early 1990s, there has been a concerted effort made by all jurisdictions in Canada to affect that. In fact, mandatory public consultation requirements are built into some of the important environmental legislation at both the federal and provincial levels.

In the case of the Great Lakes, the need for connectivity and consultation with the stakeholders in the basin is obvious. A concerned, knowledgeable and involved citizenry plays a key role in the affairs of the Great Lakes. Apart from the public at large, there has been rapid rise over the years in the number and size of public interest groups who play a key role in the Great Lakes basin. There are a number of high profile groups (NGOs) who play a watchdog role and also look after the overall health of the Great Lakes and their watershed. Also, there are numerous special interest groups and likely hundreds of "grass roots" organisations working at the community level. Local groups typically become involved in projects such as environmental education, saving wetlands or environmentally sensitive areas, rehabilitating streams, and monitoring environmental change or pollution events. These volunteer stewardship groups play a critical role for much larger Great Lakes community.

Public and stakeholder consultation and involvement have been critical in the delivery of the programmes and activities arising from the implementation of the federal provincial (Canada-Ontario Agreement on Great Lakes) and also the Canada-US Great Lakes Water Quality Agreement.



Figure 3. A clamshell dredge filling a dump scow in July 2002 in the South East Bend (SEB) Cut-Off Channel at the mouth of Lake St. Clair. This Channel is part of the main shipping and navigation route connecting all the Great Lakes.

ENVIRONMENTAL EDUCATION AND TRAINING

Significant gains have been realised in arresting the deterioration of the Great Lakes by the promulgation of various acts, statutes and agreements. Also, public and stakeholder involvement has been an important factor in the sustainability of the Great Lakes. Additionally, various jurisdictions had realised early on that an informed decision making process would be very important in achieving environmental objectives. Accordingly, the Government of Canada has applied significant resources in developing and imparting environmental awareness and education training for its functionaries involved in the implementation of key programmes and policies. This has proved particularly effective in the case of environmental issues relating to bodies of water and their coastal regimes. The task of managing water quality and related resources is made that much easier if the decision makers and others involved in developing and implementing programmes and policies have a heightened awareness of the sound environmental policies and practices. A number of environmental awareness training programmes, courses and tools have been developed and made mandatory in various Canadian jurisdictions, including the Great Lakes basin, for managers and employees who deal with policies impacting on the environment and sustainability.

The environmental training programmes that are currently in place cover a wide range, from high level awareness training for senior managers to actual "how to" courses for the medium to the front line staff engaged in the day-to-day operations of projects and facilities. The course contents also cover varied topics and subjects from environmental assessments, sustainable project delivery to indoor air quality and

applicable environmental management tools and techniques.

PIANC ENVIRONMENTAL TRAINING PROGRAMME FOR DEVELOPING COUNTRIES

PIANC as an organisation has developed a very pro-active sustainability agenda. Since the early 1990s with establishment of the Environment Commission (EnviCom), PIANC has adopted an aggressive work plan aimed at achieving sustainability for itself as an organisation and also for its membership worldwide. In particular, it is focusing considerable energies in engaging and co-opting developing countries in the greening efforts.

One important EnviCom and CoCom combined initiative has been to undertake the development of an environmental awareness training programme for developing nations. The training programme is designed to foster a better appreciation of environmental and resource conservation issues relating to the area of waterborne navigation. Also, the course is intended to provide a forum for the exchange of experience and know-how between the stakeholders and decision makers from developing countries and the marine engineering and environmental community, worldwide.

Course objectives

The proposed training programme has the following basic objectives:

- strengthening local expertise in developing countries for carrying out waterborne navigation related functions in an environmentally sound and sustainable manner;

- introducing sustainability tools and techniques in national and local decision making processes relating to navigational programmes and projects;
- helping senior policy makers in developing countries better appreciate the costs and benefits of achieving sustainability in the water navigation and related sectors; and
- building capacity in the field of sustainable development and environmental protection.

Course highlights

The proposed course is being developed as an “environmental awareness” course and not as a “how to” course:

- The course is designed to demonstrate the direct and indirect economic benefits of incorporating sound environmental and resource conservation practices in the planning, design, construction, and operation of all facets of inland and marine navigation sectors.
- The course is aimed at the senior officials and others in government in developing countries. The intent is to build a cadre of local experts and trainers who will then be able to change, adapt, and deliver the course to suit their respective needs.
- The “train-the-trainers” course will be conducted by a pool of experts drawn from the developed as well as the developing countries. The participation and input of the local expertise from the developing countries will be an essential requirement for the training sessions.
- The training programme will be structured in a flexible fashion so that it will be amenable to necessary changes to meet the respective national, jurisdictional and/or local needs.

Target audiences

The course will target a broad range of audiences comprising, for example: Senior and middle managers, marine engineers, designers and technical advisors, and in-water and on-shore infrastructure and facility managers, operators and maintenance staff.

Course structure

The proposed course will comprised various modules, each covering a number of interrelated subjects and topics:

Module 1	Introduction and Course Objectives
Module 2	Policies, Conventions and Legislation
Module 3	Principle of Sustainable Development and Marine Navigation
Module 4	Environmental Management Techniques and Best Practices
Module 5	Case Studies and Conclusions

Module 1: Introduction and Course Objectives

This module will provide a context and introduction to the rationale as well as the contents of the course.

It will also outline in clear terms the key objectives of the course. At the end of the course, participants will be able to:

1. Identify existing and proposed international environmental treaties and conventions, national and local jurisdictional regimes pertaining to the waterborne navigation sector.
2. Understand the concept and the principle of Sustainable Development and the very real economic benefits of adopting and applying pro-active environmental and resource measures and practices.
3. Possess a good knowledge of Environmental Management Framework (EMF) and Environmental Management Systems (EMS) as outlined for the ports and marine navigation by PIANC and formalised in the ISO 14000 series of standards.
4. Understand and also learn some of the established and well known environmental management techniques.
5. Get an overall heightened awareness of environmental issues associated with the marine navigation sector.

Module 2: Policies, Conventions and Legislation

This module would introduce participants to environmental policies, conventions and legislation, including guidelines, recommendations and standards as applicable in various jurisdictions. It will also highlight the numerous international, regional and national conventions and agreements that attest to the international need for action by the PIANC family. Also, it will offer a brief description of significant pieces of legislative instruments that have been developed and implemented in various jurisdictions to protect and conserve marine related resources. The module will, as a minimum, review the following:

- The London Convention and Basel Convention
- Key pieces of legislation, standard and guidelines dealing with:
 - Environmental protection measures enacted to protect and preserve water based resources
 - Environmental assessment of various navigation related projects and undertakings
 - The protection and enhancement of fisheries
 - Transportation of dangerous goods on waterways
 - Creation, preservation and enhancement of wetlands
 - Protection of habitat for migratory birds and species
 - Dredging and dredged material management activities
 - Heritage and cultural values of waterways and structures
 - Use of products and chemicals harmful to aquatic life and the water quality
 - Waste Management (shipborne and shore based)
 - Environmental Emergency Contingency (e.g. oil spills) Planning



Figure 4. One of the long term engineered confined disposal facilities (CDF) on the adjacent Seaway Island for the disposal and management of material dredged from the SEB Cut-Off Channel.

Module 3: The Principle of Sustainable Development and Waterborne Navigation

This module will start with a brief discussion of the principle of sustainable development and its underlying principle in terms of saving the environment and conserving natural resources, not only for our own use but also for the future generations. More specifically, the module will outline the pro-active environmental and sustainable development measures for planning, design, construction and operation of the following:

- Waterways development
- Ports and harbours
- Access channels
- Shore stabilisation works
- Capital and maintenance dredging
- Management of both clean and contaminated dredged material
- Port terminals and other on shore infrastructures
- Wetlands and fish habitats
- Heritage areas and valued ecosystems

Module 4: Environmental Management Techniques and Best Practices:

Environmental management techniques for achieving sustainability and environmental goals and objectives would be covered here. In particular, the module would explore the implementation of a Framework for Environmental Management encompassing the ISO 14000 Environmental Management System as part of the overall Sustainable Development agenda of PIANC. The module would cover some of the established and well-known environmental management techniques such as:

- Environmental auditing
- Environmental assessment
- Environmental contingency planning including fuel and chemical spills
- Storage and management of hazardous substances and chemicals
- Environmental Management systems
- Site-specific risk assessment

Module 5: Case Studies and Conclusions

Module 5 would present a number of case studies pertaining to different aspects of inland and marine navigation. The case studies would clearly demonstrate the benefits, economic as well as environmental, of adopting and applying the principle of sustainable development and sound environmental practices in the waterborne navigation areas. The case studies would be derived from various jurisdictions with particular focus for their applicability to the developing world. In addition, the module will also outline and compile for the participants codes of best practices dealing with various hazardous materials used or encountered in the waterborne marine navigation sector. In concluding, the module will attempt to clearly demonstrate the benefits of adopting and implementing sound resource conservation measures in developing world setting.

Course format, duration and manual

The course would consist of presentations, exercises, case studies, and discussions. Participants would be very much encouraged to be actively involved with the instructors and with each other in sharing information and in developing a practical approach for the

implementation of procedures and practices within their respective areas of influence. It is anticipated that the course will be of five days duration.

The course contents will be provided as reference material for the information presented during the course. Instructors will be expected to refer to the course manuals for additional material and/or added emphasis of a topic. Also, the material will be made available on a CD and other appropriate electronic media.

A certificate will be issued to each participant who has completed the course.

Course preparation plan and costs

Presumably almost all of the course material would be available from existing sources and agencies engaged in the championing and delivery of sustainable waterborne navigation and related issues. The preparation of the course material will be a co-operative effort of the countries and the international and national agencies associated with PIANC and its affiliate bodies. From amongst the PIANC bodies, it is expected that its various committees, such as CoCom and EnviCom will work closely to develop the course material.

In view of the number of unknown factors involved at this stage, it is not possible to get an accurate estimate of the costs involved in the development of the course. It is anticipated that the most of the costs will pertain to the retention of an outside consultant for the preparation and compilation of the course material. Assuming that the bulk of the material is available from existing sources, it is estimated that the actual cost can range anywhere from \$25K to \$35K depending on the ready availability of the course material from existing sources and a number of other contributing factors.

EnviCom and CoCom are making a concerted effort to solicit the necessary resources and funds from various countries and organisations from within the PIANC membership and the navigational community at large.

Conclusions

Sound policies and programmes based on the application of "sustainable development" principle offer the only solution to the increasing stresses being placed on the environment and the natural resources globally. The world's water bodies and the associated coastal environments, in particular, face mounting developmental pressures in their watersheds.

In Canada, the Great Lakes cater to the well being of literally one third of the country's population. The earlier attempts in Canada at preserving the Great Lakes ecosystem were primarily made by means of enacting

a plethora of acts and legislation. There were noticeable successes achieved but the gains made were nowhere on par with the resources invested. Also with the rapid growth in public awareness of the environmental issues beginning in the 1980s, there was a realisation that public involvement and buy-in would be a key factor in achieving sustainability for the Great Lakes basin. Accordingly, a concerted effort was made by all jurisdictions to seek stakeholder and public involvement in the affairs of the Great Lakes. A number of non governmental environmental organisations (NGOs) started getting actively involved with the various governments on both sides of the Canada-US border in the formulation and implementation of policies and programmes in the Great Lakes basin. Concurrently, comprehensive programmes to raise the environmental awareness of governmental decision makers were also established in almost all Ministries and Departments.

The result of this three-pronged strategy has been extremely successful in not only arresting the degradation but also in restoring and in some cases enhancing the fragile ecological balance of the Great Lakes ecosystem. The overall benefits and gains have been significant and also measurable in terms of achieving sustainability.

PIANC is also actively attempting to implement a number of public out-reach programmes in its efforts to green its operations and achieve sustainability worldwide. One important component of that strategy is to seek greater involvement of developing nations. EnviCom and CoCom are in the process of developing an environmental training programme for use by the decision makers in developing countries. While preparations are in place, EnviCom and CoCom are presently seeking resources and support to complete this undertaking.

All of the measures outlined above, legislation, public involvement and training to achieve sustainability are resource-intensive. In addition, involvement of the public, stakeholders and NGOs raises the expectations of the citizens, thus adding a significant challenge for cash strapped governments. Also, considerable lead times are needed and are added to the planning cycles. On the other hand, the price for formulating and implementing programmes and policies in watersheds without public input and informed decision-making is too high to ignore. The achievement of sustainability demands that all environmental, economic and social implications of any actions affecting water resources and coastal regimes be broad based and firmly footed in the minds of the public and the governmental decision makers at large.