Schulich School of Law, Dalhousie University
Schulich Law Scholars

LLM Theses | Theses and Dissertations

1999

International Law and the Maritime Carriage of Radioactive Materials: Prospects for the Non-Anthropocentric Greening of International Law

A. Suzette V. Suarez

Follow this and additional works at: https://digitalcommons.schulichlaw.dal.ca/llm_theses

 Part of the Environmental Law Commons, International Law Commons, and the Law and Philosophy Commons

International Law and the Maritime Carriage of Radioactive Materials:

Prospects for the Non-anthropocentric Greening of International Law

by

A. Suzette V. Suarez

Submitted in partial fulfillment of the requirements
for the degree of Master of Laws

at

Dalhousie University
Halifax, Nova Scotia

December 1999

© Copyright by A. Suzette V. Suarez, 1999

National Library of Canada
Acquisitions and Bibliographic Services
395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque nationale du Canada
Acquisitions et services bibliographiques
395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

Our file Notre référence

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-57331-1

Canada

Table of Contents

ABSTRACT

The maritime shipments of nuclear materials and radioactive wastes have incited a chorus of protests from some members of the international community, in particular Coastal States and non-governmental organizations. Their disapproval stems from the risks of harmful radiation from the shipments passing through their maritime zones near their coastal communities. The States engaged in the shipments counter that they observe international safety regulations and standards and that they have contingency plans and liability schemes to answer for harm that might occur.

A review of the legal regime governing the shipments of radioactive materials reveals an array of preventive and emergency measures as well as liability and compensation measures. The legal regime, however, does not provide any voice to all potentially affected entities, particularly developing Coastal States and the marine environment. The legal regime must be transformed in order to take the above interests into consideration.

Any reform in the legal system must start with an evaluation of the ethics and philosophy underlying the system. Ethics and philosophy do not provide all the answers to resolve the dilemma. However, ethics and philosophy contribute to the definition of the parameters of the existing legal regime and explain why the controversy regarding shipments of radioactive materials continue. Understanding the ethical and philosophical basis of the legal regime contributes to the formulation of recommendations for reforms.

This thesis asserts that the principal reason why the interests of all potentially affected entities and the marine environment are overlooked is because the legal regime is principally anthropocentric. Under the anthropocentric framework, hazardous human activities which are economically beneficial are given primacy. The environment is protected to the extent that its degradation affects the beneficial outcomes of the activity. In the non-anthropocentric approach to the greening of international law, the interests of all potentially affected entities, including the marine environment would be covered in the legal system.

The non-anthropocentric greening of international law on shipments of radioactive materials ensures that any reform in the legal system considers and includes the interests of all potentially affected entities, including the marine environment. The following measures are proposed in the non-anthropocentric greening of the legal regime governing the shipments of radioactive materials: mandatory codes: participation of non-governmental organizations; collaboration of the International Atomic Energy Agency and the International Maritime Organization; regional arrangements, and internationalization of the nuclear issue.

ABBREVIATIONS

Code of Practice	Code of Practice on the International Transboundary Movement Radioactive Waste
COLREGs	1972 *Convention on the International Regulation for Preventing Collisions at Sea*
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution
IAEA	International Atomic Energy Agency
ICJ	International Court of Justice
ICRP	International Commission for Radiation Protection
ILC	International Law Commission
ILO	International Labour Organisation
INF materials	Irradiated nuclear fuel, plutonium, and high-level radioactive wastes
IMCO	International Maritime Committee Organization renamed to IMO
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
IMO FSI	Sub-Committee on Facilitation and Implementation
IMO MEPC	Marine Environmental Protection Committee (IMO)
IMO MSC	Maritime Safety Committee (IMO)
IMO NAV	Sub-committee on Safety of Navigation
INF Code	Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium And High-Level Radioactive Wastes in Flasks on Board Ships
ISM Code	International Safe Management Code
Joint Convention	*Joint Convention on the Safety of Spent Fuel Management and On the Safety of Radioactive Waste Management*

JWG for INF Code	Joint Working Group on the Safe Carriage of Irradiated Nuclear Fuel by Sea
LOSC	1982 *United Nations Law of the Sea Convention*
MOX fuel	MOX fuel is a form of reprocessed nuclear fuel that is made up of spent plutonium and spent uranium.
NLB	Nuclear Law Bulletin
NNWS	Non-nuclear weapons States
NWS	Nuclear-weapons States
NPT	Treaty on Non-Proliferation of Nuclear Weapons
OECD	Organization of Economic Cooperation and Development
OECD/ NEA	Organization of Economic Cooperation and Development Nuclear Energy Agency
PNTL	Pacific Nuclear Transport Limited
PSSA	Particularly sensitive areas
Safe Transport Regulations	*Regulations for the Safe Transport of Radioactive Materials* (As Amended 1990)
SAGSTRAM	IAEA Standing Advisory Group on the Safe Transport of Radioactive Materials
SOLAS	*International Convention for the Safety of Life at Sea*
TRANSSAC	IAEA Transport Safety Standards Advisory Committee
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCHE	United Nations Conference on Human Environment
UNEP	United Nations Environment Programme

UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
VTS	Vessel Traffic Service
WHO	World Health Organization

ACKNOWLEDGMENTS

I owe a debt of gratitude, both professional and personal, to many people. First, I would like to acknowledge the academic supervision, support and encouragement of Dr. David VanderZwaag, Professor of Law, Dalhousie University. My readers, Professors Hugh Kindred and Moira McConnell, Professors of Law, Dalhousie University, went beyond the call of duty in providing perceptive insights, suggestions, and encouragement.

To friends and colleagues at Dalhousie University, Dalhousie LLM Class 1998-99, particularly the Night Crew, Gloria Chao, Anshumala Juyal and Michael Cantlon; your company, ideas, laughter and energy kept me sane and going. I also acknowledge the librarians and staff at Dalhousie Law School for being wonderfully supportive of the research needs of a graduate student. The Beech St./Cunard Court group, *salamat gid* for the good food, stories, music, and prayers. To my Le Merchant friends, thank you for support. Paul Elsner, my warmest appreciation for your support, friendship and love. To my family, my parents, siblings, and Aunt Christine and Uncle Don, to whom I dedicate this work, your prayers, love, and support sustained me. I will forever be grateful.

I would also like to acknowledge the financial support of the Canadian International Development Agency (CIDA) and the assistance of Ms. Sophia Robineault of CIDA, Ms. Patricia Roberts of the Marine Affairs Program of Dalhousie Univeristy, Mrs. Dagmo Nour of CIDA, and Ms. Lesley Brechin of the Marine Affairs Program of Dalhousie University.

S.V.S.

Halifax, Nova Scotia
December 1999

Introduction

Spent nuclear fuel from civilian nuclear reactors is starting to pile up on a world wide scale. For closed cycle States or those States engaged in reprocessing spent nuclear fuel, the increase of spent nuclear fuel is not a problem. Spent nuclear fuel can be reprocessed and may be used again as fuel in nuclear reactors. Out of the 32 countries that are engaged in commercial nuclear energy generation, only a few are capable of reprocessing their own spent nuclear fuel. Rather than establishing their own nuclear reprocessing facilities, other countries sign cooperation agreements with countries that have the technology and experience to undertake reprocessing for them. One of these countries, France, for example, undertakes reprocessing activities for 10 Japanese nuclear companies. Japan delivers spent nuclear fuel to France for reprocessing. France returns the reprocessed nuclear fuel, usually in mixed oxide [hereinafter MOX][1] form, as well as the remaining high-level radioactive wastes, in vitrified or solidified form, to the State of origin, Japan. From the points of view of the States engaged in nuclear energy generation, this arrangement is ideal and beneficial to them both.

However, spent fuel, reprocessed nuclear fuel and highly radioactive wastes are highly radioactive substances. Their shipments across international jurisdictions pose radiation risks to human populations and the environment. Because of the risks posed, this activity is one of the most highly regulated activities in international law. The international and national regulations have been able to keep the risks of any accident

[1]MOX fuel is a form of reprocessed nuclear fuel that is made up of spent plutonium and spent uranium.

pertaining to nuclear activities, including the maritime shipments of radioactive materials, low. However, when accidents do happen, the consequences of radiation exposure may be grave and far-reaching, affecting many countries, their populations and the environment. The potential for a widespread excessive exposure to radiation from the maritime carriage of radioactive materials has made many Coastal States anxious and concerned. Excessive exposure to radiation has caused deaths and long-term diseases in humans as well as contaminated ecosystems.

The findings of this thesis revealed a regime that has preventive and contingency measures, as well as a civil liability scheme should harm occur. Despite the comprehensive nature of the legal framework, the controversy surrounding the shipments has not been resolved and has become like a never-ending cycle of protests and new regulations.

A review of the legal regime and the nature of the activity and its risks indicated serious gaps. The problem is that the risks from the shipments of radioactive materials are imposed upon entities that have nothing to do with the activity at all. The benefits, however, accrue only to the States of origin and destination. There may be residual benefits to other States, in the form of cleaner air on a global level as a result of using nuclear energy instead of oil. The direct risks to these third States and to the marine environments are higher than the residual benefits. Despite the potential risks, the present legal regime does not allow the participation of these potentially affected third States and other stakeholders in the decision-making process at a stage before any harm has occurred. Nor does the legal regime provide any protection to the marine environment, per se, other than being a residual beneficiary of the protection accorded to humans.

Is there a way that the interests of all potentially affected States and the interests of the marine environment might be meaningfully represented and considered in the decision-making processes of the legal regime governing the maritime carriage of radioactive materials? This study argues that the legal regime governing the maritime carriage of radioactive materials is based on anthropocentric ethics and philosophy.[2] The anthropocentric tendency is a fundamental factor why the controversy regarding the shipments has not been resolved. The anthropocentric framework prioritizes economic concerns and overlooks non-economic interests of other potentially affected entities: States, non-States and the marine environment. A shift to non-anthropocentric ethics and philosophy as the underlying rationale of the legal framework is necessary before reforms in the legal regime can be pursued.

In Chapter 2, I will present the two general ethical and philosophical views of the relationship of humanity and the rest of the biotic community: anthropocentrism and non-anthropocentrism. Anthropocentric ethics and philosophy are human-centered. Human economic concerns and interests are considered paramount. Non-anthropocentrism, on the other hand, while not denying the importance of human-centered concerns, recognizes the need to consider the interests of both humans and non-humans species. Humans are not considered superiors but are members, thus, they have the obligation to become responsible and judicious members of the community.

---

[2]Philosophy is broader than ethics. "Ethics does not come into existence without a social, intellectual and general philosophical context." Hence, environmental ethics necessarily include a philosophical base. Together, both terms denote a certain worldview or perspective of the relationship of the human community with the natural environment. A. Gunn, "Can Environmental Ethics Save the World?", in F. Férre and P. Hartel, (eds.) *Ethics and Environmental Philosophy, Theory Meets Practice* (Athens and London: The University of Georgia Press, 1994) at 197.

Chapter 3 provides the parameters of the issues surrounding the maritime shipments of radioactive materials. The controversial shipments and the concerns raised by potentially affected States and non-governmental organizations will first be described. The validity and reasonableness of the concerns raised by potentially affected States will then be placed in a more objective perspective by a discussion of the nuclear fuel cycle, the effects of radioactivity on humans and the environment, and the risks attached to maritime transport as a whole. The purpose of this Chapter is to provide a basis for taking the position that the risks posed to other potentially affected States and to the marine environment necessitates a re-examination of the underlying ethics and philosophy of legal regime. When the risks posed by an activity are high, the tendency of an anthropocentric-based legal system is to impose more stringent laws or regulations. The stringency of regulations does not guarantee the non-occurrence of harm. Non-anthropocentric ethics and philosophy also do not guarantee the non-occurrence of harm. However, they empower all potentially affected entities in activities that present risks to them and to the environment.

The legal regime governing the maritime shipment of radioactive materials will be presented in Chapter 4. The legal regime, partly comprised of nuclear law and maritime safety laws, is mostly made up of safety standards and requirements for modal and non-modal aspects of transportation. The anthropocentric bias of the legal regime is obvious. The rights of States to undertake nuclear activities and to pursue shipping interests are prioritized in this regime. Separate protection of the marine environment and participation of other potentially affected States and non-State entities are secondary objectives.

The final Chapter summarizes the challenges facing the non-anthropocentric greening of the legal regime regulating the shipments of radioactive materials. The non-anthropocentric greening of international law does not look overly optimistic. The social system is anthropocentric. The international legal system is but a reflection of the anthropocentric ethics and philosophy that fuels the modern system. However, a strategy that can work around the principal obstacles to the non-anthropocentric greening of international law already exists: fragmented incrementalism. Fragmented incrementalism is a multi and inter-level approach to making changes in international law. This approach recognizes that transformation has to be gradual, incremental.

The following proposals for action are offered to continue the process of non-anthropocentric reforms in the legal regime: broaden the collaborative efforts of the IAEA and the IMO; continue the effort to transform recommendatory codes into mandatory instruments; establish regional arrangements; and internationalize the nuclear issue. These proposals may provide avenues for the participation of all affected entities and for the consideration of the marine environment.

This thesis does not assert that a change in the ethics and philosophy will ensure that no harm to the environment and to people from any human activity will occur.

> [U]niversal dependence on the use of environmental resources for even the most basic needs renders it impossible to refrain from altering the environment. As a result, environmental conflicts are ineradicable and environmental protection is always a matter of degree, inescapably requiring choices as to the appropriate level of environmental protection and the risks which are to be regulated. [3]

---

[3]F. Du Bois, "Social Justice and the Judicial Enforcement of Environmental Rights and Duties", in A. E. Boyle and M. R. Anderson (eds.), *Human Rights Approaches to Environmental Protection* (Oxford: Clarendon Press, 1996) at 174.

The contemporary system will always involve the utilization of the environment for human purposes and impairment at some level will result. Conflicts will arise not only between and among states,[4] between and among states and non-states; and ultimately, between and among non-states. Ultimately in any environmental conflict situation, injury to persons and degradation of the environment are inevitable.

The role of ethics and philosophy is to provide guidance in determining the rational and sustainable level or degree of interference and reliance on the environment. The highly anthropocentric approach understands environmental protection in the language of assimilative capacity. As long as the environment seems to be able to assimilate, then any human interference is permissible. The word 'limit' in the anthropocentric framework applies only when the capacity to assimilate reaches its maximum level. The non-anthropocentric framework, however, speaks the language of ecosystem unity and ecosystem health. The word 'limit' is applied even before any human activity is undertaken. The non-anthropocentric ethics and philosophy do not wait for degradation to occur; they anticipate and prevent harm from actually taking place.

---

[4]Conflicts concerning water resources, for example, are a source of political tensions between and among Middle Eastern states. See A. Hurrell and B. Kingsbury (eds), *The International Politics of the Environment, Actors, Interests and Institutions*, (Oxford: Clarendon Press, 1992) at 36.

Chapter 2

An ethical and philosophical framework to greening international law

In this level of our analyses, this question would lead us to the discovery that society itself is guilty - and we know this already.[5]

I. Introduction

The phenomenon of the greening of international law, or the increasingly environmental slant of international law, as adverted to by one scholar, is by no means new.[6] According to Philippe Sands, States entered in agreements for the protection of fisheries as early as 1867.[7] Many of these agreements are bilateral and/or regional. Protection of the environment then was not in a global context. The greening of international law in a global context is a recent phenomenon that started in 1972 during the United Nations Conference on the Human Environment [hereinafter Stockholm Conference]. It was in the Stockholm Conference where the relationship between environment and development was articulated in an integrated and international context. Human industrial activities have been elevated to an increasingly international context with increasingly wide transboundary consequences. International shipping of dangerous or hazardous cargoes is an example. A vessel carrying dangerous cargoes from State C,

---

[5]N. Luhmann, *Ecological Communication*, (Chicago: The University of Chicago Press, 1989) at 10.

[6]P. Sands, *Principles of international environmental law, Volume 1 Frameworks, standards and implementation*, (Manchester and New York: Manchester University Press, 1995) at 3.

[7]*Ibid.* at 26. Sands cited the following conventions: *Convention between France and Great Britain relative to Fisheries*, Paris, 11 November 1867, XXI *I.P.E.* 1; *North Sea Fisheries* (Overfishing Convention), 1882, UN doc. ST/LEG/SER.B/6, 1957, 695.

flying the flag of State A but may be owned by a company registered in State B, meets an accident in the territorial waters of State D and subsequently spills its hazardous cargoes. The vessel pollutes the marine environments and coastal communities of States D and adjoining States E and F. The pollution that started in States D, E, and F may also have contaminated environment of the entire region. The number of States involved in the activity and affected by the subsequent accidental pollution manifests the interconnectedness of environmental issues. Philippe Sands identifies the element of interconnectedness as the principal reason which contributed to the greening of international law:

> environmental issues are accompanied by a recognition that ecological interdependence does not respect national boundaries and that issues previously considered to be matters of domestic, sovereign concern have international implications. The implications, which may be bilateral, sub-regional, regional or global, can frequently only be addressed by international law and regulation. [8]

International law, the primary means or tool in implementing green considerations into industrial activities, has undergone a considerable amount of greening through the years. Under the present international legal framework, the process of greening the law can only go so far. This is because the underlying ethical and philosophical bases of the legal framework - anthropocentrism - are also the very same ethics and philosophy that cause environmental degradation and species depletion and extinction. Anthropocentric ethics and philosophy are human-centered and prioritize human activities first before the environment. In reaction to the environmental degradation and species depletion and extinction brought about by anthropocentric ethics, non-anthropocentric ethics and philosophy were developed.

In greening the law, there has been no conscious effort to evaluate its ethical and philosophical foundations. This thesis argues that any greening must start and must be guided by ethics and philosophy as these two constitute the foundation of any social system, including the legal system.

This Chapter will outline the anthropocentric ethics and philosophy and contrast it from the non-anthropocentric views. There are two purposes of this Chapter. First, it is to formulate a non-anthropocentric framework of international law for environmental protection. The second purpose, which will be expanded in Chapter 5, is to use the ethical and philosophical framework to analyze why the international legal regime that governs the maritime carriage of radioactive materials has not greened in a way that is responsive to the concerns and interests of all potentially affected entities, including the marine environment.

II. Rationale behind the ethical and philosophical approach to greening

Do ethics and philosophy play a role in the legal system? Some environmental philosophers[9] criticize the idea of an ethical and philosophical justification behind policies, laws and actions to protect the environment. Their main contention is that philosophy and action/policy exist in separate continuums. Philosophy does not induce human societal behavior.

> In no case does the reasoning of an ethical theorist actually cause a norm to be socially instituted or cause a norm once in force to lose status. Whether a moral norm is actually in effect within a given community

---

[8] *Ibid.* at 9.

[9] J. B. Callicott, "Environmental Philosophy Is Environmental Activism: The Most Radical and Effective Kind", in D. E. Marietta, Jr. and L. Embree, (eds.) *Environmental Philosophy and Environmental Activism* (United States of America: Rowman and Littlefield Publishers, Inc.,1995) at 20. Callicot describes them as anti-philosophers.

> depends not at all on ethical theorizing... If norms encouraging conservation and proscribing pollution were actually in force in industrial society, it would not be the result of ethical theory; and the fact that currently they are not in force is not alleviated by any amount of adroit ethical reasoning.[10]

Systems theorist Luhmann agrees and cautions against over-simplistic prescriptions, ethical or otherwise, for the present environmental dilemma.[11] Transformation of society is not a factory-like process of inputs and outputs.[12] The input of new ethics and philosophy in the legal system does not automatically result in a transformed society as its output. The danger, according to Luhmann, of the entry of ethics in the discussion of the environmental dilemma is that the

> intention to demonstrate good intention determines the formulation of the problem. So, by accident, as it were, a new *environmental* ethics enters the discussion without ever analysing the all-important system structures.[13]

However, one cannot dismiss completely the influential role of ethics and philosophy in the legal system. Law and policies do not and cannot exist in a vacuum. "Reasons come first, policies second, not the other way around."[14] Law is an articulation of the ethical and philosophical views of society.

The danger is not that ethics and philosophy will mislead the quest for a resolution of the environmental dilemma. Rather, the peril lies in grasping upon ethics and philosophy as if they provide the only way to resolve the environmental dilemma.

Ethics and philosophy have their function to play in the system. Ethics and philosophy serve a very important role in the legal system: either they reflect the

---

[10]J. B. Callicott, "An Alternative View of Environmental Ethics," 13 Environmental Ethics (1991) at 200. Callicott quoted Kenneth M. Sayre.
[11]Luhmann, *supra* note 5 at 11.
[12]*Ibid.* at 15.
[13]*Ibid.* at 5.

worldview that supports the legal system or they articulate and push for a new worldview that can transform the legal system.[15] Ethics and philosophy thus serve as catalysts for change. They function as maps to guide human society; they outline the options that society may take.

Cognizant of the limitations of ethics and philosophy, this thesis argues that the most fundamental approach to greening the legal system should start with an examination of the underlying ethics and philosophy and the role they play in the system. The next two sections will discuss the two general worldviews or ethics that have a profound impact on the way we view the environment and non-human members in it.

III. Anthropocentrism and non-anthropocentrism

There are two general ethical and philosophical views that fuel the human or social system today: anthropocentrism and non-anthropocentrism. The locus of anthropocentrism is human concerns. Non-anthropocentrism, on the other hand, puts humans on equal footing with the other members of the biotic community. The dominant ethical and philosophical view is anthropocentrism.

A. Anthropocentric approach

The main consideration of the anthropocentric or human-centered view is the well being of humans.[16] Nature and everything in it exist for the "support and comfort" of

---

[14]J. B. Callicott, *supra* note 9 at 23.
[15]*Ibid.*
[16]P. W. Taylor, "The Ethics of Respect for Nature", in M .Zimmerman (Gen. Ed.), *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993) at 66.

humans.[17] For nature to acquire value according to the human perspective, it must be put to use by or consumed by humans.[18] According John Locke, one of the forerunners of the anthropocentric worldview, a cultivated land is more valuable than a non-cultivated one.[19] Materials from nature and the Earth are useless until manufactured for use by humans.[20] The anthropocentrics see the oceans and the marine organisms in accordance to their use and value to humans, e.g. shipping, commerce, source of resource and as sink for wastes.

The anthropocentric view of Locke is reflected in the philosophy of utilitarianism.[21] This philosophy advocates the maximization of good, pleasure and happiness to the greatest number of humans.[22] Hence, under the anthropocentric/utilitarian view, the standard upon which any activity, policy, or law is evaluated depends on how well it promotes the human interest and welfare.[23] The legal implication of a human-centered or anthropocentric view is that "it is to humans and only to humans that all duties are ultimately owed."[24] In carrying out the duties and obligations for humans, there may be residual benefits to non-human species and the environment, but there is no separate "obligation to promote or protect the good of non-human living things..."[25]

---

[17]E. Katz, *Nature as Subject, Human Obligation and Natural Community*, (Lanham: Rowman & Littlefield Publishers, Inc., 1997) Katz quoted J. Locke, *The Second Treatise of Government*, at 221.
[18]*Ibid.*
[19]*Ibid*. at 229.
[20]*Ibid.*
[21]*Ibid.* at 230.
[22]*Ibid.* at 231.
[23]Taylor, *supra* note 16 at 67.
[24]*Ibid.*
[25]*Ibid.*

Complementing the anthropocentric ethics is the ethics of consumerism. Modern human society is now synonymous with the consumer society.[26] The ethics of contemporary consumerism traces its origins in the United States of America after the World War II. Consumerism was seen as the new American ideology. One retail analyst explains why the American system must embrace consumerism.

> Our enormously productive economy ...demands that we make consumption our way of life, that we convert the buying of goods into rituals, that we seek our spiritual satisfaction, our ego satisfaction, in consumption...We need things consumed, burned up, worn out, replaced, and discarded at an ever increasing rate.[27]

The source of fulfillment of the consumerist society is the material thing. In the consumerist society, the maximization of happiness, pleasure and good is in the consumption of the material.

The neoclassical economic theory that complements the maximization of material satisfaction is another anthropocentric based school of thought. This economic approach focuses on the market exchange processes and uses the natural environment in two ways: as a source of materials for goods and services (or human satisfaction in a material sense) and as sink for the waste generated by the production or manufacture of goods and services.[28]

Under a neoclassical economic theory, there are two main actors: the consumer and the producer. The consumer's main motivation is maximization of material

---

[26]A. Durning, *How Much Is Enough? The Consumer Society and the Future of the Earth*, (New York: W.W. Norton, 1992) at 274.
[27]*Ibid.* Durning quoting retailing analyst Victor Lebow.
[28]J. Gowdy and S. O'Hara, *Economic Theory for Environmentalists*, (Boca Raton: St. Lucie Press, 1995) at 9.

satisfaction through goods and services;[29] the producer, on the other hand, is motivated to maximize profit.[30]

Critics to the neoclassical economic theory state that the major problem to this theory is that the consequences to the natural environment of the interests of the consumer and the producer are beyond its scope and are thus not taken into consideration.[31] The notion of scarcity of resources in this approach is relative and does not refer to the biophysical notion of finite resources, which is absolute.[32] For example, when tropical timber in the Philippines had been used up for international commercial purposes, many multi-national companies simply transferred operations in Indonesia where tropical timber was still abundant. As well, this economic theory does not consider the pressure imposed upon the environment of the wastes generated by the production processes.[33] It rests on the notion that the environment can assimilate the wastes generated by the manufacturing and consumption processes. Again, there is no notion of a finite natural world, or a limited assimilative capacity of the environment.

B. Non-anthropocentric approach

The increasing environmental problems such as global warming, air pollution, climate change, loss of biodiversity, confronting the global community necessitated a reassessment of the anthropocentric worldview. The root of all these issues can be traced to the way the environment and everything in it are treated by the human society. Anthropocentrism allowed the environment to be used as resource as well as sink of the

---

[29] *Ibid.* at 33.
[30] *Ibid.* at 38.
[31] *Ibid.* at 48.
[32] *Ibid.* at 49.

waste of the consumerist industrial society. The dual roles that the environment plays led to environmental degradation and species depletion and extinction.

The non-anthropocentric approach is principally a reaction to the anthropocentric worldview and condemns anthropocentrism as the source of the present environmental dilemma. According to the non-anthropocentric ethics and philosophy, there is a need to assess human-centered ideologies and to review what it means to be a human being.

There are several variants to the non-anthropocentric world view. The following will be covered here: land ethics, deep ecology, life-centered, ethics of attunement, social ecology and ecofeminism. The last two are distinctive because they address the "social root of the ecological crisis."[34]

Non-anthropocentrism sees nature as "a community of interacting, but interdependent individuals."[35] The individual members of the ecosystem include both humans and non-humans. Aldo Leopold's land ethics subscribes to this view.[36] Humans are members of the natural environment - the land - and thus are part of the biotic community.[37] The integrity of the individual member of the biotic community as well as of the whole is important.[38] Ultimately, however, when a choice has to be made between the individual member and the community, the ecocentric approach would choose the biotic community. The more significant element is the whole biota, not the individual

---

[33]*Ibid.*

[34]M. Bookchin, "[From] Defending the Earth", in D. Jamieson and L. Gruen (eds.), *Alternative Perspectives on Environmental Philosophy* (New York: Oxford University Press, Toronto, 1994) at 122.

[35]*Ibid.*

[36]The land ethic was developed by L. Aldo, *A Sand County Almanac and Sketches Here and There* (London: Oxford University Press, 1949).

[37]J. B. Callicott, "The Conceptual Foundations of the Land Ethic", in M. Zimmerman, *Environmental Philosophy, supra* note 16 at 117.

members. "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."[39]

Deep ecology agrees on the importance of both human and the non-human members of the biotic community.[40] Naess and Sessions, two of the main proponents of deep ecology identify the eight (8) principal points of deep ecology.

> (1) The well-being and flourishing of human and non-human life on Earth have value in themselves (synonyms: intrinsic value, inherent worth). These values are independent of the usefulness of the non-human world for human purposes.
>
> (2) Richness and diversity of life forms contribute to the realization of these values and are also values in themselves.
>
> (3) Humans have no right to reduce this richness and diversity except to satisfy vital needs.
>
> (4) The flourishing of human life and cultures is compatible with a substantially smaller human population. The flourishing of non-human life requires a smaller human population.
>
> (5) Present human interference with the non-human world is excessive, and the situation is rapidly worsening.
>
> (6) Policies must therefore be changed. These policies affect basic economic, technological, and ideological structures. The resulting state of affairs will be deeply different from the present.
>
> (7) The ideological change will be mainly that of appreciating life quality (dwelling in situation of inherent value) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between bigness and greatness.

---

[38] *Ibid.* at 118.
[39] *Ibid.*
[40] B. Devall, "[From] Deep Ecology and Radical Environmentalism", Society and Natural Resources 4(1):247 at 116.

(8) Those who subscribe to the foregoing points have an obligation directly or indirectly to try to implement the necessary changes.[41]

Life, under the deep ecology perspective, has an expansive meaning and refers not only to the "living entities" but also to the non-living parts of the eco-system like rivers, and seas.[42] The so-called lower life forms have intrinsic as well as instrumental worth to the biodiversity of the ecosystem.[43] Non-human species may be taken but only when they are vital to humans.[44] "Vital needs" depend on variable factors such as the climate and other social structures.[45]

The principal rationale that allows for this perspective is the abandonment of the notion of human superiority. Humans are not superiors but are members of the "web of life"; they are integral parts of the whole.[46] The notion of *ecocentric identification*, said to be the most distinctive characteristic of deep ecology, is possible only when humans become truly a part of the whole[47] and not superior. The deep ecologist, thus says, "I am the rainforest."[48]

Deep ecology has been criticized as environmental imperialism because of its position in point (4). To advocate for a smaller population is to imply that large population, as a cause of environmental degradation, is equivalent to over-consumption and waste generation of developed countries. Many developing countries, whose

---

[41]A. Naess, "The Deep Ecological Movement: Some Philosophical Aspects," in M. Zimmerman (ed.), *Environmental Philosophy, supra* note 16 at 197.
[42]*Ibid.* at 197 - 198.
[43]*Ibid.*
[44]*Ibid.*
[45]Naess, *supra* note 41 at 31.
[46]Devall, *supra* note 40 at 118.
[47]*Ibid.*
[48]*Ibid.*

populations are bigger than that of developed States, protest against this implication.[49] While developing countries have bigger populations, they consume and produce much less waste than the populations and industries of developed States.[50]

When humans and non-humans are considered on an equal footing, the implication is that obligations are owed not just to humans but also to non-humans and the entire biotic community. Taylor's life-centered approach works and elaborates on this implication.[51] The human community has an obligation to ensure that its activities respect and consider the integrity and well-being of the natural community.[52] The obligation towards the biotic community is thus separate from the obligation to advance human interests. The independent and separate consideration of non-humans has tremendous implications upon environmental policies and laws. It means that the well-being of the non-human members of the natural community shall be considered in conjunction with, and not as an afterthought or appendage to, the welfare and good of the human community.[53]

But what is the good of the non-human community that the life-centered perspective must respect and observe? According to P. W. Taylor, the good or welfare that must be aimed for the non-human, biotic community is to be able to maintain its

---

[49]G. Sessions, "Introduction", in M. Zimmerman, *Environmental Philosophy, supra* note 16 at 168.
[50]*Ibid.*
[51]P. W. Taylor, *supra* note 16 at 67-68. Taylor limits the membership of the biotic community to wild plants and animals, excluding animals and plants whose genetic makeup are artificial, controlled or manipulated by humans for human or anthropocentric purposes. However, he concedes that artificial or controlled animals and plants may have an impact on the environment and it is only when this happens that the life-centered ethics may apply.
[52]*Ibid.*
[53]*Ibid.*

biological and ecological health.[54] The right to health of members of the biotic community is based on their possessing intrinsic worth. The idea of intrinsic worth of each species, human and non-human, is similar to the basic points embraced by deep ecology as mentioned earlier.[55]

The life-centered perspective has four main elements:

> (1) Humans are thought of as members of the Earth's community of life, holding that membership on the same terms as apply to all the non-human members;
>
> (2) The Earth's natural ecosystems as a totality are seen as a complex web of interconnected elements, with the sound biological functioning of each being dependent on the sound biological functioning of the others;
>
> (3) Each individual organism is conceived of as a teleological center of life, pursuing its own good in its own way; and
>
> (4) Whether we are concerned with standards of merit or with the concept of inherent worth, the claim that humans by their very nature are superior to other species is a groundless claim and, in light of elements (1), (2), and (3) above, must be rejected as nothing more than an irrational bias in our own favor.[56]

To declare that humans are members of the biotic community is not to deny their differences from wild plants and animals.[57] From a biological point of view, however, humans are but one of the species of the biotic community;[58] humans are not even the essential members.[59] The integrity and well-being of other members of the biotic community do not depend largely on the health of humans. But human health and

---

[54]*Ibid.*
[55]A. Naess, *supra* note 41 at 197.
[56]Taylor, *supra* note 16 at 70.
[57]*Ibid.*
[58]*Ibid.*
[59]*Ibid.* at 71.

integrity are highly dependent on the health of the entire biotic community.[60] The human and non-human species both have the same terms of membership in the biotic community in the life-centered perspective.

The interconnectedness of the various ecosystems and members - humans and non-humans - of the biotic community has now been established as a 'biological reality'.[61] The immediate implication, therefore, is to set standards and norms for the realization of the well-being of the various ecological units and members, and not just for the well-being of its human members.[62]

Non-human species have their own teleological centers. According to Taylor, the emphasis that the non-human members of the biotic community pursue their own way of life is not anthropomorphizing, or assigning human traits.[63] Research has established that plants and animals have their own teleological centers, their own world or life-cycles, separate and apart from human cycles.[64]

Human superiority, as mentioned earlier, is the foundation of the anthropocentric view. The fourth element of the life-centered perspective rejects the notion of human superiority. The underlying reason why human traits such as "rational thought, aesthetic creativity, autonomy and self-determination, and moral freedom"[65] are judged to have

---

[60] *Ibid.*
[61] *Ibid.* at 73. See also J. E. Lovelock, "The earth as a living organism", in *Biodiversity*, (Washington , D.C.: National Academy Press, 1988); L. Margulis and J.E. Lovelock, "Gaia and geognosy", in *Global Ecology Towards a Science of the Biosphere*, (London: Academic Press Inc., 1989).
[62] *Ibid.*
[63] *Ibid.*
[64] *Ibid.*
[65] *Ibid.* at 75.

superior value is because they are evaluated from the human point of view.[66] These traits, as far as other species are concerned, are not valuable because they are not essential to their own well-being and integrity. There is no rational or logical basis for the claim of human superiority over other members of the biotic community.[67] This element is the most important aspect of the life-centered perspective.[68] "Once we reject the claim that humans are superior either in merit or in worth to other living things, we are ready to adopt the attitude of respect."[69]

The abandonment of the notion of human superiority leads one to discover the many lessons that the human society can learn from the non-human community. One ethic that recognizes how much human society can learn from the natural biological community is the ethic of attunement.[70] The ethic of attunement invites one to learn from the biological processes. The biological process is efficient because its production, consumption and decomposition stages follow a cyclical pattern[71] that does not leave nor generate waste. The industrial cycle, on the other hand, follows a linear pattern that leaves waste and other industrial left-overs at the end of the production process.[72] The ethic of attunement thus calls for the redesigning of industrial processes and technologies so that these are in accord with the biological cyclical fabric.[73] An environmentally attuned technology and process is

---

[66]*Ibid.*
[67]*Ibid.* at 80.
[68]*Ibid.* at 81.
[69]*Ibid.*
[70]E. Dodson Gray, "Come Inside the Circle of Creation, The Ethic of Attunement," F. Férre and P. Hartel, *supra* note 2 at 29.
[71]*Ibid.*
[72]*Ibid.*
[73]*Ibid.*

> like a hand in a glove. It must be designed and used with such sensitivity and attunement that it fits within the biospheral system just as a hand fits into a glove without destroying that glove.[74]

It is technology that is

> motivated not only by profit but by a profound appreciation of our true place within the living earth system and marked by a commitment to stop using any technology if it proves harmful.[75]

The idea of an appropriate technology is what the ethic of attunement is advocating. Appropriate technology has been demonstrated to be feasible. For example, chlorofluorocarbon propellants in spray cans were replaced by non-ozone-threatening substitutes, and polychlorinated biphenyls in electrical machinery are being replaced by less toxic lubricants.[76]

Another example of an environmentally attuned application of a technological process was the construction of the Alaskan oil pipeline from Prudhoe Bay on the Arctic Ocean to the southern coastal port of Valdez.[77] The environmental condition involved in the project was the permafrost of the Arctic. Permafrost looks and feels like rock when solid frozen but it can melt when warmed.[78] The specific condition of the permafrost, however, was initially not considered in the design and location of the pipeline. A portion of the pipeline was situated at the bottom of the permafrost.[79] The crude oil that was to run through the pipeline was to be pumped out very hot. After one winter of use, the engineers of the project discovered that the pipeline "had been twisted and curled like

---

[74] *Ibid.* at 30.
[75] *Ibid.* at 31.
[76] *Ibid.*
[77] *Ibid.* at 32 - 33.
[78] *Ibid.*
[79] *Ibid.*

copper wiring."[80] The pipeline was redesigned and was elevated to about six to eight feet off the permafrost.[81]

The problem of environmental degradation and species depletion and extinction does not merely rest on a general anthropocentric basis. Ecofeminists and social ecologists argue that integral to the present environmental dilemma are issues of patriarchy, racism, gender and imperialism.[82]

Bookchin, a proponent of social ecology describes the environmental dilemma in this manner.

> Our present society has a definite hierarchical character. It is a propertied society that concentrates economic power in corporate elites. It is a bureaucratic and militaristic society that concentrates political and military power in centralized state institutions. It is a patriarchal society that allocates authority to men in varying degrees. And *it is a racist society* that places a minority of whites in a self-deceptive sovereignty over a vast worldwide majority of peoples of color. While it is theoretically possible that a hierarchical society can biologically sustain itself, it is absolutely inconceivable that present-day hierarchical and particularly capitalist society could establish a non-domineering and ethically symbiotic relationship between itself and the natural world. As long as hierarchy persists, as long as domination organizes humanity around a system of elites, the project of dominating nature will remain a predominant ideology and inevitably lead our planet to the brink, if not into the abyss, of ecological extinction.[83]

The source of the environmental dilemma, which Bookchin calls the ecological crisis, is domination of humans by other humans. The culture and ethics of domination spilled into the environmental sphere, hence, humans also dominate the natural community.[84] Bookchin's chief recommendations in order to halt the path to destruction

---

[80] *Ibid.*
[81] *Ibid.*
[82] Bookchin, *supra* note 34 at 112.
[83] *Ibid.* at 123.
[84] *Ibid.*

are decentralization and alternative technology.[85] Decentralization of the human systems, for example from nation-State to manageable cities or towns is central to the ethics of social ecology.[86] These cities or towns are envisioned to be ecologically self-sufficient, living only within the carrying capacity of its natural environment.[87] Technology must also be transformed into "small-scale, multi-use facilities with production processes that reduce arduous toil, recycle raw materials, eliminate pollution and toxic wastes."[88] Bookchin, however, admits, that decentralization and alternative technology, by themselves, will not resolve the environmental dilemma. According to him, "a genuine ecological vision ultimately needs to directly answer such nagging questions as "who owns what?" and "who runs what?"[89]

Ecofeminists also focus on the political and social institutions that perpetuate domination and/ or patriarchy as vital to the resolution of the environmental dilemma.[90] Central to the ecofeminist view is the woman-nature connection and parallelism. The ecological crisis is seen not as a consequence of anthropocentrism per se but of andocentrism or male-centered worldview.[91] At the top of the patriarchal pyramid is GOD (male) and man.[92] All others - women, children, animals, plants, and rock - are viewed as resources for man.[93] The domination and subordination framework that

---

[85]*Ibid.* at 126.
[86]*Ibid.*
[87]*Ibid.*
[88]*Ibid.* at 127.
[89]*Ibid.*
[90]W. Fox, "The Deep Ecology - Ecofeminism Debate and Its Parallels", in M. Zimmerman, *Environmental Philosophy, supra* note 16 at 216.
[91]*Ibid.*
[92]*Ibid.* A. Salleh, "Working with Nature: Reciprocity or Control?", at 315.
[93]*Ibid.*

explains the oppression of women also explains the domination and subordination of man over nature.[94]

These non-anthropocentric views have one common position: human-centered interests permit the environment to be used as resource as well as sink of the waste of the consumerist industrial society. They have one fundamental proposal: there is a need to *shift* the way the natural world is seen and treated. Humans are not on top of a pyramidal structure. Rather, they are members of the natural environment and therefore, must start to act responsibly and morally in order to deserve and continue such membership.

IV. Implications of non-anthropocentric ethics and philosophy

Non-anthropocentric ethics and philosophy have several implications. First, they call for a shift in the ethical and philosophical mindset of the human community, from human-centered to life-centered. The life-centered perspective covers both human and the non-human members of the biotic community. Humans are members, not superiors, in the natural community. In the legal system, using non-anthropocentric ethics and philosophy as the policy or spirit of the law can manifest the ethical and philosophical shift.

Second, the non-human members of the biotic community must be regarded independent of their value to humans. From biological and ecological perspectives, non-humans have different teleological objectives and centers. The good of the human community is not the good of the non-human members of the biotic community. Protection of the human community from hazardous activities, for example, should not be equated as adequate protection of the non-human environment. Any regulatory measure,

thus, must provide for separate protection measures for the environment. Separate protection measures do not necessarily advocate for the grant of separate right of the natural and non-human environment.[95] Legal harm must comprise of both human (economic harm) and non-human, ecological harm. As well, the long-term consequences must be considered in determining the scope and type of harms that should be legally compensated.

Third, technology or any application of science under the holistic approach must be sensitive to the environment and to human communities. Technology should be applied only when it is environmentally attuned. Science has two simultaneous attributes: it can destroy and it can provide solutions. Thus, the faith placed in science and technology must be an enlightened one, not blind.[96]

Fourth, the hierarchy of human activities and endeavors based on purely economic valuation is abandoned. The interests and concerns of States that are not economic or have low economic value should not be ignored merely on these grounds. The environment and non-human species cannot be reduced in neoclassical economic terms.

---

[94]*Ibid.* K. Warren, "The Power and the Promise of Ecological Feminism", at 321.
[95]But C. D. Stone, "Should Trees Have Standing? - Toward Legal Rights for Natural Objects", 45 S. Cal. L. Rev. 450 (1972).
[96]L. M. Talbot and World Resources Institute, "Man's Role in Managing the Environment", in D. Botkin, M. F. Caswell, J. E. Estes, and A. A. Orio (eds.), *Changing the Global Environment, Perspectives on Human Involvement*, (San Diego, California: Academic Press, Inc., 1989) at 28.

V. A framework of international environmental law based on non-anthropocentric ethics and philosophy

Based on the above implications, a model legal non-anthropocentric regime can be formulated. This framework follows the existing framework of international law for environmental protection and does not abandon the foundations of international environmental law, which are the duty not to cause significant transboundary harm and the duty to cooperate.[97] The difference is that the suggested framework will be given a non-anthropocentric slant. Non-human concerns are integrated in the legal system. As well, all potentially affected entities, States and non-States would be allowed to participate in the decision-making and implementation processes of environmental protection.

The principles that will be especially mentioned here are the precautionary approach, generational equity, and participatory processes. The protection measures outlined here correspond to two circumstances: normal conditions and emergency situations. In normal conditions, the following protection measures must be undertaken: establishment of safety standards, the conduct of environmental impact assessment, prior notification and consultation with all potentially affected entities - States and non-States. In emergency situations, notification and assistance between and among affected States and States responsible for the harm must be undertaken. The liability scheme that should support the non-anthropocentric legal framework is one that recognizes and compensates for environmental damages, not just property damages and injury or loss of life.

---

[97]See P. Birnie and A. Boyle, *International Law and the Environment*, (Oxford: Clarendon Press, 1992).

A. Principles

1. Precautionary principle

The precautionary principle[98] has emerged as one of the major principles of contemporary international environmental law. Principle 15 of the 1992 Rio Declaration provides:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[99]

The precautionary approach was first applied in the context of marine environment. Chapter 17, Paragraph 17.21 of Agenda 21 elucidates why precaution has been considered essential in the context of marine environmental protection.

> A precautionary and anticipatory rather than a reactive approach is necessary to prevent degradation of the marine environment. This requires, *inter alia*, the adoption of precautionary measures, environmental impact assessments, clean production techniques.[100]

Further, paragraph 17.22 of Chapter 17 of Agenda 21 calls States to commit themselves, in accordance with their policies, priorities and resources, to prevent, reduce

---

[98]The use of the term 'precautionary approach' has been interchanged with the term 'precautionary principle'. Many scholars use either term. The term precautionary approach, however, may refer more to the procedural aspects of precaution. The term precautionary principle may refer to the strategy of creating an atmosphere where various environmental policies use precaution as a guide or rationale. See J. Cameron and J. Abouchar, "The Status of the Precautionary Principle in International Law," in D. Freestone and E. Hey, *The Precautionary Principle and International Law, The Challenge of Implementation*, (The Hague: Kluwer Law International, 1996) at 51.

[99]*Rio Declaration, Report of the United Nations Conference on Environment and Development,* Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. 1, [hereinafter Rio Declaration].

and control degradation of the marine environment so as to maintain and improve its life-support and productive capacities. To this end, it is necessary to:

- Apply preventive, precautionary and anticipatory approaches to as to avoid degradation of the marine environment, as well as to reduce the risk of long-term irreversible adverse impacts upon the marine environment;

- Ensure prior assessment of activities that may have significant adverse impacts upon the marine environment.

The concept of precautionary approach is distinctive because it does not rely on science as a matter of policy before protection and preventive measures are undertaken.[101] Its underlying assumption is that science "does not always provide the insights needed to protect the environment effectively."[102] Its non-reliance on science distinguishes the precautionary principle from the ordinary preventive measures. The traditional notion of preventive measures requires action only when there is clear and convincing proof of risks. The precautionary approach, however, only requires a *prima facie* case that risks exist.

Several environmental instruments now contain or allude to the principle of precaution.[103] The principle of precaution, however, has been applied differently by States. Measures such as zero discharge of toxic or dangerous substances, reverse listing, to mere recitation of the principle in the preamble of several instruments, have all been

---

[100]Agenda 21, *United Nations Conference on Environment and Development*, Rio de Janeiro, Brazil, 3-14 June 1992, Report:A/CONF.151/26/Rev.1 (3 vols.) + vol.I/Corr.1, voll.III/Corr.1 (Sales No.:93.I.8), [hereinafter Agenda 21].
[101]D. Freestone and E. Hey, *supra* note 98 at 12.
[102]*Ibid.*
[103]*Montreal Protocol on Substances That Deplete the Ozone Layer*, 16 September 1987, 26 I.L.M. 1541 at 1551 (1987); *Framework Convention on Climate Change*, 9 May 1992, 31 I.L.M. 849 (1992); *Biodiversity Convention*, 5 June 1992, 31 I.L.M. 818 (1992).

cited as examples of State practice of the precautionary principle.[104] A non-anthropocentric reading of the precautionary principle, however, would encourage preventive and precautionary measures such as zero discharge of toxic and dangerous substances and reverse listing. Mere allusion of the principle in preambles does not actualize the essence of precautionary principle, which is to actually prevent risks to the environment even without sufficient scientific proof.

2. Generational equity

The notion of equity is not a new concept under international law.[105] There has been no uniform application and definition of equity. Three notions of applying equity under international law have been advanced. First, equity is the process of selecting different laws, all applicable and appropriate under the circumstances of the case.[106] Considerations of justice contribute to the process of deciding among applicable laws. The International Court of Justice [hereinafter ICJ] in one case held that equity is not

---

[104]Paragraph 72, Final Report of the Experts Group on Environmental Law on Legal Principles for Environmental Protection and Sustainable Development, Experts Group on Environmental Law of the World Commission on Environment and Development (Brundtland Commission), Environmental Protection and Sustainable Development 29-30 (1987), [hereinafter Report of Experts Group], as reprinted in E. B. Weiss, *International Environmental Law and Policy*, (New York: Aspen Law & Business, 1998) at 357. See also D. VanderZwaag, "The Precautionary Principle in Environmental Law and Policy: Elusive Rhetoric and First Embraces", In press, Journal of Environmental Law and Practice.

[105]Article 38(2) of the *ICJ Statute* permits a decision *ex aequo et bono*, upon the request of parties. There has been no cases decided based on equity under Article 38(2). However, there have been several cases before the ICJ that referred and applied the notion of equity. Many of these cases are in the area of resource allocation, e.g. *Tunisia-Libya Continental Shelf Case*, I.C.J Reports (1982) 18; *Libya-Malta Continental Shelf Case*, ICJ Reports (1985) 29; *North Sea Continental Shelf Cases*, I.C.J Reports (1969) 3. See R. Higgins, *Problems and Process, International Law and How We Use It*, (Oxford: Clarendon Press, 1994) at 219 to 228.

[106]*Ibid.* Higgins at 219.

only a "direct emanation of the idea of justice" but also a "general principle directly applicable as law."[107] Second, another application of equity is as *praetor legem* - filling a lacunae in the law or constructing rules that are too general.[108] A third application of equity is the "softening of the application of an applicable norm, for extra-legal reasons."[109] This type of equity is corrective equity.[110]

In the environmental field, the notion of equity travels in two time zones - the present and the future. It involves the application of equity by assessing present rights against other present rights and future rights. The first type of equity in the environmental framework is intergenerational equity or those relating to the rights of future generations and our obligations to them. The second type is intragenerational equity or those relating to members of generations existing today.[111] These two types are provided under Principle 1 of the Stockholm Declaration.[112] The present generation bears a solemn responsibility to protect and improve the environment for present and future generations. Considerations of equity demand that the present generation must not compromise the needs of the future generation.

Under the principle of intergenerational equity, the rights of the present beneficiaries of the planet are intertwined with their obligations to protect and maintain the same for future generations.[113]

---

[107]*Ibid.* Paragraph 39, Report of Experts Group, *supra* note 104.
[108]*Ibid.* at 220.
[109]*Ibid.*
[110]*Ibid.* at 221.
[111]*Ibid.* Paragraph 41.
[112]*Stockholm Declaration, Report of the United Nations Conference on the Human Environment*, U.N. Doc. A/CONF.48/14/Rev.1, at 3 (1973), 11 I.L.M. 1416 (1972), [hereinafter Stockholm Declaration].
[113]E. B. Weiss, et al. *International Environmental Law and Policy, supra* note 104 at 75.

> The starting proposition is that each generation is both a custodian and a user of our common natural and cultural patrimony. As custodians of this planet, we have certain moral obligations to future generations which we can transform into legally enforceable norms.[114]

There are three components of intergenerational equity: quality, options, and access to the natural and cultural environment.[115] Equitable quality "requires that each generation maintain the quality of life of the planet so that it is passed in no worse condition than received."[116] Equitable options refer to the conservation of the "diversity of the natural and cultural resource base so that it does not unduly restrict the options available to future generations in solving their problems and satisfying their own values."[117] In order to provide equitable options to future generations, Prof. Weiss surmises that "actions with harmful and irreversible consequences for our natural and cultural heritage"[118] must be avoided. Nuclear wastes and other hazardous wastes, for example, should be disposed without imposing an undue burden on future generations. Finally, each generation is required to provide equitable access to the legacy of the past and to the natural environment.[119] Judge Weeramantry, in the maritime boundary delimitation case of *Denmark v. Norway*,[120] opined that future generations must have

---

[114]E. B. Weiss, *In Fairness to Future Generations: International Law, Common Patrimony and Intergenerational Equity* (New York: Dobbs Ferry, 1989) at 21. Dissenting Opinion of Judge Weeramantry, *Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court's Judgment of 20 December 1974 in the* Nuclear Tests (New Zealand v. France) *Case*, I.C.J. Reports (1995) 288 at 341. [Hereinafter *Request for an Examination*].

[115]Paragraph 42, Report of Experts Group, *supra* note 104.

[116]*Ibid.* Paragraph 43, Report of Experts Group.

[117]*Ibid.* Paragraph 44, Report of Experts Group.

[118]*Ibid.* E. Weiss, *International Environmental Law and Policy*, at 76.

[119]*Ibid.* Paragraph 45, Report of Experts Group.

[120]Concurring opinion of Judge Weeramantry, *Denmark* v. *Norway,* I.C.J. Reports 38 (1993).

access to their rightful inheritance which include the earth, the atmosphere, the lakes and the seas.[121]

At the international level, the notion of intergenerational equity has not been clearly defined in State practice and conventions. One State[122] attempted to have the principle of intergenerational equity applied in the context of nuclear activities, but such attempt before the ICJ was unsuccessful because the petition was dismissed. This has prompted Judge Weeremantry in his Dissenting Opinion in the *Request for an Examination* case to assert that while there is no judicial precedent applying the principle of intergenerational equity, it is a rapidly developing principle of contemporary environmental law. Judge Weeremantry deemed it imperative that the ICJ should speak for the unborn by applying the principle of intergenerational equity.[123] Aside from this case and non-binding instruments, there are no other examples of the application of intergenerational equity.

The following strategies have been proposed to implement intergenerational equity:

(1) representation of States not only of present but also of future generations;

(2) designation of ombudsman or commissioners for protecting the interests of future generations;

(3) monitoring systems for cultural and natural resources;

(4) conservation assessment giving particular attention to long-term consequences;

---

[121] *Ibid.*

[122] New Zealand cited the principle of intergenerational equity in the *Request for an Examination* case but the ICJ dismissed its petition, *supra* note 113.

[123] *Ibid.* at 341.

(5) measures to ensure use of renewable resources and ecological systems on a sustainable basis;

(6) commitment to scientific and technical research to advance the purposes set out above; and

(7) programmes of education and learning at all social levels and age groups, especially the young generations.[124]

Although admittedly with an anthropocentric bent, inter- and intra- generational equities reflect a non-anthropocentric slant as they do not only call for the representation of present and future generations but also for the protection of the environment. To ensure that the present and future generations are provided for, the protection of the environment is essential.

3. Participatory processes

The non-anthropocentric legal regime is best implemented when the public and all those affected by a certain activity are allowed to participate in the legal processes aimed to protect them and the environment. At the heart of the notion of participatory processes is the abandonment of domination-based ethics and philosophy, denounced by ecofeminists and social ecologists as the main cause of environmental degradation.

The Rio Declaration reflects a non-anthropocentric bent by declaring that "environmental issues are best handled with the participation of all concerned citizens, at the relevant level."[125] The notion of a participatory process rests on the axiom that there is a beneficial cause-effect relationship among three factors: information access,

---

[124]*Ibid.* E. Weiss, *International Environmental Law and Policy* at 103.
[125]Principle 10, Rio Declaration, *supra* note 99.

stakeholder awareness and improved environmental conditions.[126] Fundamental to an effective public participatory process is access to information. In a public participatory scheme, everyone is a user and at the same time, provider of information.[127] Access to information and knowledge empowers both the decision-maker and the stakeholder in deciding on activities and issues that have impact on the environment.

Paragraph 23.2 of Chapter 23 of Agenda 21 (Strengthening the Role of Major Groups) identifies the need of individuals, groups, and organizations to participate in environmental impact assessment procedures and other processes, particularly on projects and activities that impact their work and communities.[128] Many governments responded and established national councils on sustainable development where representatives from different sectors sit and participate in policy-making at the national level.[129] However, crucial to the public participatory process is the participation of stakeholders and major groups in formal decision-making processes, not just policy-making processes.[130] The underlying rationale is that public participation in the decision and or policy-making processes promotes and ensures official accountability of public officers for their actions.[131] Ultimately, public officials must be held accountable to the people who are

---

[126]United Nations Environmental Programme [hereinafter UNEP], "Access to Environmental Information", On line: UNEP Home Page <http://www.unep.org/unep/access.htm> (Date accessed: 30 August 1999).

[127]Paragraph 40.1 Chapter 40 Agenda 21, *supra* note 100.

[128]See also Paragraph 129, Report of Experts Group, *supra* note 104.

[129]UN Economic and Social Development, "Earth Summit + 5, Five Years After Rio: Where Do We Stand? ", On line: UN Economic and Social Development Home Page< http://www.un.org/ecosocdev/geninfo/sustdev/5years.htm >(Date accessed: 30 August 1999).

[130]See On line: United Nations Sustainable Development Home Page <http://www.un.org/esa/sustdev/mgroupsMain.htm> (Date accessed: 30 August 1999).

[131]Paragraph 108, U.N.G.A. Resolution A/S-19/29, U.N.G.A. 19th special session, New York, 23-27 June 1997.

directly affected by their decisions. The participation by the stakeholder balances and checks government decisions that affect their lives.

B. Protective measures

Protective measures are classified into two: preventive measures and contingency measures. The reason for the classification is to emphasize that these obligations exist under two factual conditions: 1) normal condition and 2) emergency situation. Highly qualified publicists such as the International Law Commission [hereinafter ILC][132] and the American Law Institute [hereinafter ALI] [133] opine that these measures are inherent in the duties to prevent, reduce and control significant transboundary harm and the duty to cooperate.

1. Preventive measures during normal conditions

Preventive measures during normal conditions include the establishment of safety standards, the conduct of environmental impact assessment, and prior notification and consultation with all potentially affected entities

---

[132]Article 1, Chapter IV, International Liability for Injurious Consequences Arising Out of Acts not Prohibited by International Law (Prevention of Transboundary Damage from Hazardous Activities), in ILC, *Report of the ILC on the work of its Fiftieth Session*, 20 April - 12 June 1998, General Ass. OR, 53rd Session Supp. No. 10 (A/53/10) (New York, United Nations, 1998). [Hereinafter *Report of the ILC*].

[133]Restatement (Third) of the Foreign Relations Law of the United States, Introduction to Part VI (Law of the Environment), Sections 601-602 and Comments, as reprinted in E.B. Weiss, et al, *International Environmental Law, Basic Instruments and References*, (United State of America: Transnational Publishers, Inc., 1992) at 195. [Hereinafter Restatement (Third).] The Restatement (Third) "represents the opinion of the American Law Institute [hereinafter ALI] as to the rules that an impartial tribunal would apply if charged with deciding a controversy in accordance with international law." Restatement (Third) at 3 and 4. The ALI is a group of highly qualified publicists within the meaning of Article 38 © of the *I.C.J. Statute*.

a. International safety standards

The ALI in the *Restatement (Third) of the Foreign Relations Law of the United States* cites the establishment of appropriate safety standards as the first level of preventive measures required for activities that pose significant transboundary harm.[134] The safety standards are the first level of minimization of the risks arising from operation of the hazardous activity. The status of safety standards under international environmental law is not settled. Non-anthropocentric safety regulations provide protection measures for both the human population and the non-human population of the environment.

b. Environmental impact assessment

The significance of conducting an environmental impact assessment [hereinafter EIA] for activities with significant transboundary harm cannot be understated. An EIA provides knowledge about the proposed activity, the risks it posed, identifies the potentially affected States and natural environments, and serves as a basis for mitigation measures to protect humans and the environment.

The conduct of an EIA, however, is not an international obligation except in some treaties, including the *UN Convention on the Law of the Sea*.[135] When States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution or significant and harmful activities to the marine environment, Article 206 of *LOSC* provides that, as far as practicable, States shall *assess* the potential effects of such activities on the marine environment. The *LOSC* does not

---

[134]*Ibid.* Section 601.1(a) and (b). *Restatement (Third) of the Foreign Relations Law of the United States*.

provide an enumeration of activities for which an EIA is required and leaves it up to Contracting States to determine what activities require an EIA.

The only international instrument that requires the conduct of an EIA in a transboundary context is the *Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)*.[136] The *Espoo Convention* enumerates the activities that require an EIA. If a proposed activity is not one of the activities enumerated, Article 2.5 of the *Espoo Convention* allows the Contracting Parties the discretion to subject certain activities with transboundary impact to the EIA process, in accordance with criteria set in Appendix III. The criteria include: *size* of the proposed activities; *location* - whether it will be located close to or near areas with special environmental sensitivity or importance, or near human population; *effects* - whether the proposed activity will have complex and potentially adverse effects on the human and physical environment.

According to the UNEP Guidelines of 1987 on "Goals and Principles of Environmental Impact Assessment", a proper EIA should provide a description of the following: the proposed activity, the potentially affected environment, including specific information necessary for identifying and assessing the environmental effects of the proposed activity, the practical alternatives.[137] An assessment should then be made as to

---

[135]*United Nations Convention on the Law of the Sea,* 10 December 1982, entry into force 16 November 1994, 21 I.L.M. (1982), [hereinafter *LOSC*].

[136]*Convention on Environmental Impact Assessment in a Transboundary Context*, done at Espoo, Finland, 25 February 1991, 30 I.L.M. 800 (1991).

[137]Principle 4, UNEP Governing Council Decision, *Goals and Principles of Environmental Impact Assessment*, 17 June 1987, UNEP/GC.14/17, Annex III, UNEP/GC/DEC/14/25. See H. Hohmann, *Precautionary Legal Duties and Principles of Modern International Environmental Law The Precautionary Principle: International Environmental Law Between Exploitation and Protection*, (London: Graham &

the likely or potential environmental and social impacts of the proposed activity and alternatives, including the direct, indirect, cumulative, short-term and long-term effects. The measures available to mitigate adverse environmental and social impacts must also be identified and assessed.

The importance of assessment has been recognized in the decisions of arbitral and judicial tribunals. In the *Trail Smelter* case, the tribunal noted that the study undertaken by well-established and known scientists in the case "was the most thorough [one] ever made of any area subject to atmospheric pollution by industrial smoke."[138] Judge Weeramantry, in his Dissenting Opinion in the *Request for an Examination* case, also opines that the current state of international environmental law requires the undertaking of an assessment in activities that pose a magnitude of risks to the environment.[139] Many non-binding instruments mandate the conduct of EIA for activities that pose significant transboundary harm;[140] this phenomenon manifests an emerging acceptance of such practice in international environmental law.

c. Prior notification and consultation

When activities within the jurisdiction and control of States pose harm to other States, customary international law mandates that States provide timely and relevant

---

Trotman/Martinus Nijhoff, 1994) at 187. Dissenting Opinion of Judge Weeramantry, *Request for an Examination, supra* note 114.

[138]*Trail Smelter* case, U.N. R.I.A.A. Vol. 3, p. 1965 at 1973-74. See also Commentary to Article 12, Report of the ILC, *supra* note 132 at 44.

[139]*Request for an Examination supra* note 114 at 345.

[140]Report of the ILC, *supra* note 132. Report of the Experts Group, *supra* note 104 at 357.

information to potentially affected Sates.[141] The duty to notify and consult is contained in Principle 19 of the Rio Declaration mandates that

> States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.

The notion of timely and relevant notification to affected States is reiterated in Article 15 of the General Principles Concerning Natural Resources and Environmental Interferences[142] [hereinafter General Principles]. Article 16 of the General Principles requires States to give timely notice regarding activities within their control or jurisdiction to potentially affected States. Based upon the information provided, Article 17 of the General Principles provides that consultations in good faith may be carried out between the State that may be affected by a transboundary interference and the States under whose jurisdiction such a transboundary interference originates or may originate in connection with activities carried on or contemplated therein.[143] The potentially affected State has the obligation to request that a consultation be conducted.

The status of the duty of prior notification and consultation under customary international law is well-established but the particulars of this duty are not definite.[144] Who is the potentially affected State? The different binding environmental instruments

---

[141] *Lac Lanoux* case, (France v .Spain) 24 I.L.R. 101 (1957).

[142] Article 15 of the General Principles: "States shall provide the other States concerned upon their request and in a timely manner with all relevant and reasonably available data concerning a transboundary natural resource, including the uses made of such a resource and transboundary interference with them, or concerning a transboundary environmental interference. Report of the Experts Group, *supra* note 104.

[143] *Ibid.* at 358.

[144] G. Handl, "Internationalization of Hazard Management in Recipient Countries: Accident Preparedness and Response", in G. Handl and R. E. Lutz (eds.), *Transferring*

providing for a prior notification and consultation system does not include States that legally have nothing to do with the proposed activity.[145] Thus, potential exposure to the risks of the proposed activity appears not to be a sufficient requirement that would entitle prior notification and consultation from and with proponent State.

A non-anthropocentric legal framework, however, would expand the notion of potentially affected States to include even those not officially part of the transaction that is the source of the risks. The main condition should be the whether an entity is exposed to the risks from an activity within the control or jurisdiction of another.

2. Contingency measures and hazard management during emergencies

The value of contingency plans in the context of hazardous activities that pose significant transboundary risks has been proven. Contingency measures in anticipation of emergency situations include the following: notification, contingency plans, and assistance in the clean-up and restoration activities. The non-anthropocentric contingency plan includes measures for both the safety of humans and the safety of the environment.

Hazardous Technologies and Substances The International Legal Challenge, (London: Graham & Trotman, 1989) at 115 - 116.

[145]*Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal*, 22 March 1989, Cm 984; 28 I.L.M. 657, entry into force 5 May 1992. [Hereinafter *Basel Convention*]; *The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, 5 September 1997, IAEA Doc. GC/INF/821-GC(41)/INF/12,RWSC/DC/Sr.5; I.L.M. 36 (1997) 1433, [Hereinafter *Joint Convention*].

a. Notification

The obligation to notify of impending dangers to other States was affirmed by the ICJ in the *Corfu Channel* case.[146] The duty to notify, according to the ICJ is based on "elementary considerations of humanity."[147] Information regarding the emergency must be timely and relevant in order to assist affected States in conducting self-help measures of mitigation and reduction. The State of origin, under whose jurisdiction and control the activity causing harm belongs, must also inform the affected States of the measures it has undertaken to mitigate and control the significant transboundary harm. In the context of the marine environment, the *LOSC* requires Contracting Parties under Article 198 to notify States deemed likely to be affected of an imminent danger or damage by pollution. The duty to notify in case of emergencies or pollution from vessels rests with the Flag State. When danger is already imminent, the non-anthropocentric legal regime requires that all potentially affected States, not just parties to the contract or transaction, be notified.

b. Contingency plans

Contingency plans are very important because they provide guidelines to those involved in combating the emergency as well as the victim or affected entity. The duty to prepare contingency plans is articulated in the maritime context under Article 199 of the *LOSC*. States in the area affected, in cooperation with international competent organizations, are obligated to put in place contingency plans in case of emergencies in

---

[146] *Corfu Channel* case, I.C.J. Reports (1949) 1.
[147] *Ibid.*

their marine environments.[148] This means that the duty to put in place plans to manage an emergency within maritime zones rests with coastal States. The non-anthropocentric contingency plan includes measures for the safety of humans and non-humans.

C. Liability and Compensation

While the principal feature of a non-anthropocentric international environmental legal framework rests on its preventive aspect, a liability and compensation system remains an important feature. Preventive measures do not guarantee the non-occurrence of significant transboundary harm. Under international environmental law, the operation of hazardous activities is prima facie legitimate, a corresponding liability and compensation scheme is deemed a necessary component.

In a non-anthropocentric liability regime, the harms prohibited and compensated must include environmental harms. Damage to the environment must be considered separate from harm to property and people. This non-anthropocentric feature implies the inclusion of costs of cleaning up the contaminated areas even without damage to property or people as well as costs to restore the damaged site to its previous condition. Full restoration, of course, is not possible and has even been called a myth and a lie by some non-anthropocentric ethicists and philosophers.

VI. Conclusion

The primary point emphasized in this Chapter is that in the greening of a legal regime, the underlying ethical and philosophical notions of the legal system must first be appraised. The question must be asked whether such ethics and philosophy are the same

---

[148]Article 199 of *LOSC*, *supra* note 135.

ethics and philosophy that caused or contributed to the problem in the first place. In the context of environmental dilemmas, one must pause and reflect on the ethical and philosophical basis that allowed environmental degradation and species depletion and extinction. Often, the greening of the law does not involve the appraisal of the underlying ethics and philosophy that contributed to the problem. The result is that the law responds to the symptoms, not the cause.

In the model non-anthropocentric legal framework, it is not necessary to overhaul the legal system and institute entirely new provisions and measures. Some of the existing principles and measures can be applied as long as there is a conscious recognition of how non-anthropocentric ethics and philosophy may have a bearing on these principles and measures.

The ethical and philosophical approach to greening international law is undertaken with the recognition that they cannot be translated word for word into policies or actions or laws. Nevertheless, it has been earlier asserted that ethics and philosophy do serve a very important role in the legal system. They can guide and influence the direction of the legal system. The next chapters will elaborate on how ethics and philosophy influenced and developed the legal regime governing the maritime carriage of radioactive materials and how non-anthropocentric ethics and philosophy may influence the path of transformation.

Chapter 3

Nature and scope of the problem of the maritime carriage of radioactive materials

I. Introduction

The nature of radioactive material as well as the risks attendant to the mode of transport explain why the maritime transport of radioactive materials is regulated under the law. This Chapter will present the issues surrounding the controversial shipments of plutonium between France and Japan and how and why potentially affected Coastal States and non-governmental entities react in opposition and with trepidation about these shipments. How valid are the concerns expressed by Coastal States? The following subjects of the succeeding sections of the Chapter will contribute to the assessment of the validity of the concerns expressed by Coastal States and non-government organizations about the nuclear fuel cycle, radioactivity and its effects on humans and the marine environment, the different categories of radioactive materials, trends of nuclear energy generation, and the risks attendant to the maritime carriages such as accidents and acts of violence. The discussion of these topics show that, indeed, there is validity to the concerns expressed by other Coastal States and non-governmental entities regarding the shipments of radioactive materials passing through their maritime zones.

II. The controversial shipments of plutonium, MOX fuel and vitrified high-level wastes

According to the International Atomic Energy Agency [hereinafter IAEA], more than 10 million packages of radioactive materials are transported every year.[149] These shipments have been relatively safe.[150] Despite the fact that transport of radioactive materials is a regular occurrence, shipments of spent nuclear fuel (plutonium), recycled or reprocessed nuclear fuel, (e.g. MOX fuel) and vitrified wastes have generated a big dispute in the international community.

In particular, the shipments between France and Japan, two of the world's major nuclear energy generating States, have attracted protests from other States and non-State actors in the international arena. The first controversial maritime carriage of reprocessed plutonium between France and Japan was in the Japanese vessel, *Akatsuki Maru.*[151] Accompanied by an escort security vessel, *Shikishima*, the *Akatsuki Maru* left Cherbourgh, France in November 1992. Sailing through the Cape of Good Hope, across the Indian/Southern Ocean, and North between Australia, New Zealand and South Pacific Island States, it arrived in the port of Tokai, Ibaraki Prefecture, Japan, after 60 days. The *Akatsuki Maru*, a veteran carrier of nuclear materials, was a double-hull ship, with anti-

---

[149]Paragraph 48, United Nations General Assembly [hereinafter U.N.G.A.], *Progress made towards the sustainable and environmentally sound development, Addendum, Report by the International Atomic Energy Agency,* U.N.G.A., 44th session, U.N.G.A. Doc. A/44/339/Add.11-E/1989/119/Add.11, 6 October 1989, extract reprinted in the United Nations Office for Ocean Affairs and the Law of the Sea, (ed.), *Annual Review of Ocean Affairs: Law and Policy, Main Documents* 1988 Volume III, (Sarasota, Florida: UNIFO Publishers, 1990) at 199.

[150]*Ibid.*

[151]Information regarding the trip was taken from "Plutonium heads for Japan", 26 Marine Pollution Bulletin, No.1 (January 1993) at 4.

collision device, and fire extinguishers. The 1992 shipments were followed by other shipments.

The first delivery of vitrified wastes from France to Japan transpired on 23 February to 25 April 1995.[152] Two other shipments of vitrified wastes followed: 40 canisters were delivered during the 13 January to 18 March 1997 voyage and 60 canisters from 21 January to 13 March 1998.[153] Vessels that were particularly designed for transport of nuclear materials carried the shipments of vitrified wastes. These vessels (*Pacific Sandpiper, Pacific Pintail, Pacific Teal, and Pacific Swan*) owned by the Pacific Nuclear Transport limited [hereinafter PNTL],[154] follow one of these three routes on their way to Japan: Panama Canal, Cape Horn, Cape of Good Hope.

---

[152]Vitirified wastes refer to left-over radioactive wastes after plutonium and uranium are reprocessed. No further use is foreseen for these wastes, thus they are not recycled but are vitrified or incorporated into a very stable glass matrix. Thereafter, the glass is poured into a stainless steel container 1.34 m in height and 0.43 m in diameter, where it is allowed to solidify. The weight of this canister is around 500 kg. Reprocessed plutonium and uranium can still be used as nuclear materials for nuclear reactors. For example, 1 gram of plutonium is equivalent to 1 ton of oil. COGEMA, "Return Shipment of vitrified residues from France to Japan," On line: COGEMA Web site <http://www.cogema.fr/dossiers_gb/dossier2.html > (Date accessed: 17 August 1999). [Hereinafter Return Shipment].

[153]*Ibid.*

[154]*Ibid.* PNTL ships, owned by British Nuclear Fuel Limited (BNFL), COGEMA and the Japanese utilities, are 104 m long and 16 m wide. According to COGEMA, each ship carries sufficient amount of fuel to complete a journey without any port-call. In addition, each ship is equipped with: a double bottom and double hull structure for minimising damage and for safety in case of accident, duplicated navigation, communication, electrical and cooling systems. A cask cooling system installed each hold; a comprehensive fire fighting system maintained in case of emergency, emergency sources of electrical power; satellite navigation and tracking systems. A worldwide emergency response system is operated, including a 24-hour standby team and salvage cover.

On 21 July 1999, France delivered its first shipment of MOX[155] fuel to Japan aboard the *Pacific Teal* and the *Pacific Pintail.*[156] These ships sailed to Japan via the Cape of Good Hope and the South Pacific Ocean and reached Japan in the second half of September this year. The two vessels were armed to escort each other.[157]

Many coastal States, particularly those whose territorial waters and exclusive economic zones are part of the routes taken by these vessels, are apprehensive about the risks posed by these international shipments of nuclear materials and radioactive wastes to their peoples and marine environments. Argentina, for instance, posited that the transit of radioactive wastes through the waters of the South Atlantic poses "clear ecological risks ... given the particular characteristics inherent in navigation in the southern seas."[158] The Ministers of the Non-Aligned Countries also

> expressed their concern for the unsafe maritime transportation and dumping of nuclear wastes as well as for the risks and dangers this transportation and dumping presents especially to sea coastal areas and fisheries and any other areas, particularly those under state sovereignty and jurisdiction.[159]

---

[155]MOX fuel is the mixture of recycled plutonium and uranium. On line: COGEMA home page <http://www.cogema.fr/recherche_gb/index.html> (Date accessed: 30 August 1999).

[156]COGEMA NEWS, "Departure Of The First Shipment Of Recycled (MOX) Fuel To Japan" 22 July 1999, On line: COGEMA Web site <http://www.cogema.fr/actualites_gb/communiques/index.html> (Date accessed: 17 August 1999).

[157]*Ibid.*

[158]*Zone of Peace and Cooperation of the South Atlantic-Report of the UN Secretary-General*, 24 October 1995, U.N. Doc.no.:A/50/671, as reprinted in the Netherlands Institute for the Law of the Sea, *International Organizations and the Law of the Sea, Documentary Yearbook 1995*, Volume 11, 1995 (The Hague: Martinus Nijhoff Publishers, 1998), at 144-145, citing the statement by the Foreign Minister of Argentina at the Review and Extension Conference of the Parties to the *NPT* on April-May 1995.

[159]*Ibid.* Letter dated 18 May 1995 from the Permanent Representative of Indonesia addressed to the Secretary General (Communique of Ministerial Meeting of the Coordinating Bureau of the Non-Aligned Countries, in Bandung, Indonesia, 25-27 April 1995) U.N. Doc. No.: A/49/920-S/1995/489, 16 June 1995, at 181.

The member States of the Pacific Forum echoed the concerns voiced by other coastal States about shipments of plutonium and radioactive wastes throughout the region during the 26th South Pacific Forum at Madang, Papua New Guinea, from 13 to 15 September 1995.[160]

Not only States object to the shipments of spent nuclear fuel and radioactive wastes across international borders. Many non-governmental organizations, including Greenpeace, International, also oppose the international shipments of nuclear materials on the ground that they are dangerous. In a report submitted to the International Maritime Organization Maritime Safety Committee [hereinafter IMO MSC], Greenpeace alleged "that there were enough serious questions regarding the safety of the sea transport of such materials to justify postponement of these shipments, pending results of further investigation."[161]

---

[160]*Ibid.* Letter dated 18 September 1995 from the Charge d'affaires a.i. to the Permanent Mission of Papua New Guinea to the United Nations Addressed to the Secretary-General (Communique of the 26th Pacific Forum, Madang, Papua New Guinea, 3-15 September 1995), U.N. Doc. A/50/475, 26 September 1995 at 189. The 26th South Pacific Forum was attended by Australia, the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, Nauru, New Zealand, Niue, Palau, Papua New Guinea, the Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The Pacific Forum expressed concerns about the shipments between France and Japan as early as 1992. In the Letter dated 17 August 1992 from the Charge d'affaires a. i. of the Permanent Mission of Solomon Islands to the United Nations Addressed to the Secretary-General (Communique of the 23rd South Pacific Forum, Honiara, Solomon Islands, 8-9 July 1992), U.N. Doc.:A/47/391, 20 August 1992, as reprinted in The Netherlands Institute for the Law of the Sea, *International Organizations and the Law of the Sea, Documentary Yearbook 1992*, Volume 8, 1992 (London: Graham & Trotman/Martinus Nijhoff, 1994) at 67.

[161]IMO MSC - 64th session, IMO MSC 64/22.

The shipments are in pursuance of the reprocessing contracts between COGEMA/France[162] and ten (10) Japanese electric utilities in accordance with the cooperation agreements entered by their governments.[163] The reprocessing contracts provide for reprocessing of spent fuel from the ten Japanese electric utilities into new fuel and the conditioning and vitrification of leftover wastes. Under the contracts, France delivers the reprocessed nuclear materials and the vitrified wastes back to Japan. In the coming years, it is expected that the number of shipments of plutonium and mixed fuel oxide from France to Japan will increase.[164]

The shipments of spent nuclear fuel, recycled or reprocessed nuclear fuel and vitrified wastes are part of the nuclear cycle of States that adopt the close loop cycle of

---

[162]COGEMA is a French company that specializes in the nuclear fuel cycle. It is active in 30 countries and is considered the world leader in the entire nuclear fuel cycle. On line: COGEMA Home Page <http://www.cogema.fr/connoaitre_gb/pdf/ rapport.pdf >(Date accessed: 10 August 1999). See also General Information on Nuclear Power in France, On line: Embassy of France Washington D.C. Home Page < http://info-france-usa.org/fsearch.htm > (Date accessed: 15 August 1999).

[163]*1990 Agreement Between France And Japan On Co-Operation In The Peaceful Uses Of Nuclear Energy*, 46 Nuclear Law Bulletin [hereinafter NLB] (1990) p.86; *1993 Agreement Between France And Japan On Co-Operation On Radioactive Waste*, 54 NLB (1994) p. 66. Other examples of agreements are between and among France, the United Kingdom and Germany. For example, on 6 June 1989, France and the Federal Republic of Germany made a *Joint Declaration on Co-Operation Between the Two Countries in the Field of Peaceful Uses of Nuclear Energy*. This Declaration covers cooperation in reprocessing, production of MOX fuels, uranium enrichment, nuclear reactors, information relating to nuclear installations, transport of nuclear material and community aspects. The two Governments confirm that transport of nuclear materials between them would not be impeded. They agreed to move towards the harmonization of standards. Germany also signed another *Joint Declaration on Co-operation in the Peaceful Uses of Nuclear Energy with the United Kingdom*. This Declaration, signed on 25 July 1989, records an intent to increase existing co-operation in the peaceful uses of nuclear energy. The two governments confirm that they will place no obstacles to the safe transport of radioactive materials. While national transport concepts are to be recognised, the two States agree to work towards mutual recognition and technical usability of containers permitted in either of their countries. 44 NLB (1989) at 60-61.

[164]Return Shipment, *supra* note 152.

commercial nuclear energy generation. Closed loop countries like France and Japan consider reprocessing very important and economically beneficial. As States of origin and destination, they repudiate the alleged inadequacy of safety and security measures of the maritime shipments of nuclear materials and radioactive wastes. According to these two States, the shipments were undertaken in compliance with international safety standards and physical protection measures required under the international nuclear legal regime.[165]

The IMO and the IAEA, the two international organizations competent in the field of maritime carriage of nuclear materials and radioactive wastes established a Joint Working Group [hereinafter JWG] on the transport of irradiated spent fuel and radioactive wastes. The objective of the JWG was to review the regulations governing the maritime transport of spent nuclear fuel, reprocessed fuel and radioactive wastes. After review of the regulations and consultation with concerned parties, the JWG formulated a code of practice and declared the sufficiency and adequacy of the regulations and safety standards to transport nuclear materials and radioactive wastes, in particular spent fuel, reprocessed fuel and radioactive wastes. The code, formally called the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium, and High-Level Radioactive Wastes in Flasks on board Ships [hereinafter INF Code] was adopted in 1993 by the IMO Assembly in its 18th session.[166]

---

[165]COGEMA, "Reprocessing and Recycling," On line: COGEMA Web site <http://www.cogema.fr/ activities_gb / recyclage/index.html > (Date accessed: 17 August 1999).

[166]Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium, and High-Level Radioactive Wastes in Flasks on board Ships [hereinafter INF Code], adopted by the IMO Assembly, 18th Session, IMO Resolution A.748(18), IMDG Code Supplement, 1994 Consolidated Edition (IMO Sales number: IMO-200E).

Despite the adoption of the INF Code, the controversy concerning the shipments of nuclear materials and radioactive wastes continues. Environmental activists persist in their opposition to the shipments of spent nuclear materials and radioactive wastes. Many Coastal States, through the IMO, revive the issue by recommending the adoption of more preventive measures. States of origin and destination rely on the claim of sufficient preventive regulations to ensure the safety of the transport. A resolution of the different issues arising from the shipment of radioactive materials will likely not occur very soon as the two opposing groups continue to stand by their conflicting opinions and positions.

III. Nuclear fuel cycle

The nuclear fuel cycle refers to the concept of a controlled nuclear fission to generate electricity.[167] There are two types of nuclear fuel cycle: closed fuel cycle and the once-through cycle.

The closed fuel cycle begins with the mining, milling, converting and enriching uranium. The next stages of the cycle are fuel fabrication and power generation. The end-cycle involves reprocessing, recycling of plutonium and uranium, conditioning and final disposal of wastes.[168] The once-through cycle follows the same pattern except that spent fuel is not reprocessed but is stored for disposal later as waste.[169]

---

[167]B.A. Semenov and N. Oi, "Nuclear fuel cycles: Adjusting to new realities", in the *IAEA Bulletin* Vol.3 (1993), reproduced in United Nations Department of Public Information, *United Nations and Nuclear Non-Proliferation*, (New York: United Nations Publication, 1995) at 187.
[168]*Ibid.*
[169]*Ibid.*

The closed fuel cycle is of two types: the thermal reactor cycle and the fast breeder reactor cycle. In both types, spent fuel is reprocessed and uranium and plutonium are recycled into new fuel elements.[170] Compared to the thermal reactors, the fast breeder reactors generate more fuel than they burn up, hence, the name "breeder."[171]

There are two objectives in reprocessing. The first is to recover uranium and plutonium so these materials can be used again as energy material.[172] "One tonne of reprocessed and recycled fuel provides the same energy as 20,000 tons of oil. In this respect, reprocessing results in significant savings in natural resources."[173] The second aim of reprocessing is to "process remaining waste into qualified and safe solid forms ready for transport and final disposal."[174] There are only a few countries that perform reprocessing activities and these include the United Kingdom[175] and France.[176] The United States of America practices the once-through cycle.[177]

The examples given in the introduction illustrate the transport of radioactive materials at the end stage of the nuclear fuel cycle. However, the transport of radioactive

---

[170]Plutonium is recycled and later mixed with uranium to make up MOX fuel. Recovering and recycling plutonium allow natural uranium resources and subsequent enrichment costs to be spared on one hand, and, on the other, to very significantly reduce the radiotoxicity of the ultimate residues. Plutonium is the major long-term contributor to the radiotoxicity of spent fuels and reprocessing leaves only 0.1% of the initial plutonium in ultimate residues. COGEMA, *supra* note 165.

[171]*Ibid.*

[172]*Ibid.*

[173]*Ibid.*

[174]*Ibid.*

[175]The United Kingdom has reprocessed over 30,000 metric tonnes of uranium for the past 30 years. Reprocessed uranium has supplied 70 percent of the U.K.'s uranium fuel for its advanced gas reactors. On line: Nuclear Energy Institute <http:/www.nuke-energy.com/ recycling_u.html> (Date accessed: 21 June 1999).

[176]For more information about reprocessing activities of France, visit the COGEMA Web site at < http://www.cogema.fr/>.

materials occurs at all stages of the nuclear fuel cycle. Fresh nuclear materials for use in generating energy are also regularly transported across international borders.

IV. Radioactivity and its effects[178]

The disintegration of atoms that results in the transformation of one element into another is the process of radioactivity. Elements that undergo the radioactive process are called radioactive elements. Radioactive elements are either naturally occurring or artificially produced. Uranium, the fuel used in nuclear reactors, is an example of an element whose atoms disintegrate naturally. When uranium is used as fuel in nuclear reactors, it undergoes complex radioactive processes while releasing power for energy production. The uranium fuel is transformed into elements that are highly radioactive called radionuclides. One of these radionuclides is plutonium.

Radioactive elements emit three types of particles: alpha particles, beta particles and gamma rays. Alpha particles are sub-atomic particles that are positively charged and travel at high speed. Alpha particles are so easily blocked that even a thin sheet of paper will absorb the radiation from them. Any type of packaging will be sufficient. Beta particles, on the other hand, are negatively charged and of very small mass. They also travel at high speed. They are able to penetrate more than alpha particles but still, a few millimeters of solid material, as protection, is sufficient to reduce radiation to negligible levels. Gamma rays, unlike the first two, are not particles but electromagnetic waves.

---

[177]See K. S. Shrader-Frechette, *Burying Uncertainty: Risk and the Case Against Geological Disposal of Nuclear Waste*, (Berkely: University of California Press, 1993).

[178]The discussion in this part is based largely on A.M. Freke, "The Application of Radiological Protection Principles to the Transport of Radioactive Materials", IAEA, (Proceedings of a Symposium) Stockholm, 18-22 June 1972, *Maritime Carriage of*

Examples of gamma rays are visible light, wireless waves and x-rays. These are highly penetrating, hence, a high degree of care must be used in packaging, handling and transporting this material.

A special type of radioactive material called fissile materials requires a different degree of care. The atomic structure of fissile materials is such

> that if a neutron was to collide with one of its nuclei, then fission would take place, the atom would be split. Considerable heat would be generated, fission products would be produced and more neutrons would become available to cause more collisions. This could continue as a chain reaction and the fissile material in its environment would be in a critical state.[179]

Some examples of fissile materials are uranium -235 and plutonium -239.[180] Packaging for fissile materials must be designed with these distinctive traits.[181]

When atoms disintegrate, they undergo the process of decay.[182] The periods in which different radionuclides decay vary depending on the number of radioactive atoms and the type of nuclear species.[183] The decay process of radionuclides is expressed in half-life. Half-life refers to the time consumed for half of any nuclear material to decay.[184] For example, the half-life of tritium is 12.3 years. If there are 1000 atoms of tritium, there will only be 500 after 12.3 years, after 24.6 years, there will be 250.[185] The decay of radionuclides means that the radioactivity is waning until it becomes harmless.

Nuclear Materials (Vienna: IAEA, 1973) at 15-26. [Hereinafter *Symposium Proceedings*].

[179]*Ibid.* S. Williamson, "The Special Problems Involved in the Maritime Carriage of Fissile Materials", in *Symposium Proceedings* at 29.

[180]*Ibid.*

[181]Discussion on packaging requirements in Chapter 4.

[182]R. L. Murray, *Understanding Radioactive Wastes,* 4th ed. (Columbus: Battelle Press, 1994) at 11.

[183]*Ibid.* at 12.

[184]*Ibid.*

Some radionuclides like plutonium, however, have half-lives of thousands of years. Plutonium has a half-life of 24,000 years, thus, its radioactive effects can extend up to 250,000 years.[186] The environmental and human health and safety implications are therefore, different for each radionuclide.

A. Effect on individuals

When radioactive particles encounter living entities, they may interfere with the normal functioning of cells.[187] The effect of such interference may either be deterministic or stochastic depending on the dosage, the length of time of exposure, and the modes of exposure. Interference resulting in the killing of cells is called deterministic. When the tissue cells are altered by radiation, stochastic effects result.

When the effects of radiation exposure are manifested immediately or within a short period of time (hours, days, or weeks), there is acute radiation. For instance, twenty-eight (28) deaths among 134 personnel and emergency workers are attributable to acute radiation sickness during the 1986 Chernobyl accident.[188] However, effects may also become apparent after a longer period of time, particularly if the same radiation dosage is spread out over a long period of time. This effect may become manifest in the form of cancer and leukemia. The radiation exposure caused by the Chernobyl accident

---

[185]*Ibid.*

[186]Shrader-Frechette, *supra* note 177 at 1.

[187]Discussion in this portion is based on the *1990 Recommendations of the International Commission on Radiological Protection*, as reprinted in M. ElBaradie, et al, *The International Law of Nuclear Energy Basic Documents Part I,* (Dordrecht, Martinus Nijhoff Publishers: 1993) at 159-169, [Hereinafter *Nuclear Energy Basic Documents*]; See also A.M. Freke, in *Symposium Proceedings*, *supra* note 178 at 15-26.

[188]IAEA Press Release, "International Chernobyl Conference Concludes in Vienna", 17 April 1996, IAEA PR 96/7, On line: IAEA Web site < http://www.iaea.org/wordlatom/inforesource/pressrelease/pm796.html > (Date accessed: 17 August 1999).

resulted into a substantial increase of reported cases of thyroid cancer especially in young children.[189] At the end of 1995, 800 cases of thyroid cancer were reported in children under age of 15.[190] More cases of thyroid cancer among children exposed to radioactivity during the early phases of the accident in Chernobyl over the next decades were predicted by a group of international experts.[191]

Radiation may not only inflict damage to the individual exposed, but its effects may be carried on to the individual's descendants. Damage on the individual exposed to radiation is called somatic damage; damage to his/her descendant is called genetic damage.

B. Mode of exposure to individuals

The pathways of radioactivity to humans are by air, water or land.[192] Exposure may be external (direct exposure) and internal (indirect exposure). External radiation exposure may occur directly to people who are within the vicinity or within the critical zone of the radiation release. Internal or indirect exposure starts when radiation released in the atmosphere settles on the ground and contaminates the soil, plants and crops.[193] When radiation is released into the water, it may also contaminate the water as well as the organisms in the water.[194] Consumption of contaminated food and water by humans is indirect radiation exposure.[195]

---

[189] *Ibid.*
[190] *Ibid.*
[191] *Ibid.*
[192] R. L. Murray, *supra* note 182 at 112.
[193] *Ibid.* .
[194] *Ibid.*
[195] *Ibid.*

In transport situations, when a package containing radioactive material is leaking, radiation exposure may be indirect and may occur by any or all of four ways:

(1) Ingestion or eating food or drinking liquids with contaminated hands;

(2) Inhalation or breathing contaminated air;

(3) Injection or when radiation occurs on, or near an area of the skin which is punctured, cut, or abraded; and

(4) Absorption or direct passage through the unbroken skin.[196]

C. Effect on the marine environment

According to the 1990 study by the United Nations Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP),[197] anthropogenic sources of radioactivity in the oceans constitute no more than 1 per cent of the total coming from natural sources such as volcanic activities in the sea floor. Of the anthropogenic sources of radioactivity, dumping and nuclear weapons tests mainly comprise the artificial radioactivity present in the oceans.[198]

Several studies on the effect of artificial radioactivity on the oceans from nuclear weapons testing reveal insignificant impact on the marine environment.[199] The

---

[196]A.M. Freke, *Symposium Proceedings*, *supra* note 178 at 23.

[197]Joint Group of Experts on the Scientific Aspects of Marine Pollution, *The State of Marine Environment, Reports and Studies GESAMP No. 39* (Nairobi: U.N.E.P., 1990). GESAMP is composed of IMO, FAO, UNESCO, WMO, WHO, IAEA, UN, and UNEP.

[198]*Ibid.* at 39 and 40. Independent World Commission on the Oceans, *The Ocean Our Future* (UK: Cambridge University Press, 1998) at 38.

[199]The most recent study on the impact of artificial radioactivity in the oceans was undertaken on the Mururoa and Fangataufa atolls. The Mururoa and Fangataufa atolls are located in French Polynesia, in the middle of the South Pacific Ocean about halfway between Australia and South America. France had conducted 41 nuclear weapons tests and five safety trials[199] in the atmosphere at the atolls between 1966 and 1974. A total of 137 underground tests and 10 underground safety trials followed between 1975 and 1996.

GESAMP, however, warns that although the total amount of artificial radioactivity in the oceans is less than natural radioactivity, there might still be adverse impacts on marine organisms and humans. As mentioned earlier, the content and the type of radioactivity vary. This variation determines its potential effect on living entities. "[R]adionuclides vary widely in the extent to which they can affect marine organisms and man, their total activity is only a very rough guide to risks."[200] For example, the risks associated with dumped radioactive wastes are extremely low. Nevertheless, the radioactive matter from dumped radioactive wastes may affect humans via shellfish consumption,[201] or when long-lived radionuclides escape into the atmosphere and into the land, contaminating sources of food and water.[202] These findings by GESAMP particularly in respect to the effects of artificial radioactivity on marine organisms, moreover, should be considered in light of its own admission that

> [d]oses to, and effects on, marine organisms or marine populations are much less well known. As in man, effects may be somatic (in the individuals exposed) or genetic (in the germ cells of the irradiated individuals and therefore transmissible to their descendants). While for

---

In 1995, the French government requested the IAEA to conduct an independent assessment on the radiological situation at the atolls. Composed of experts from different institutions and countries, the team of scientists concluded that the "radionuclide concentrations on the atoll's surfaces and in the surrounding seas -- with four exceptions -- are similar to or below those found elsewhere in the region where no nuclear weapons testing took place...It was concluded that no population group is likely to receive a future dose, attributable to the residual materials at the two atolls, exceeding about one percent of the background dose received from natural background radiation." According to the Study team, based on the negative findings, there was no need for monitoring for purposes of radiological protection. A program to measure radioactivity in the environment was recommended for scientific purposes and to assure the public of the continuing safety of the atolls from significant radiological exposure. On line: IAEA Web site, IAEA Public Information, "Nuclear Tests in French Polynesia: Could Hazards Arise?" <http://www.iaea.org/mururoabook.html;> (Date accessed: 26 June 1999).

[200]GESAMP, *supra* note 197 at 40.

[201]*Ibid.*

[202]*Ibid.* at 41.

> man the individual is the target of concern, for marine organisms interest is primarily in population effects such as survival, growth and reproductive performance.[203]

Studies have been conducted to determine the health and environmental impact of flasks containing nuclear materials in a maritime accidental situation. A study conducted by Denmark -Risr National Laboratory (RNL) - Nuclear Fuel concluded that the flasks used to transport spent nuclear fuel can withstand severe conditions in an accidental situation.[204] The barriers of these flasks are designed to contain radioactivity from being released into the environment in an accidental condition.[205] Radiation release may occur after a long-term exposure to seawater and even at this condition, the study found out the radiation release is still under the prohibited dosage to individuals.[206] The risks posed to non-marine organisms were also found to be very low.[207]

Japan's Center Research Institute of Electric Power Industry (CRI) - conducted a study on environmental and health consequences from the sinking of vitrified waste in shallow and deep waters.[208] The packaging for vitrified wastes have been found to be "extremely safe."[209] Should radiation be released from the vitrified wastes and exposed to the human population, the dosage would still be below the standards allowed for

---

[203]*Ibid.* at 42. For a critique of the 1990 GESAMP study on the marine environment, see P. Taylor, "The State of the Marine Environment: A Critique of the Work and Role of the Joint Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)", Marine Pollution Bulletin, Vol. 26, No.3, pp. 120-127 (1993).
[204]R. Pedrozo, "Transport of Nuclear Cargoes by Sea", 28 J. Maritime Law and Commerce, No. 2 (April 1997) p.207, at 215.
[205]*Ibid.*
[206]*Ibid.*
[207]*Ibid.*
[208]*Ibid.*
[209]*Ibid.*

individual exposure.[210] Similar conclusions were arrived at by France - *Institut de Protection et de SfretJ NuclJaire (IPSN)* - on a study on plutonium and by United States - Department of Energy on a study on spent nuclear fuel.[211]

As of the present time, there has been no major accidental radioactive release into the marine environment from the maritime carriage of radioactive materials. Thus, there is no conclusive data as to the effect of excessive artificial radioactivity when released into the oceans.

D. Lessons from Chernobyl

The conclusions about the effects of artificial radioactivity in the marine environment should be evaluated in light of the Chernobyl experience. Prior to Chernobyl, the international community had never anticipated the wide geographical reach of excessive radiation from an accident involving a nuclear facility. The vulnerable geographical zone with respect to areas surrounding nuclear installations was assumed to constitute only "a few tens of kilometres in distance from the nuclear facility."[212] The radioactive substance released from the Chernobyl accident traveled to Finland and Sweden, then to Poland, Czechoslovakia and southern Germany, and then to the Netherlands.[213] It later moved to Austria and northern Italy and to France and finally the United Kingdom.[214] The weather conditions at the time of radiation release were

---

[210] *Ibid.* at 216.
[211] *Ibid.*
[212] IAEA, "Response to a Radioactive Materials Release Having Transboundary Impact," IAEA Safety Series No. 94, as reprinted in ElBaradie, *supra* note 187 at 400, [hereinafter Response to Transboundary Radiation].
[213] OECD/NEA, *Liability and Compensation for Nuclear Damage, An International Overview,* (Paris: OECD, 1994) at 87.
[214] *Ibid.*

primarily responsible for the quick movement of radioactivity from Russia to other countries in Europe.

> [R] ainshowers in certain regions, as the cloud was moving to the north and west, provoked the deposition of certain nuclides from 10 to 100 times the rate of deposition of dry particles. Naturally, the absolute level of the contamination by radioactive rain depended upon the intensity of the precipitation and the distribution of the various substances in the cloud. The situation was complicated by the fact the cloud passed back and forth over Europe during a period of several days, thereby exposing the public to radioactivity during a longer period than would have been the case in the event of a single passage.[215]

The excessive radiation from Chernobyl contaminated the air, water, fauna and flora of other European countries.[216] The agricultural industries of victim countries consequently suffered when their produce and livestock were contaminated by radiation.[217]

The accident in Chernobyl provides the following lessons:

> (a) It is difficult to predict where and when the radioactive plume will arrive at the borders of a potentially affected State. It is also difficult to predict where washout or rainout of the radioactive material (in the case of an atmospheric release) will occur and to predict how much will be deposited.
>
> (b) The areas within an affected State which require radiological monitoring may amount to a large fraction (or even all) of its total geographic area.
>
> (c) The organization, technical resources and facilities required to monitor and assess the radiological situation require considerable flexibility, mobility and adaptability since it is not clear beforehand what types of land, crops or population centres will be affected.

---

[215] *Ibid.*
[216] *Ibid.* at 90.
[217] *Ibid.*

(d) The large areas potentially involved may lead to difficulties relating to the availability, supply, economics, and trade involving food products.[218]

The Chernobyl lessons should be considered in determining the radiation risks posed by the maritime carriage of nuclear materials and radioactive wastes to the human population of Coastal States and to their marine environments. The risks posed by nuclear activities may be of low probability, but when radiation is released, disastrous transboundary harm may occur.[219] As mentioned earlier, harm from radiation may be via external or internal exposure. The radiation release in the marine environment from the maritime carriage of nuclear materials and radioactive wastes may be both external and internal. External or direct radiation is more likely for the officers and crew on the vessel carrying the nuclear materials. Internal radiation (or indirect radiation) is likely to occur to the nearest Coastal States and their marine environments. The Chernobyl experience indicates that the vulnerable geographical zone may vary and "may amount to a large fraction (or even all) of its total geographic area."[220]

V. Categories of radioactive materials

This thesis uses the general terms "radioactive materials", "radioactive substances" or "radionuclides." As discussed earlier, there are various types of radionuclides with different health, environmental and security significance depending on the uses and categories of nuclear materials and radioactive wastes such as physical protection, safe management of spent fuel and radioactive waste, and maritime safety.

---

[218]Response to Transboundary Radiation, *supra* note 212 at 402.
[219]Article 2(a), ILC Draft Articles, ILC Draft Report, *supra* note 132 at 12.
[220]GESAMP, *supra* note 197.

Further, the radioactive materials covered in this study refer to those used for civilian purposes, not military purposes.

For physical protection purposes, nuclear materials are categorized to determine the type of security measures that must be applied. The basis for concern for the physical protection stems from the fact that plutonium, highly enriched uranium or uranium -232 can lead to the manufacture of a nuclear explosive device.[221] There are three general categories of nuclear materials for purposes of physical protection. As a rule, the basis of the categorization is the original fissile content of the nuclear material, which thus, determines the level of physical protection.[222]

Nuclear material that is in a form no longer usable for any nuclear activity is considered to have minimal environmental consequences, thus, does not merit physical protection measures.[223] An example of this is the vitrified high-level radioactive waste

---

[221]IAEA, "Assignment of Nuclear Activities to Physical Protection Categories", IAEA Doc. INFCIRC/225/Rev.3, August 1993, On line: IAEA Web site, <http://www/iaea.org/worldatom/program/protection/infcirc225/infcr230.html,> (Date accessed: 10 July 1999). However, experts from the nuclear industry assert that weapons-grade plutonium/uranium and reactor grade plutonium/uranium are different. "Uranium and plutonium are composed of several isotopes, some of which are fissile. To produce an explosive device for military purposes requires the percentage of fissile isotopes (U-235 for uranium, Pu-239 for plutonium) present in the material to be of the order of 93%. The levels reached in the nuclear power industry are, however, much lower; less than 5% for uranium and between 50 and 60% for plutonium. Plutonium containing high quantities of fissile material i.e. Pu-239 in the order of 90-95 %, is known as weapon-grade plutonium. Plutonium containing lower concentrations, in the range of 50-60 % is known as reactor-grade plutonium. The definitions of the various plutonium grades are expressed as a percentage of the isotope Pu-240 which is considered as an impurity for weapons manufacturers." On line: COGEMA home page <http://www.cogema.fr/recherche_gb/index.html> (Date accessed: 30 August 1999).

[222]*Ibid.*

[223]*Ibid.*

that is generated from the recycling and reprocessing of spent fuel.[224] Because of the low fissile content of high-level wastes, they do not merit physical protection measures.[225]

For purposes of safety management, radioactive materials are classified as either spent fuel or radioactive waste under the *Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management.*[226] The classification process is a political decision and depends on whether the State adopts the once-through cycle or the closed loop cycle. Though radioactive, spent fuel and other radioactive elements that can be reprocessed are not considered wastes by countries adhering to the close loop cycle. For once-through cycles States like the United States, spent fuel is considered radioactive waste.

For purposes of maritime safety, the *Convention for the Safety of Life at Sea, 1974* [hereinafter *SOLAS*][227] and the *International Maritime Dangerous Goods Code* [hereinafter IMDG Code][228] classify radioactive materials as dangerous materials, the handling, packaging and transport of which must be regulated. This classification is inclusive of both fresh nuclear material and spent nuclear fuel.

---

[224]R. Seitz, "Sustainable development & electricity generation: Comparing impacts of waste disposal" 38 IAEA Bull. No. 2 (1996) On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/bulletin/bulletinv38n2/html> (Date accessed: 17 August 1999).

[225]Return Shipment, *supra* note 152.

[226]*Joint Convention, supra* note 145.

[227]*International Convention for the Safety of Life at Sea*, 1 November 1974, entry into force 25 May 1980, 1184 U.N.T.S. 2. [Hereinafter *SOLAS*].

[228]International Maritime Dangerous Goods Code, Volume IV Class 7, (IMO Sales No. 200 86.10E) (1986). [Hereinafter IMDG Code].

The IMO's adoption of the INF Code[229] puts irradiated nuclear material, plutonium and high-level waste in a distinct category. The INF materials covered under the INF Code are:

- Irradiated nuclear fuel - material containing uranium, thorium and/or plutonium isotopes which has been used to maintain a self-sustaining nuclear chain reaction and may be recycled and reprocessed;

- Plutonium - the resultant mixture of isotopes of that material extracted from irradiated nuclear fuel from reprocessing;

- High-level radioactive wastes - liquid wastes resulting from the operation of the first stage extraction system or the concentrated wastes from subsequent extraction stages, in a facility for reprocessing irradiated nuclear fuel, or solids into which such liquid wastes have been converted.

In this thesis, the focus is on INF materials because they have generated the most controversy. The large-scale international maritime shipments of these materials present the most risks to other Coastal States and coastal communities.

VI. Nuclear energy generation and the transport of nuclear materials - Trends

At the end of 1998, there were 434 reactors in operation, from 32 countries around the globe. There were 151 nuclear power reactors in Western Europe, 70 in Eastern Europe, 118 in North America, 5 in Latin America, 11 in the Middle East and South Asia, 2 in Africa, and 77 in the Far East.[230] The six countries that have the most

---

[229]IAEA, *IAEA Annual Report for 1993*, IAEA Doc. no.:GC (XXXVIII)/2 & Corr.1, July and 19 August 1994, excerpts reprinted in Netherlands Institute for the Law of the Sea , *International Organizations and the Law of the Sea Documentary Yearbook 1993 Vol. 9,* (London: Graham & Trotman/Martinus & Nihjoff, 1993) at 684-94; INF Code, *supra* note 166.

[230]IAEA, *The Annual Report for 1998* On line: IAEA Web site <http:// www. iaea.org/ worldatom/inforesource/annual/anrep98/98anreppdf.html> (Date accessed: 17 August 1999) at 4. [Hereinafter *1998 IAEA Annual Report*].

number of reactors are the United States of America (104 reactors), France (58 reactors), Japan (53 reactors), the United Kingdom (35 reactors), Russia (29 reactors), and Germany (20 reactors).[231]

Nuclear energy generation is predicted to increase in East and Southeast Asia, where new power reactors are built to supply increasing electricity demands.[232] China, Japan, and the Republic of Korea are planning to expand nuclear power generation.[233] However, the present financial crisis in the region slowed the pace of nuclear power expansion.[234]

In Europe, nuclear energy generation could remain at its present level. For instance, the German government announced in September 1997 that the use of nuclear power would be stopped and has issued invitations for talks concerning a new energy consensus.[235] France has also decided to shut down and dismantle the Superphoenix, a fast reactor breeder.[236]

The increase of nuclear energy generation naturally results in increased amounts of INF materials. Since not all States undertake their own reprocessing or disposal of INF materials, the transport of INF materials across international jurisdictions is predicted to increase.[237] To facilitate the reprocessing, storage and/or disposal of INF materials, closed fuel cycle States entered into cooperation agreements. The objective underlying

---

[231] *Ibid.*
[232] *Ibid.*
[233] *Ibid.*
[234] *Ibid.*
[235] *Ibid.*
[236] *Ibid.*
[237] Japan, for example, is a closed fuel cycle State but it does not undertake its own reprocessing activities. It entered into a cooperation agreement with France for

such co-operation agreements is to establish a more efficient inter-state system that can administer all activities relating to reprocessing and reconditioning, including shipments of nuclear materials and radioactive waste.

VII. Risks attached to maritime carriage

The previous sections of this Chapter presented the risks surrounding radioactive materials. This section will examine the perils attached to maritime transport. Considering these two types of perils, one by nature of the material transported, and the other by nature of the mode of transport, a clearer picture of the risks attached to the maritime transport of radioactive materials is presented.

Despite the leaps and bounds achieved by technology for maritime transport, this type of transport continues to be perilous. Maritime accidents continue to occur. The IMO, citing the figures published by the Institute of London Underwriters, reported that casualty statistics for ships of 500 gross tons and above in 1992-1996 were caused by the following: collision or contact (63), fire or explosion (126), grounding (62), machinery (29); weather (187), other (153). [238] Lloyd's Register of Shipping casualty statistics for 1996 showed a total of 179 losses with the following causes: foundered (83), missing (12), fire/explosion (22), collision (29), wrecked/stranded (36), contact (1), other (6).[239]

The IMO FSI Working Group on Casualty Statistics analysed 136 incidents and found that human factor played a significant part in many of these incidents which

---

reprocessing of its spent fuel (extraction of plutonium and uranium) into MOX fuel and the conditioning and vitrification of left-over wastes.

[238]IMO, "World Maritime Day 1997 Optimum maritime safety demands a focus on people" On line: IMO web site <http://www.imo.org/wmd/wmd97/htm.> (Date accessed: 17 July 1999).

[239]*Ibid.*

include: lack of training and experience of pilots, defective or poor communications, failure to comply and appreciate the rules of risk collision under the *COLREGs 1972*, and failure to reduce speed to allow for conditions of weather.[240] Experts say that as much as 80% of the maritime accidents have been caused by human error.[241]

Threats and actual acts of piracy and robbery at sea intensify the security risks attached to the carriage of nuclear materials. The total number of incidents of piracy and armed robbery against ships reported to have occurred from 1984 to the end of June 1999 was 1,480.[242] The areas most affected in 1998 (i.e. five incidents reported or more) were the Far East, in particular the South China Sea and the Malacca Strait, South America and the Caribbean, the Indian Ocean and West and East Africa.[243]

VIII. Conclusion

This Chapter showed that there are two principal reasons why the maritime shipments of radioactive materials produce anxiety upon other Coastal States and non-governmental organizations. The first reason is due to the dangerous nature of the material itself. Excessive radiation from radioactive materials is harmful to individuals and to the marine environment. The second reason is because maritime transportation, per

---

[240]IMO FSI - 7th session: 22-26 March 1999, On line: IMO Web site <http://www.imo.org/imo/meetings/fsi/7/fsi7.html > (Date accessed: 10 August 1999).

[241]IMO, "Frequently Asked Questions (FAQS) about the IMO", On line: IMO Web site <http://www.imo.org/imo/faqs.hmt> (Date accessed: 30 July 1999). [Hereinafter IMO FAQS].

[242]IMO MSC, *Reports on Acts of Piracy and Armed Robbery Against Ships*, IMO MSC/Circ.925, 30 June 1999, On line: IMO Web site <http://www.imo.org/circs/msc/piracy/925.pdf > (Date accessed: 10 August 1999). The IMO MSC now issues a monthly report on acts of piracy and armed robbery against ships.

[243]*Ibid.*

se, is perilous. The perils are both man-made and natural. The next Chapter lays out the regime established to regulate the activity and manage the risks involved.

Chapter 4

The law of maritime carriage of radioactive materials

I. Introduction

The regime governing the maritime transport of radioactive materials is composed of two different areas in international law: nuclear law and maritime safety law. Nuclear law governs the non-modal aspects of the transport. Non-modal aspects include the radiation protection and requirements for safe packaging. Maritime safety law governs the modal aspects of transportation such as requirements for the seaworthiness of vessels and rules for safe navigation of vessels. The two regimes also mandate prior notice and consultation requirements, contingency measures and a liability system.

The purpose of this Chapter is to assess the legal regime governing the maritime shipments of radioactive materials and determine its underlying ethics and philosophy. The findings will then be used to formulate strategies for reforms that will be taken up in the next Chapter.

Before the legal regime governing the maritime transport of radioactive materials is discussed, it is important to introduce the nature of the two areas of international law that constitute the regime: nuclear law and maritime safety law.

The development of nuclear law followed largely the attributes of nuclear energy. From the earlier years of its development and use, nuclear energy has demonstrated two attributes. It is both destructive and advantageous. These two characteristics of nuclear energy are the underlying bases of the fundamental principles of the law of nuclear energy: non-proliferation of nuclear weapons and the right of all States to peaceful and

beneficial uses of nuclear energy. These two principles are contained in the *Treaty on the Non-Proliferation of Nuclear Weapons* [hereinafter *NPT*].[244] While Contracting States[245] have the right to the peaceful uses of nuclear energy, they also have the responsibility to ensure the non-proliferation of nuclear weapons on the ground that the spread of nuclear weapons undermines international peace and security and increases the potential for nuclear war. [246] Commercial and civilian shipments of nuclear materials and radioactive wastes conducted within the non-proliferation and peaceful uses framework of international nuclear law are allowed under international law.

Maritime safety laws also developed because of the inherent perilous conditions of the sea as well as the collective experiences of the shipping industry involving disasters and collisions. The first version of the *SOLAS*, for example, came out in 1914

---

[244]*Treaty on the Non-Proliferation of Nuclear Weapons*, 1 July 1968, entry into force 5 March 1970, 729 U.N.T.S. 161. [Hereinafter *NPT*].

[245]*Ibid.* The *NPT* divides the international community into nuclear weapons states (NWS) and non-nuclear weapons States (NNWS). The nuclear weapons states are restricted to only five countries: China, France, the USSR, the United Kingdom and the United States. In accordance with Article IX (3) of the *NPT*, a nuclear -weapon state is one which had manufactured and exploded a nuclear weapon or other nuclear device prior to 1 January 1967. All other Contracting States are non-nuclear weapons States. There is also a class of states called "threshold states." These are non-nuclear states that have nevertheless acquired the capability to develop nuclear-weapon programmes. They include India, Israel and Pakistan. South Africa was able to assemble nuclear devices but had already come under the umbrella of the *NPT* and subsequently dismantled them.

[246]*Ibid.* Under Article 1 of the *NPT*, each nuclear-weapon State Party undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices. Article II, on the other hand, mandates each non-nuclear weapons State to undertake not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices, directly or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons

following the *Titanic* disaster in 1912.[247] It was not until after the IMO was established that the *SOLAS* first entered into force in 1965. Another example is the *International Convention for the Prevention of Pollution of the Sea by Oil* that was adopted in 1954.[248] However, it was not until the 1967 serious oil spill of more than 120,000 tons off the coast of the United Kingdom by the tanker *Torrey Canyon* that the treaty took off and became effective.[249] Maritime safety laws have been developed to manage the perils of the sea - both natural and manmade, ensuring and maintaining the viability of the international shipping industry.

The history of these two areas of law influenced the development and focus of the regime governing the maritime carriage of radioactive materials. Protecting and advancing the interests of the nuclear industry and the shipping industry are the principal objectives of the legal regime regulating the maritime carriage of radioactive materials. The regime governing the maritime carriage of radioactive materials regulates the following areas: radiation protection, safety packaging, seaworthiness of vessels, prior notification and consultation, contingency and emergency measures, and civil liability scheme. The main focus of the legal regime is to protect and ensure the safety of the radioactive material and safety of life at sea. Marine environmental protection as well as protection of the interests of the Coastal States are attended to only after harm occurs - in the liability scheme and in a limited manner, in the emergency measures.

---

or other nuclear devices. See also V. Lamm, *The Utilization of Nuclear Energy and International Law,* (Budapest: Akademiai Kiado, 1984).

[247]IMO, "IMO: the first fifty years", On line: IMO Web site <http://www.imo.org/imo/50ann/history3.htm> (Date accessed: 15 July 1999).

[248]*Ibid.*

II. The international organizations responsible for the legal regime governing the maritime carriage of radioactive materials

The two international organizations responsible for the establishment and development and the facilitation of the legal regime are the IAEA and the IMO. Both are part of the United Nations family.

A. IAEA

The IAEA was created by virtue of the *Statute of the International Atomic Energy Agency* [hereinafter *IAEA Statute*] on 23 October 1956. [250] A year later, the *IAEA Statute* came into force on 29 July 1957,[251] formally authorizing the IAEA to undertake its mandate. The fundamental objectives of the IAEA reiterate the twin-principles of international nuclear law:

a) To accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world; and

b) To ensure so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.[252]

With these objectives, the IAEA is authorized under its Statute to undertake the following activities:

a) research and develop the practical application of atomic energy for peaceful uses;

b) provide for materials, equipments, and facilities for nuclear research and development;

---

[249] *Ibid.*

[250] *Statute of the International Atomic Energy Agency* (As Amended up to 28 December1989), entry into force 29 July 1957, as reprinted in ElBaradie, *supra* note 187 at 3. [Hereinafter *IAEA Statute*].

[251] *Ibid.* Article XXI.E of the *IAEA Statute* provides for the requirements of entry into force.

[252] *Ibid.* Article II of the *IAEA Statute*.

c) foster exchange of information on the peaceful uses of atomic energy as well as training of scientists;

d) establish and administer safeguards to ensure that materials, facilities and information are not used or diverted for military purposes;

e) establish standards of safety for protection of health and minimization of danger to life and property, including such standards for labour conditions;

f) acquire any facility and materials in carrying out its authorized functions.[253]

The policy-making organs of the IAEA are the General Conference and the Board of Governors. The General Conference consists of all member states that meet in regular annual sessions.[254] Article V.E of the *IAEA Statute* grants to the General Conference the power to discuss as well as make any recommendations to the IAEA or the Board of Governors, on any question or matter within the scope of the Statute or relating to the powers and organs of the IAEA. The Board of Governors is composed of a selected number of states, based on their atomic energy production and geographical representation.[255] The Board of Governors has the authority to carry out the functions of the Agency as provided by the *IAEA Statute*.[256]

As of 14 September 1998, the IAEA had 128 member States.[257] The major nuclear power generating States are members of the IAEA.

The IAEA is the recognized competent international authority in nuclear activities. It works with governments and other international organizations pertaining to

---

[253]*Ibid.* Article III of the *IAEA Statute*; See Birnie and Boyle *supra* note 97 at 262.
[254]*Ibid.* Article V of the *IAEA Statute.*
[255]*Ibid.* Article VI.A of the *IAEA Statute.*
[256]*Ibid.* Article VI.F of the *IAEA Statute.*

the peaceful uses of nuclear energy. It is not a regulatory body, thus, it has no power to enforce its recommendatory standards on any of nuclear activities of its member States.[258] As its mandate suggests, its role is to facilitate and ensure the peaceful uses of nuclear energy.

B. IMO

The IMO, formerly called the Inter-government Maritime Consultative Organization [IMCO] was established in Geneva in 1948 through a Convention.[259] The Convention, however, did not enter into force until 1959.[260] The IMO held its first meeting in January 1959.[261]

The IMO's main responsibility is to facilitate

> cooperation among governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and the prevention and control of marine pollution from ships.[262]

The IMO carries out its responsibilities through an Assembly,[263] a Council[264] and five main Committees: the Maritime Safety Committee [hereinafter IMO MSC], the

---

[257]IAEA, "Membership of the IAEA" On line: IAEA Web site; <http://www.iaea.org./worldatom/glance/profile/ member.hmtl> (Date accessed: 5 July 1999).
[258]Birnie and Boyle, *supra* note 97 at 354.
[259]*Convention on the International Maritime Organization,* 6 March 1948, entry into force 17 March 1958, IMO Doc. 023.82.08E; U.N.T.S. vol. 289, p.3. The IMO was then known as the Inter-Governmental Maritime Consultative Organization. An amendment which changed the name of IMCO to IMO, became effective on 22 May 1982. [Hereinafter *IMO Convention*].
[260]*Ibid.*
[261]IMO FAQS, *supra* note 241.
[262]Article1, *IMO Convention, supra* note 259.
[263]The IMO Assembly is composed of all Member States and meets once every two years in regular sessions.

Marine Environment Protection Committee [hereinafter IMO MEPC], Legal Committee, Technical Co-operation Committee, and a Facilitation Committee. The two most important and most influential committees in the IMO are the IMO MSC and the IMO MEPC. These two committees derive their influence and stature from their composition and the range and scope of their responsibilities. Both Committees are composed of all Member States. The IMO MSC's nine (9) sub-committees[265] deal with any matter within the scope of the IMO concerning

> aids to navigation, construction and equipment of vessels manning from a safety standpoint, rules for the prevention of collisions, handling of dangerous cargoes, maritime safety procedures and requirements, hydrographic information, log-books and navigational records, marine casualty investigation, salvage and rescue, and any other matters directly affecting maritime safety.[266]

The IMO MEPC, on the other hand, has the responsibility to consider any matter within the scope of the IMO respecting the prevention and control of pollution from ships.[267]

Although there are now 57 Member States to the IMO, representing 98.59% of the world shipping tonnage,[268] the IMO has limitations. It is not an executive body, and thus does not enforce any of the Conventions or regulations it develops. Its main role is to facilitate the negotiation of Conventions whose objectives are to ensure maritime

---

[264]The IMO Council is composed of 40 member States elected by the Assembly for two-year term. The Council is the executive organ of the IMO.

[265]*Ibid.* The sub-committees are: Bulk Liquids and Gases (BLG), Carriage of Dangerous Goods, Solid Cargoes and Containers (DSC), Fire Protection (FP), Radiocommunications and Search and Rescue (COMSAR), Safety of Navigation (NAV), Ship Design and Equipment (DE), Stability and Load Lines and Fishing Vessels Safety (SLF), Standards of Training and Watchkeeping (STW), and Flag State Implementation (FSI).

[266]IMO, "IMO Structure", On line: IMO Web site http://www.imo.org/imo/structur.htm≥ (Date accessed: 10 August 1999).

[267]*Ibid.*

[268]As of 1 May 1999, On line: IMO web site <http://www.imo.org/imo/convent/summary.htm> (Date accessed: 3 June 1999).

safety.[269] International legislative work, however, is now focused on amendments, revision, and effective implementation since there now exists a significant number of agreements for maritime safety and prevention of pollution from shipping.[270]

IMO acts as the depositary and secretariat to several international Conventions. There are three general areas covered by these Conventions: maritime safety; marine environmental protection; and responsibility and liability arising from shipping activities.[271] The Contracting States to these Conventions are primarily responsible for implementing their obligations through their national laws. The IMO assists the Contracting Governments to implement their obligations through the committees and in particular, through the IMO FSI. Some of the recent achievements of the IMO FSI are approval of a draft Code for the Investigation of Marine Casualties and Incidents,[272] and approval of a Flag State performance self-assessment form.[273]

C. Collaboration efforts of the IAEA and the IMO

The IAEA and the IMO work together by virtue of a cooperation agreement. A year after the IAEA came up with the first version of the *Safety Transport Regulation*, it entered into a Cooperation Agreement with the IMO on 10 April 1962.[274] The

---

[269]Article 15(j) of the *IMO Convention, supra* note 259. E. C. Henry, *The Carriage of Dangerous Goods by Sea The Role of the International Maritime Organization in International Legislation,* (New York: St. Martin's Press, 1985), at 40.
[270]IMO FAQS, *supra* note 241.
[271]*Ibid.* at 61.
[272]IMO FSI -5th session: 13-17 January, 1997, On line: IMO Web site< http://www.imo.org/meetings/fsi/5/fsi3.htm > (Date accessed: 10 August 1999).
[273]IMO FSI - 6th session:22-26 June 1998, On line: IMO Web site < http://www.imo.or/meetings/fsi/6/fsi0.htm >; IMO FSI - 7th session: 22-26 March 1999, On line: IMO Web site <http://www.imo.org/meetings/fsi/7/fsi.htm > (Date accessed: 10 August 1999).
[274]*Cooperation Agreement between IAEA and IMO*, 10 April 1962, IAEA INFCIRC/20/Add.1.

Cooperation Agreement provides for co-operation and consultation between the two organizations in the attainment of their objectives, particularly concerning matters of common interest.[275] It also calls for reciprocal representation and participation without vote in meetings and work sessions of each organization.[276] Further, the two organizations agreed to exchange information and documents and undertake scientific and technical co-operation activities.[277]

The principal output of the collaboration between the IAEA and the IMO is the incorporation of the *Safety Transport Regulations* in the IMDG Code of the IMO. Another major output of their collaboration is the INF Code adopted by the IMO in 1993.

Other organizations that also work with the IAEA and the IMO in establishing safety standards include the International Commission on Radiological Protection [hereinafter ICRP], the World Health Organization [hereinafter the WHO], the International Labour Organisation [hereinafter the ILO] and the GESAMP.

III. The legal regime governing the international maritime transport of radioactive materials

The legal regime for the international maritime transport of radioactive materials has seven (7) major areas: radiation protection, safety packaging requirements, maritime safety requirements, safety navigation rules, prior notification and consultation requirements, contingency and emergency measures, and liability system.

---

[275]IAEA, "The texts of the Agencies Relationship Agreements with Specialized Agencies," IAEA INFCIRC/20, On line: IAEA Web site <http://www.iaea.org/worldatom/infcircs/inf20.html> (Date accessed: 17 August 1999).
[276]*Ibid.*
[277]*Ibid.*

A. Radiation protection

The fundamental objective underlying the safe transport regulations is radiation protection. Requirements of all safety aspects of the transport of nuclear materials are designed to ensure protection from and containment of excessive or harmful radiation exposure.

1. Recommendatory documents for radiation safety

a) From the International Commission on Radiological Protection

Since radiation naturally occurs, the concept of permissible radiation levels without the attendant risks and injuries associated with excessive doses is an accepted practice in the international community. The international body tasked to set the permissible levels of radiation exposure is the ICRP, a recommendatory group of experts from different countries.[278]

According to the ICRP, safe radiation exposure must be in accordance with the following principles:

a) no practice resulting in human exposure to radiation shall be authorized unless its introduction produces a positive net benefit, taking also into account the resulting radiation detriment (justification of the practice);

b) all exposures should be kept as low as reasonable achievable (ALARA), economic and social factors being taken into account (optimization of radiation protection);

---

[278]The ICRP is a non-governmental organization of international experts. The members of ICRP are chosen primarily for their expertise regardless of citizenship. The mandate of the ICRP is to "provide advice on radiation protection, including specific recommendations and guidelines on the degrees of exposure to ionising radiation that will have deleterious effects." OECD/NEA, *supra* note 213 at 89.

c) the dose to individuals from all practices (except those specifically excluded) should not exceed the applicable dose limits (individual dose limitation).[279]

These three principles are results of scientific tests over the years. In 1959, the scientific understanding about radiation exposure was that no bodily injury would occur even from lifelong exposure as long as radiation exposure was within the safe limits.[280] However, in 1977, based on the accumulating evidence of long-term harm and the relation of increased risk of cancer to the accumulated radiation does, the ICRP recommended that safe dose limits must be combined with the requirement that radiation must be as low as reasonably achievable.[281]

There are two groups of people protected from harmful artificial radiation exposure:

1) workers in any nuclear related activity such as transport of nuclear material;

and

2) the general public.

Radiation exposure levels are different for workers in the nuclear industry and the general public. The permissible level for nuclear industry workers is generally 5 rems per year, with some qualifications and conditions. An individual from the general public is allowed one-tenth of the annual permissible rems of a worker's.[282] The reason for the

---

[279]ElBaradie, *supra* note 187 at 157.
[280]IAEA, "International Radiation and Waste Safety Standards," On line: IAEA Web site <http://www.iaea.org/worldatom/ > (Date last updated: 26 February 1999).
[281]*Ibid.*
[282]*Ibid.*

difference is the availability of regular medical supervision, monitoring and other safety services provided to nuclear industry workers.[283]

The environment, *per se*, is not guaranteed separate protection from excessive doses of artificial radioactivity. The ICRP and the IAEA postulate "that *controlled* deliberate releases of radionuclides into the environment that are adequate for the protection of man will also ensure an adequate level of protection for the environment."[284] There is no scientific certainty that radiation protection for the individual is appropriate for the protection of the environment and its organisms. As observed in the 1990 GESAMP Study on the State of the Marine Environment, "[d]oses to, and effects on, marine organisms or marine populations are much less well known."[285]

b) From the IAEA in collaboration with other international organizations

In an effort to harmonise radiation safety standards, the IAEA, the WHO, the ILO, and the Organization for Economic Cooperation and Development/Nuclear Energy Agency [hereinafter OECD/NEA] collaborated and published the latest *International Basic Safety Standards for Radiation Protection* (*Radiation Safety Standards*) in 1994.[286] The new standards contain more comprehensive and specific protection measures for people working in the nuclear field and the general public in both accidental and chronic

---

[283] *Ibid.*
[284] *Ibid.*
[285] GESAMP, *supra* note 197 at 42.
[286] IAEA, "Radiation Safety, Excerpt from the IAEA Annual Report for 1994," On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/annual/anr9410.html > (Date accessed: 17 August 1999).

conditions.[287] Prior to the new *Radiation Safety Standards*, the recommendatory measures for accidental and chronic conditions were contained in separate documents.[288]

Based on the *Radiation Safety Standards*, Section II (205) of the *Safe Transport Regulations* provides that transport workers may receive the maximum dose level of 5 mSv (500 mrem) per year, while the general public may receive a dose level of not more than 1 mSv (100 mrem) per year. Despite the higher allowable radiation exposure to transport workers, this dosage is within the limits allowed under the *Radiation Safety Standards* and under the standards of the ICRP.

2. Binding document for radiation safety

The *Convention Concerning the Protection of Workers Against Ionising Radiations* [hereinafter *Convention No. 115*][289] protects workers from exposure to ionising radiations in the course of their work.[290] Article 5 of the Convention mandates the Contracting States to take every effort to restrict the exposure of workers to ionising radiation to the *lowest practicable level* and any unnecessary exposure shall be avoided by all parties concerned. Different maximum permissible doses of ionising radiation are

---

[287] *Ibid.*

[288] The previous IAEA recommendatory document that provided guidelines in emergency or accidental situations was the *Protection from Radiation Sources Not Under Control: Accidents*. IAEA, *Protection from Radiation Sources Not Under Control: Accidents*, IAEA Pre-publication document of Safety Series No. 72 Rev. 1, December 1992, reprinted in ElBaradie, *supra* note 187 at 438.

[289] *Convention (No.115) Concerning the Protection of Workers from Ionising Radiations*, adopted by the General Conference of the ILO at its 44th session, Geneva, 22 June 1960, entry into force, 17 June 1963, 42 U.N.T.S. 1962. For non-signatory States, the ILO has also come up with a Code of Practice on Radiation Protection of Workers (Ionising Radiation) at its 231st Session in November 1985. This is a non-binding document but it serves to provide guidelines to States in their national legislation on radiation protection for workers.

[290] *Ibid.* Article 2.1, *Convention No. 115.*

allowed for various categories of workers[291] and appropriate levels of radiation doses are permissible for non-workers who may be in the vicinity of the workplace, either passing or remaining therein.[292]

Since *Convention No. 115* is a treaty of general nature, its implementation depends on the Contracting Parties following up with national laws or regulations or codes of practice or other appropriate means.[293] Within the radiation limits recommended under the *Radiation Safety Standards*, Contracting Parties have the discretion to determine the level and types of protection measures accorded to the workers from radiation exposure.[294]

In light of the higher radiation dosage allowed to workers, *Convention No. 115* mandates that workers must be adequately instructed before and during such employment in the precaution to be taken for the protection of their health and safety.[295] Further, monitoring,[296] medical examination[297] as well as emergency actions shall also be undertaken by Contracting States should there be exposure to radiation.[298]

However, though multilateral, *Convention No. 115* only has a limited influence. Since its entry into force in 1962, only six (6) States have become Contracting Parties.

---

[291] *Ibid.* Article 6, *Convention No. 115.*
[292] *Ibid.* Article 8, *Convention No.115.* Contracting Parties are also required to place appropriate warnings to indicate presence of hazards from ionising radiation under Article 9.1.
[293] *Ibid.* Article 1, *Convention No. 115.*
[294] *Ibid.* Article 3.1 of *Convention No. 115*, however, requires that such discretion must be exercised "In light of knowledge available at the time."
[295] *Ibid.* Article 9.2, *Convention No. 115.*
[296] *Ibid.* Article 11, *Convention No. 115.*
[297] *Ibid.* Article 12, *Convention No. 115.*
[298] *Ibid.* Article 13, *Convention No. 115.*

They are Ghana, Iraq, Norway, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland.

B. Safety packaging requirements

1. Status of IAEA Regulations for the Safe Transport of Radioactive Materials

There are no binding international instruments relating to packaging of nuclear materials. The *Regulations for the Safe Transport of Radioactive Material 1985 Edition* [hereinafter *Safe Transport Regulations*][299] is a recommendatory document establishing packaging standards and requirements[300] but serve as the basis of most national regulations for the safe transport of nuclear materials.[301]

The IAEA first came out with the *Safe Transport Regulations* in 1961. Since then, these regulations have been continuously amended to incorporate new technology and new practices. Revisions were done in 1985 and subsequent amendments were passed in

---

[299]IAEA, *Regulations for the Safe Transport of Radioactive Material 1985 Edition (As Amended 1990)* (Vienna: IAEA, 1990) [Hereinafter *Safe Transport Regulations*].

[300]*Ibid.* See the Foreword to the *Safety Standards Series No. ST-1*. "The Regulations generally use the form 'shall' in making statements about requirements, duties and obligations. Use of the form 'should' is restricted to statements that are a desired option. Use of the form 'may' is limited to statements that are pursuant to an option provided by the Regulations." On line: IAEA Web site <http://www.iaea.org/worldatom/ publications/ newrelease/transportintro. html> (Date accessed: 17 August 1999). Return Shipment, *supra* note 151.

[301]Paragraph 5.1.2, *IAEA Report to the UN General Assembly*, Forty-fourth Session, 6 October 1989. U.N.G.A. Doc.:A/44/339/Add.11-E/ 1989/ Add.11. According to the IAEA Secretariat, 88% of 65 IAEA Member States that responded to a recent survey reported that they have legally binding regulations applicable to the international transport of radioactive materials. The IAEA Regulations serve as bases for these national regulations. IAEA Secretariat, "Report on Legally Binding and Non-Binding International Instruments and Regulations Concerning the Safe Transport of Radioactive Materials and their Implementation", 16 April 1998, IAEA GOV/1998/17, at 49.

1990.[302] The latest version of the *Safe Transport Regulations* series was approved by the IAEA's Board of Governors in September 1996 and published as *Safety Standards Series No. ST-1*.[303] However, the 1985 *Safe Transport Regulations* are still valid pending entry into force of the *Safety Standards Series No. ST-1* in the year 2001.[304] The IAEA is assisting the International Civil Aviation Organization, the IMO and the United Nations Economic and Social Council Committee of Experts on the Transport of Dangerous Goods in their revisions to implement requirements for the safe transport of radioactive material based on the *Safety Standards Series No. ST-1*. All these organizations have planned for a uniform date of entry into force by 1 January 2001.[305]

2. Purpose and coverage

The *Safe Transport Regulations* are for establishing standards of safety to ensure "acceptable level of control of radiation hazards to persons, property, and the environment"[306] during transport, whether in normal or accidental conditions.[307] Safety requirements are established in "the design, fabrication and maintenance of packaging,

---

[302]*Safe Transport Regulations*, *supra* note 299.

[303]*Safety Standards Series No. ST-1*, *supra* note 300. The following are some of the major changes introduced in the *Safety Standards Series No. ST-1*: 1) incorporation of the basic safety standards for protection against ionising radiation[BSS]; 2) new definition of radioactive material based on the BSS; 3) introduction of new package type C for air shipments of plutonium; 3) specific provisions for uranium hexafluoride because its physical and chemical toxicity safety are different than other radioactive materials; and 4) new UN numbers to provide information about the radioactive materials which are not shown in the markings. There were no fundamental changes, such as the express articulation of precautionary principle and intergenerational equity in the new regulations. B. Dodd and J. Mairs for the IAEA, "Training Manual Supplement in the Changes in the 1996 Edition of the IAEA Transport Safety Regulations", (Vienna: IAEA, 21-25 April 1997).

[304]*Ibid.*

[305]*1998 IAEA Annual Report, supra* note 230.

[306]IMDG Code, *supra* note 228.

and the preparation, consigning, handling, carriage, storage in transit and receipt at the final destination of packages."[308]

Under the *Safe Transport Regulations*, transport includes all operations and conditions present in the carriage of radioactive material other than that which is an integral part of the means or modes of transport.[309] From the perspective of the nuclear legal regime, safe packaging is the most important consideration in the transport of radioactive materials. The *Safe Transport Regulations* thus apply to any mode of transport, whether on land, water, or in the air. The *Safe Transport Regulations* series, however, do provide for additional requirements that are peculiar to a particular mode of transport, such as by vessels, by rail and by road, by air, and by post.[310]

3. Requirements for safe packaging

Under the *Safe Transport Regulations*, four basic objectives must be met to achieve quality in the design, manufacture, testing, documentation, use, maintenance and inspection of all packages, including in-transit storage operations.[311]

(a) Effective containment of radioactive material;

(b) Effective control of radiation emitted from the package;

(c) A subcritical condition for any fissile material; and;

(d) Adequate dissipation of any heat generated within the package.

---

[307]Section 1 (103) of the *Safe Transport Regulations, supra* note 299.
[308]*Ibid.*
[309]*Ibid.* Section 1 (102).
[310]IAEA, *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Materials (1985 Edition)* Third Edition (as Amended 1990), (IAEA, Vienna: 1990) at 44-46. [Hereinafter *Advisory Material*].
[311]Section II (209) of the *Safe Transport Regulations*, *supra* note 299 at 15.

The test formula used in the selection of package materials is that which "will not yield under the range of loads expected in normal handling, yet should yield under severe overloads without affecting the safety of the system."[312] Thus, in determining the appropriateness of the packaging of nuclear shipment, two types of assessments are conducted. The first is on the material to be shipped and the second is on the package to be used. Actual tests are not required on the radioactive material for reasons of safety. Demonstration compliance procedures on packages are conducted in assessing their appropriateness and soundness. The means of assessing the appropriateness of packaging is through demonstration or full-scale tests on sample packages. Compliance does not necessarily mean that full-scale tests are conducted on all packages used in the actual shipment.[313] Full scale, simulation tests are conducted on packages representative of the relevant physical characteristics of actual packages.[314]

Cost is a legitimate factor in determining the safety of the package material.[315] However, the *Safe Transport Regulations* recommend that cost should not compromise the effectiveness of features that are necessary for compliance of other safety requirements.[316]

The factors that must be taken into consideration in determining whether packaging of nuclear materials comply with the standards set by IAEA are as follows:

---

[312]*Ibid.* Paragraph A-506.1 at 51.
[313]*Ibid.* Paragraph A-601.2 at 75.
[314]*Ibid.* Paragraph A-601.3 at 75.
[315]*Ibid.* Paragraph A-508.2 at 52. "Measures to comply ...need not involve undue or unreasonable expense. For example, the choice of materials and methods of construction for any given packaging should be guided by commonly accepted good engineering practice for that type of packaging... and need not invoke extravagantly expensive measures."
[316]*Ibid.* Paragraph A-508.1.

(a) Appropriate and sound packages are used;[317]

(b) The activity of radioactive material in each package does not exceed the regulatory activity limit for that material and that package type;

(c) The radiation levels external to, and the contamination levels on, surfaces of packages do not exceed the appropriate limits;[318]

(d) Packages are properly marked[319] and labelled[320] and transport documents are completed;[321]

(e) The number of packages containing radioactive materials in a conveyance is within regulatory limits;[322]

(f) Packages of radioactive material are stowed in conveyances and are stored at a safe distance from persons and photosensitive materials;[323]

(g) Transport and lifting devices which have been tested are used in loading, conveying, and unloading packages of radioactive material; and

(h) Packages of radioactive material are properly secured for transport.

---

[317]*Ibid.* A certificate of approval is issued by the competent regulatory body to certify that the design of an individual package meets regulatory requirements, Section IV.

[318]During transit, one of the control measures adopted is inspection by a qualified person in assessing the integrity of the package and check for any leakage and other radiological implications, *IAEA Advisory, supra* note 310 at 28.

[319]*Ibid.* at 35. Markings on packages containing nuclear materials must be in bold print, of sufficient size, durable quality ink, and sensible location.

[320]*Ibid.* at 37. The radionuclides present in the package must be labelled in order that radioactivity can be properly identified.

[321]*Ibid.* at 38. The consignor has the responsibility of ensuring that all transport documents are in order.

[322]The *Safe Transport Regulations, supra* note 299, allow a surface radiation level exceeding 200 mRem/h only under additional requirements if shipped in a regular cargo vessel. Hence, the number of packages may be restricted to a maximum of "200 mR/h, or about 100 times the dose permitted for workers in the nuclear energy field" is the general allowable radiation dosage for nuclear shipments in regular cargo ships.

[323]Segregation is important to enforce radiation protection measures. Segregation measures has two main aspects: distance between packages and distance of the entire shipment of nuclear materials from the workers assigned to it, *IAEA Advisory, supra* note 310 at 39.

4. Statistics regarding effectiveness of packaging of radioactive materials

The IAEA has not been able to assess the sufficiency of its packaging requirements on a worldwide scale. In 1980, the IAEA Standing Advisory Group on the Safe Transport of Radioactive Materials (SAGSTRAM)[324] attempted to conduct an empirical assessment on the adequacy of the safety requirements for the safe transport of nuclear materials.[325] The data collection was a failure. The data supplied by States were either incomplete or insufficient, and were thus inaccurate.[326] To this date, the IAEA has

---

[324]The SAGSTRAM is now the Transport Safety Standards Advisory Committee (TRANSSAC). The Transport Safety Standards Advisory Committee (TRANSSAC) is a standing body of senior regulatory officials with technical expertise in safety in the transport of radioactive materials. TRANSSAC provides advice to the Secretariat on the overall transport safety programme and has the primary role in the development and revision of the Agency's transport safety standards.
The functions of TRANSSAC are:

- to recommend the terms of reference of all documents in the Agency's programme for safety standards for radioactive materials transport and supporting programme and of the groups involved in the development and revision of those documents in order to promote coherence and consistency among the documents and between them and the other Agency Safety Series documents;
- to agree on the texts both of Requirements to be submitted to the Board of Governors for approval and of Guides to be issued under the responsibility of the Director General and to make recommendations to the ACSS, in accordance with the Agency's safety standards preparation and review process;
- to provide advice and guidance on a continuous programme for reviewing and revising the Agency's safety standards for radioactive materials transport and supporting documents;
- to provide advice and guidance on safety standards for radioactive materials transport, relevant regulatory issues, and activities for supporting the worldwide application of the transport safety standards;
- to identify and advise on any necessary activities in support of the transport safety programme.

[325]R.B. Pope and J.D. McClure, "Estimated Annual Worldwide Shipments of Radioactive Material" (Packaging and Transportation of Radioactive Materials, PATRAM '86 Symposium), Davos, 16-20 June 1986, Packaging and Transportation of Radioactive Materials, Proceedings of a Symposium, Vol. 1 (Vienna: IAEA, 1987) at 459.
[326]*Ibid* at 461 to 468.

been unable to collect data on the worldwide volume of traffic of all types of radioactive materials.[327] Individual nuclear energy generating countries, however, such as Canada, report a safe record in the transportation of nuclear materials for the year 1997.[328]

France, Germany and Switzerland reported problems of radioactive leakage during transport of nuclear materials within their territories in 1998. The transport of spent nuclear fuel in these three States was suspended pending inspections. The investigation concluded that for a number of years a high percentage of the flasks and wagons arriving from the reprocessing plant at La Hague had radioactivity levels that exceeded that specified in the IAEA's *Safe Transport Regulations* and the national regulations of the countries concerned.[329] France resumed transport of spent fuel in July 1998 following implementation of safety measures.[330] But Germany and Switzerland had not resumed transport at the end of 1998.[331]

C. Maritime safety requirements

Safety of cargo and safety of life are the principal objectives of maritime safety regime. The carriage of dangerous goods is therefore regulated by the maritime safety legal regime because the nature and characteristics of the cargo on board affect the over-all safety of the carriage. This section will discuss the requirements for seaworthiness of

---

[327]Email communication with Maria Theresa Brittinger of the Radiation Safety Division of the IAEA, dated 13 July 1999.
[328]Canada AECB, *Annual Report for 1998,* On line: AECB Web site <http://aecd.ca/> (Date accessed: 15 July 1999).
[329]*1998 IAEA Annual Report, supra* note 230.
[330]*Ibid.*
[331]*Ibid.*

vessels, the classification of radioactive materials, and the particular safety requirements for the seaworthiness of vessels carrying irradiated nuclear materials.

1. Ensuring seaworthy vessels

A vessel is seaworthy when it is "fit for the service for which it is intended."[332] Under *SOLAS*, Contracting States have the obligation to ensure that a ship is seaworthy to ensure safety of life at sea and security of cargo on board. Under the *LOSC*, seaworthiness is a positive obligation of States as a consequence of their rights and obligations concerning protection measures against marine pollution.[333] Seaworthiness of vessels is achieved by providing for adequate standards for the construction of ships,[334] fire-safety measures,[335] and life-saving appliances.[336]

Flag States are the entities principally obliged to ensure the seaworthiness of vessels through investigations and surveys of vessels under their national registry. At the end of investigation and survey, the Flag States issue the documents certifying the seaworthiness of vessels[337] and "guarantees the completeness and efficiency of the inspection and survey."[338] In 1988, a unified system of surveys and certification with two other Conventions, the *International Convention on Load Lines, 1966* and *MARPOL*

---

[332] Article 1 *SOLAS*, *supra* note 227.
[333] Article 219 *LOSC*, *supra* note 135.
[334] Chapter II-1, Annex of *SOLAS*, *supra* note 227.
[335] *Ibid.* Chapter II-2, Annex of *SOLAS*.
[336] *Ibid.* Chapter III, Annex of *SOLAS*.
[337] *Ibid.* Regulation 6 Part B, Chapter 1 of the Annex of *SOLAS*.
[338] *Ibid.* Regulation 6 Part B Chapter 2 of the Annex of *SOLAS*.

73/78[339] was established to facilitate easier compliance by owners of vessels. The unified system is set to enter into force on 3 February 2000.[340]

Port States under Article 219 of the *LOSC* also have the authority to determine the seaworthiness of vessels visiting their ports or off-shore terminals. The main purpose for authorizing port States is to prevent marine pollution. Port States may prevent the vessel from sailing or may permit the vessel to proceed only to the nearest appropriate repair yard and, upon removal of the causes of the violation, shall permit the vessel to continue its voyage immediately.[341] Coastal States whose territorial waters may be used by vessels carrying nuclear materials and radioactive waste do not have the authority to determine the seaworthiness of the vessel, unless the vessel anchors or stops at ports or off-shore terminal within their jurisdiction or control.

2. Classification of radioactive materials for maritime transport

The IMO estimates that more than 50% of packaged goods transported by sea are dangerous, hazardous or toxic substances from the human safety point of view and harmful to the marine environment.[342] One of these dangerous substances is radioactive material. Maritime safety law regulates the carriage of dangerous substances because it affects safety of life at sea, safety of the cargo, and safety of the carriage as a whole.

---

[339]The 1988 Protocol to *SOLAS*, adopted 11 November 1988, entry into force 11 November 1988.

[340]On line: IMO Web site< http://www.iaea.org/convent/eifdates.html > (Date accessed: 10 August 1999).

[341] *Ibid.*

[342]IMO, "IMO and dangerous goods at sea," January 1996, On line: IMO's website <http://www.imo.org/focus/ascii/imdg2.txt> (Date accessed: 17 July 1999). IMO, "The Safe Transport of Dangerous, Hazardous or Harmful Cargoes by Sea," IMO Information Paper, J/3737, May 1988, extract reprinted in UNIFO, *Annual Review of Ocean Affairs:*

Chapter VII of the *SOLAS* prohibits the carriage of any dangerous materials except in accordance with the law.[343] Radioactive materials are dangerous for purposes of maritime shipment because of possible emission of radiation that poses danger to the human health.[344] *SOLAS* does not provide for detailed requirements in the carriage of dangerous goods. What it establishes are standards and general principles in the following areas: packing (Regulation 3), marking and labelling (Regulation 4), documents (Regulation 5), and stowage requirements (Regulation 6).[345]

The details regarding the regulation of dangerous goods are contained in the IMDG Code.[346] IAEA's *Safe Transport of Regulations* are integrated in the IMDG Code in the section on radioactive materials to guide "ship-owners and to those handling packages in ports and on board ships without necessarily consulting the IAEA Regulations."[347] Although the IMDG Code itself is not a binding document, practically 98% of the world tonnage observes its standards because it is a complementary document to the *SOLAS.* [348]

Radioactive materials are classified as Class 7 materials in the IMDG Code. Any material with a specific activity greater than 0.0002 microcurie per gramme is declared radioactive material and will be regulated under Class 7 regulations. Radioactive

---

Law and Policy, Main Documents 1988 Volume III, (Florida: UNIFO Publishers, Inc., 1990) at 1159.

[343]There are nine categories of dangerous goods under Regulation 2 Chapter VII *SOLAS*, *supra* note 217. Radioactive substances are classified as Class 7 in Regulation 2 of Chapter VII of *SOLAS, supra* note 227.

[344]Section 1.2.1, Class 7 of the IMDG Code, at 7005, *supra* note 228.

[345]Chapter VII of the *SOLAS, supra* note 227.

[346]IMDG Code, *supra* note 228.

[347]*Ibid.* Section 1.1.2 Class 7, IMDG Code, at 7005.

[348]IMO, "The Safe Transport of Dangerous, Hazardous or Harmful Cargoes by Sea," *supra* note 342.

materials with lower specific activity will be exempt under Class 7 regulations but may still be subjected to regulations under another class of dangerous goods.[349]

The IMDG Code, which undergoes revisions and up-dates every two years,[350] provides for packaging standards, contamination, stowage and segregation requirements, labelling and marking, and proper documentation. Packaging is designed to achieve the following objectives: retain the material, serve as a shield to reduce radiation to an acceptable level, prevent criticality and promote heat dispersion.[351] In addition to the requirements of packaging under Class 7 regulations, fissile materials must be packed and shipped in a manner that criticality will be avoided under any foreseeable circumstances.

Proper documentation is required for the shipment of radioactive materials. The particulars of the radioactive materials must be declared in the transport document[352] and the certificates of approval of all competent authorities must accompany the shipment. Certificates of approval are needed particularly in the package design.[353] Prior to the *first* shipment of any package that requires approval by a competent authority, copies of all certificates of approval of the packaging must be submitted to the competent authority of each country through or into which the nuclear material is to be carried.[354]

---

[349]Section 1.2.2 Class 7, IMDG Code at 7005, *supra* note 228.
[350]On line: IMO Web site <http://www.imo.org/imdg.htm> (Date accessed: 10 July 1999). The section on radioactive materials in the IMDG Code is being revised because of the 1996 *Safety Regulations ST-1*. The date of entry into force is on January 2001. On line: IAEA Web site <http://www.iaea.org/ > (Date accessed: 30 July 1999).
[351]Section 1.3.1 Class 7 IMDG Code at 7006, *supra* note 228.
[352]*Ibid.* Section 9.1.1 Class 7 IMDG Code at 7028.
[353]*Ibid.* Section 9.3.1 Class 7 IMDG Code at 7029.
[354]*Ibid.* Section 9.5 Class 7 IMDG Code at 7030.

3. Seaworthiness of vessels carrying irradiated nuclear materials, spent fuel and high-level radioactive wastes

The international furor over the international shipments of plutonium compelled the IAEA to establish the JWG to undertake a scientifically and technically based assessment of sea transportation of radioactive materials.[355] The JWG constituted of the IAEA, the IMO, and the United Nations Environment Programme [hereinafter UNEP]. The JWG held sessions in Vienna from 26-30 April 1993 which was attended and participated by representatives from 28 countries, the UNEP, IMO, IAEA, and the Commission of the European Communities, as well as observers from Greenpeace International.[356]

After gathering data and hearing testimonies from various sectors concerned in the maritime shipment of radioactive materials, particularly spent and recycled nuclear fuel, the JWG concluded that

> (a)ll available information demonstrates very low levels of radiological risk and environmental consequences from the marine transport of radioactive material...It was the unanimous conclusion of Member States that there was no information or data ...that would cast doubt on the adequacy of IAEA Regulations.[357]

Nevertheless, the JWG deemed it necessary to draft the INF Code.[358] The INF Code is the first integrated code of practice regarding modal and non-modal requirements for the safe maritime carriage of INF materials.[359] It sets standards for the design and

---

[355]Joint IAEA/IMO Working Group on the Safe Carriage of Irradiated Nuclear Fuel by Sea, Doc. No.: 8 IAEA Newsbriefs (1993 No. 3), May/June 1993, at 762. [Hereinafter JWG].
[356]*Ibid.*
[357]*Ibid.*
[358]INF Code, *supra* note 166.
[359]*Ibid. Oceans Policy News*, Volume XI, Number 1 - March 1994; <http://www.clark.net/ pub/diplonet/opn0394.html#N9> (Date accessed: 13 July 1999).

construction of ships carrying the following radioactive materials: irradiated nuclear fuel, plutonium, and high-level radioactive wastes.[360] All ships, new and existing, regardless of size, including cargo ships of less than 500 tons tonnage, engaged in the carriage of irradiated nuclear fuel, plutonium and high-level radioactive wastes in flask are covered by this Code.[361] The INF Code also prescribes rules and standards on the following areas: damage stability, fire protection, temperature control of cargo spaces, structural considerations, cargo securing arrangements, electrical supplies, radiological protection equipment and management, training and shipboard emergency planning.[362]

INF materials are classified into three - INF 1, INF 2, and INF 3. The classification depends on the total radioactive quantity of the INF material carried on board a vessel. INF 1 and INF 2 cargoes may be carried on board passenger ships in accordance with Chapter 1, part A, regulation 2(f) of *SOLAS*.[363] As for INF 3, there is no restriction on the aggregate radioactive quantity, thus, it may only be carried in cargo vessels with specific technical requirements under the Code.[364]

The INF Code has been criticized for not providing a comprehensive set of measures that can regulate the carriage by sea of INF materials. Considering that the JWG was constituted of several organizations, a more comprehensive code could have

---

[360] *Ibid.* Paragraph 2 INF Code defines the following materials: irradiated nuclear fuel material refers to material containing uranium, thorium and/or plutonium isotopes which has been used to maintain a self-sustaining nuclear chain reaction; plutonium is the resultant mixture of isotopes of that material extracted from irradiated nuclear fuel from reprocessing; and high-level radioactive wastes are liquid wastes resulting from the operation of the first stage extraction system or the concentrated wastes from subsequent extraction stages, in a facility for reprocessing irradiated nuclear fuel, or solids into which such liquid wastes have been converted, *supra* note 166.

[361] *Ibid.* Paragraphs 1 and 2, INF Code.

[362] *Ibid.* Table 1 and paragraphs 7 to 25 of the INF Code.

[363] *Ibid.* Paragraph 3 and Table 2 of the INF Code.

been drafted and adopted. The INF Code, in its original version, did not establish new standards and requirements and in fact referred to the existing applicable regulations of the IAEA and IMO: IAEA's *Safe Transport Regulations*, the IMDG Code for class 7 materials and *SOLAS*, as amended, for ships regulated under this Convention. Nor was there any provision for environmental impact assessment procedures prior to any international shipment. As well, lacking in the INF Code was a procedure wherein all potentially affected entities, other than the States of origin and destination, can participate in the decision-making processes such as prior notice and consultation.

Since its adoption in 1993, however, various committees of the IMO, with the participation of the IAEA, have subjected the INF Code to several reviews in accordance with IMO Resolution A.748(18). Part B of this Resolution mandates the IMO MSC and the IMO MEPC, in consultation with the IAEA to:

> a) keep the INF Code under regular review and to amend it, as necessary, and;
>
> b) consider, as a matter of high priority, relevant aspects of the transport of irradiated nuclear fuel and other nuclear material which are complementary to the INF Code, taking into account the recommendations of the Joint IAEA/IMO/UNEP Working Group and the objectives of Chapter 17 of Agenda 21 of the United Nations Conference on Environment and Development (UNCED).

For example, during its 41st meeting, the IMO MEPC discussed a proposal that there should be a specific requirement in the INF Code for a shore-based emergency response plan, but agreed there was no such need at this time. There are already

---

[364] *Ibid.*

requirements under *SOLAS*, in the International Safety Management Code, for a shipowner or operator to establish emergency response plans.[365]

The IMO MEPC also discussed the issue of prior notification for ships carrying substances covered by the INF Code. Some delegations supported the idea of prior notification, while others expressed concern that it may lead to some coastal states vetoing the passage of INF cargoes or interference by terrorists. No agreement was reached regarding the issue other than it should remain on the agenda for further discussion.[366]

Positive developments resulted from the reviews of the INF Code. The IMO in Resolution A.853(20) decided to adopt the guidelines for developing shipboard emergency plans for ships carrying materials subject to the INF Code.[367] The purpose of the guidelines is to assist ship-owners involved with INF materials in preparing comprehensive Shipboard Emergency Plans and providing information to authorities involved in case of incidents. The shipboard emergency should include the following:

- procedure to be followed in reporting an incident involving INF Code materials;
- list of authorities or persons to be contacted in the event of an incident;
- description of action to be taken immediately to prevent, reduce or control the release of INF Code materials; and

---

[365]IMO MEPC - 41st session: 30 March - 3 April 1998 On line: IMO Web site <http://www.imo.org/imo/meetings/mepc/41/dsc41.htm> (10 June 1999).

[366]*Ibid.*

[367]Amendments to the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships and Adoption of Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code, IMO Resolution A.853(20), On line: IMO Web site <http://www.imo.org/ assembly/853854.htm> (Date accessed: 15 July 1999).

- procedures and points of contact on the ship for co-ordinating section with local and national authorities.

The INF Code amendment also covers notification of an incident involving INF Code materials. The amendments mandate that the reporting requirements for incidents involving dangerous goods, as covered by *SOLAS* Regulation VII/7-1, should apply both to the loss or likely loss of INF Code cargo overboard and to any incident involving release or probable release of INF Code material. A report should also be made in the event of damage, failure or breakdown of a ship carrying INF Code materials.

The most encouraging development is the move to make the INF Code mandatory through the *SOLAS*. The draft amendments to *SOLAS* Chapter VII to make the INF Code mandatory are under review in the MSC and the MEPC. [368] The concept of prior notification to Coastal States is not included in the proposed mandatory INF Code.[369]

D. Safety in Navigation

Harmonized rules on navigation are extremely important for international shipping because they reduce collisions. In recent years, navigation rules have also been utilized to protect the marine environment.

Safety in navigation are provided under various conventions: *SOLAS* and the *Convention on the International Regulations for Preventing Collisions at Sea* [hereinafter *COLREG*s].[370]

---

[368]IMO MEPC - 41st session, *supra* note 365.
[369]*Ibid.*
[370]*Convention on the International Regulations for Preventing Collisions at Sea*, 20 October 1972, entry into force 15 July 1977, U.K.T.S. 77 (1977).

1. *SOLAS*

The rules on safety of navigation under *SOLAS* apply to all ships and all types of voyages, international or domestic.[371] Safe navigation involves rules on danger messages,[372] meteorological services,[373] ice patrol services,[374] routeing provisions,[375] distress signals,[376] signalling lamps,[377] navigational equipments,[378] and aids to navigation.[379]

The May 1994 Amendments of *SOLAS 1974*,[380] added regulation 8-1 which mandates the use of standard ship reporting systems in areas covered by the ship reporting system. To date, there are five mandatory ship reporting systems in operation: off Ushant (at the western entrance to the English Channel), in the Torres Strait region and the Inner Route of the Great Barrier Reef (Australia), in the Great Belt Traffic Area, in the Strait of Gibraltar, and off Finisterre (Spain).[381]

States in favor of the international shipments of radioactive materials assert that the mandatory ship reporting system satisfies the requirement of information to Coastal States.[382] The ship reporting system requires that reports be made about the basic

---

[371]Regulation 1 Chapter V of Annex, *SOLAS, supra* note 227.
[372]*Ibid.* Regulations 2 and 3 of Chapter V, Annex of *SOLAS.*
[373]*Ibid.* Regulation 4 Chapter V, Annex of *SOLAS.*
[374]*Ibid.* Regulations 5, 6 and 7 Chapter V, Annex of *SOLAS.*
[375]*Ibid.* Regulation 8, Chapter V, Annex of *SOLAS.*
[376]*Ibid.* Regulations 9 and 10, Chapter V, Annex of *SOLAS.*
[377]*Ibid.* Regulation 11, Chapter V, Annex of *SOLAS.*
[378]*Ibid.* Regulation 12, Chapter V, Annex of *SOLAS.*
[379]*Ibid.* Regulation 14, Chapter V, Annex of *SOLAS.*
[380]May 1994 Amendments to *SOLAS, supra* note 227.
[381]IMO, "Safety of Navigation" On line: IMO Web site http://www.imo.org/focus/safnav/safcontl.htm > and < http://www.imo.org/focus/ safnav/safenav7.htm> (Date accessed: 27 July 1999). [Hereinafter Safety of Navigation].
[382]*Ibid.* .

information concerning the ship such as its name, its position and other information affecting navigation and marine pollution.[383]

2. COLREGs

The *COLREGs* is the latest amendment of previous conventions dealing with collisions at sea.[384] *COLREGs* is applicable to all vessels of contracting States traversing the high seas and in all waters connected with them provided they are navigable by seagoing vessels.[385] There are no tonnage requirements in the *COLREGs*. Any vessel of a Contracting State that carries nuclear materials and radioactive wastes must comply with the provisions in the *COLREGs*.

The *COLREGs* lays down rules on the conduct of any vessel in any condition of visibility,[386] its proper speed,[387] when the risk of collision exists,[388] and actions to avoid collision.[389] The most relevant provision of the *COLREGs* is Rule 10 that establishes the traffic scheme. Under Rule 10 vessels must use the appropriate traffic lane in the general direction of traffic flow for that lane, keeping clear from the traffic separation line or zone. Crossing traffic lanes is to be avoided whenever practicable. When unavoidable, crossing traffic lanes is required to be accomplished at right angles towards the general traffic flow.

---

[383] *Ibid.*
[384] Earlier Conventions that adopted rules for preventing collisions at sea include the 1889 International Maritime Conference and the1929 *SOLAS Conference*. On line: IMO Web site <http://www.imo. org/focus/safnav/safenav3.htm > (Date accessed: 27 July 1999).
[385] Part A Rule 1 (a), *COLREGs*, *supra* note 370.
[386] *Ibid.* Part B Section 1, *COLREGs*.
[387] *Ibid.* Rule 6, *COLREGs*.
[388] *Ibid.* Rule 7, *COLREGs*.
[389] *Ibid.* Rule 8, *COLREGs*.

Complementary to the traffic separation system is the vessel traffic service [hereinafter VTS]. The VTS has been adopted by the IMO MSC as a new regulation, 8-2 to Chapter V (Safety of Navigation) of *SOLAS 1974.*[390] The aim of the VTS is to improve the efficiency and safety of vessel traffic with services such as simple information services to position of other traffic or meteorological hazard warnings and extensive management of traffic within a port or waterway.[391] The vessel traffic service provides the following advantages:

(1) Identification and monitoring of vessels;

(2) Strategic planning of vessel movements;

(3) Provision of navigational information and assistance; and

(4) Assistance in the prevention of pollution and coordination response to pollution incidents.[392]

The reduction of collisions in recent years has been attributed to the traffic scheme. From 0.40% in 1991, the figure decreased to 0.13% of the total world tonnage in 1996.[393] Over 100 routeing schemes have already been established and compliance of these schemes is mandatory for vessels of Contracting Parties to the *COLREGs*.[394] Commercial ships carrying nuclear materials and radioactive waste that are registered

---

[390]Amendment, adopted in June 1997, entry into force 1 July 1999.
[391]Safety of Navigation, *supra* note 381.
[392]Paragraph 201, *Oceans and Law of the Sea Report of the Secretary-General*, 5 October 1998, Fifty-third session, Agenda item 38(a), U.N.G.A. Doc.: A/53/456; On line: UN Web site <http://www.un.org/search/> (Date accessed: 28 July 1999). [Hereinafter 1998 Law of the Sea Report of the Secretary-General].
[393]IMO, "IMO's 50th anniversary: a record of success," On line: IMO Web site <http://www.imo.org/50ann/hilight3.htm> (Date accessed:10 July 1999).
[394]*Ibid.*

with a State party to the *COLREGs*, and to the *SOLAS*,[395] are obligated to comply with IMO-approved traffic schemes established by Coastal States.

Traffic schemes have also been utilized to protect particularly sensitive marine areas that would otherwise be used as regular sea lanes. IMO traffic scheme guidelines[396] allow States to designate a particularly sensitive sea area [hereinafter PSSA] following on a number of criteria, including: ecological criteria, such as unique or rare ecosystem, diversity of the ecosystem, or vulnerability to degradation by natural events or human activities; social, cultural and economic criteria, such as significance of the area for recreation or tourism; and scientific and educational criteria, such as biological research or historical value.[397] One of the consequences if an area is declared a PSSA is the adoption of specific measures to control the activities in that area including "routeing measures; strict application of MARPOL discharge and equipment requirements for ships, such as oil tankers; and installation of vessel traffic services (VTS)."[398] To date, there are only two designated PSSAs: the Great Barrier Reef, in Australia and the Sabana-Camaguey Archipelago in Cuba.[399] The latter PSSA was designated in September 1997.[400] The existing PSSA guidelines have been criticized as too cumbersome.[401] This may account for the paucity of nominated or declared PSSA's.[402] In response, the IMO

---

[395]Regulation 8 Chapter V of the *SOLAS* on Safety of Navigation also provides for ship routeing schemes that may be followed by Contracting Parties, *supra* note 227.
[396]IMO MEPC Resolution A.720(17).
[397]IMO News No. 2 1998 at 7.
[398]*Ibid.*
[399]*Ibid.*
[400]*Ibid.*
[401]*Ibid.*
[402]*Ibid.*

MEPC in its 41st Session on 30 March to April 1998 agreed to review guidelines on designating a PSSA.

Whether a PSSA can be declared for purposes of preventing potential radioactive contamination from the maritime carriage of nuclear materials and radioactive wastes remains to be seen. The IMO MEPC and the IMO Sub-committee on Safety on Navigation [hereinafter IMO NAV] considered this issue in 1996.[403] Delegates present in those meetings decided that the issue should be decided on a case by case basis. Nevertheless, this is one of the options that coastal States may consider in order to protect their environment, particularly sensitive areas, from possible radioactive contamination.

E. Measures against acts threatening the safety and security of carriage of radioactive materials at sea

Both the nuclear legal regime and the maritime safety legal regime have conventions to manage and suppress acts that threaten the safety and security of the carriage of radioactive material. Security of the radioactive material while on transport is very important and is intimately woven to the safety aspect of the regime. Any act of violence or crime against the material is likely to increase the risks of radiation exposure, make maritime navigation unsafe and ultimately, lower the commercial viability and profitability of shipping.

The nuclear legal regime provides for the physical protection measures in the international carriage of radioactive materials in two agreements: safeguards agreement(s); and the *Convention on the Physical Protection of Nuclear Material*, if the transfer involves Contracting Parties. The maritime safety legal regime has the

---

[403]IMO NAV 42/WP.7/Add.2 (18 July 1996) and IMO MEPC 38/WP.9 (9 July 1996).

Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation as well as some recommendatory guidelines to manage acts of violence at sea that threaten the safety of navigation.

1. The safeguards system - as it applies to transport of nuclear materials

The safeguards system was established to ensure that the implementation of the peaceful uses of nuclear energy is not compromised by proliferation risks.[404] Since its primary objective is to secure the nuclear material in all stages of the nuclear cycle, the safeguards system also governs the transport of nuclear materials.

The safeguards system is administered under the auspices of the IAEA in accordance with its mandate "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world" provided the same is not used to further any military purpose.[405] Particular safeguards agreements between States and the IAEA derive their status and authority from several Conventions whose main objective is the non-proliferation of nuclear weapons: *Treaty for the Prohibition of Nuclear Weapons in Latin America and the Carribean* [hereinafter *Tlateltolco Treaty*],[406] the *African Nuclear Weapon Free Treaty* [hereinafter *Pelindaba Treaty*],[407] and the *NPT*.

---

[404]But see Birnie and Boyle *supra* note 97 at 262-3.
[405]Article II of the *IAEA Statute*, *supra* note 250.
[406]*Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean,* [hereinafter *Tlateltolco Treaty*], adopted14 February 1967, entry into force 22 April 1968, 634 U.N.T.S. , No. 9068. On 3 July 1990, the word "Caribbean" was officially added to the name of the treaty in resolution 267 (E-V), in conformity with Article 7 of the Treaty.
[407]*African Nuclear Weapon Free Treaty* [hereinafter *Pelindaba Treaty*], adopted 11 April 1996, IAEA INFCIRC/512.

The IAEA first established the safeguards system in 1961.[408] Since then, the safeguards system has been reviewed and revised. The latest revision was done in 1968.[409]

There are three measures that may be established in a safeguards agreement:[410]

1) *Material accountancy*. States account for the whereabouts of the fissionable material under their control in a report submitted to the IAEA.

> (A)ll source of fissionable material in all peaceful nuclear activities within the territory of the contracting State, under its jurisdiction or carried our under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear devices[411]

are subjected to the safeguards system. In particular,

- those supplied under a project agreement;
- or those submitted to safeguards under a safeguards agreement, unilaterally, bilaterally, or multilaterally;
- or those produced, processed, or used in a principal nuclear facility under a safeguards agreement or a projects agreement;
- or those materials produced in or by the use of safeguarded nuclear materials;
- or those substituted for safeguarded nuclear material[412]

are subject of the measures implemented under the safeguards system.

---

[408]IAEA, *The Agency's Safeguards System* (1961), IAEA INFCIR/26.
[409]IAEA, *The Agency's Safeguard System* (1961, as Extended in 1964), IAEA INFCIRC/26 and Add.1; *The Agency's Safeguard System* (1965), IAEA INFCIRC/66; *The Agency's Safeguard System* (1965, as Provisionally Extended in 1966), IAEA INFCIRC/66/Rev.1; *The Agency's Safeguard System* (1965, as Provisionally Extended in 1966 and 1968); IAEA INFCIRC/66/Rev.2. [Hereinafter IAEA Safeguards System].
[410]*Ibid.* IAEA, "International Safeguards and the Peaceful Uses of Nuclear Energy", On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/factsheets/safeguards.html> (Date accessed: 17 August 1999).
[411]*Ibid.* Part I.2, *Structure and content of agreements between the IAEA and States parties*, as required in connection with the *NPT*, IAEA INFCIRC/153 (Corr), 1970.
[412]*Ibid.*

2) *Containment and surveillance techniques*. Nuclear energy generating States are obligated to install containment and surveillance measures, such as film and tv cameras in a nuclear installation, and security seals on any nuclear material. [413]

3) *Inspection or verification by IAEA inspectors*. Inspection and verification allows the IAEA to confirm the reports submitted by States as well as check and verify the integrity and sufficiency of containment and surveillance measures in the nuclear facilities.[414]

The safeguards system, however, allows exempted nuclear material that otherwise would have been subjected to the system. Nuclear exempt materials include those materials which may not at any time exceed 1 kilogram in total of special fissionable material, which may consist of one or more of the following: plutonium, uranium with an enrichment of 0.2 (20%) and above; uranium with an enrichment below 0.2% (20 %) and above that of natural uranium; 10 metric tons in total of natural uranium and depleted uranium with an enrichment above 0.0005 (.5%); 20 metric tons of depleted uranium with an enrichment of 0.005 (5%) or below; and 20 metric tons of thorium.[415] The low radioactive content and enrichment percentage of the exempt nuclear materials render them insignificant for purposes of production of nuclear devices or explosives.[416]

As of 31 December 1998, 222 safeguards agreements were in force with 138 States; 126 of these were in accordance with the NPT.[417] Seven of the nine States party to the *Treaty in the South East Asia Nuclear Weapon Free Zone* [hereinafter *Treaty of*

---

[413] *Ibid.* .
[414] *Ibid.*
[415] *Ibid.* .
[416] Return Shipment, *supra* note 152.
[417] *1998 IAEA Annual Report, supra* note 230.

Bangkok] and all 11 of the signatories to the *South Pacific Nuclear Free Zone Treaty* [hereinafter *Rarotonga Treaty*][418] have safeguards agreements in pursuance of their obligations under the *NPT*.[419] Thirty-one of the thirty-two Contracting Parties to the *Treaty of Tlatelolco* also have safeguards agreements with the IAEA[420] that are either simultaneously in pursuance of the *NPT* or are compatible with the *NPT*.[421]

The IAEA safeguards system does not grant any executive power to the IAEA to physically prevent the diversion of nuclear material. The IAEA acts only as "an inspection, detection and alarm mechanism."[422] Its limited mandate is further constricted with its organizational and financial constraints.[423] When there is any possible diversion of nuclear materials, the Director General reports it to the IAEA Board of Governors, who will then report it to the General Assembly of the United Nations and to the Security Council.[424] The Security Council is the only UN body with executive power to impose sanctions upon any State that illegally diverts nuclear materials for purposes other than peaceful.[425]

The safeguards system has generally been successful in accounting for declared nuclear materials. There have been only a few cases of possible diversions, and no known record of diversion during transportation of radioactive materials. The most

---

[418]*South Pacific Nuclear Free Zone Treaty*, 6 August 1985, entry into force 11 December 1986, IAEA INFCIRC/331.
[419]*Ibid.*
[420]*Ibid.*
[421]*Ibid.* Annex to the *1998 IAEA Annual Report, supra* note 230.
[422]IAEA, *The IAEA's Safeguards System, Ready for the 21st Century*, On line: IAEA Web site < http://www.iaea.org/worldatom/inforesource/other/safeguards2/intro.html> (Date accessed: 21 June 1999). [Hereinafter Safeguards System for the 21st Century].
[423]*Ibid.*
[424]*Ibid.*

serious was the 1991 discovery of a clandestine nuclear program in Iraq, party to the *NPT.*[426] The IAEA conducted verification and other safeguard measures. On 23 February 1998, Iraq entered into a Memorandum of Understanding with the United Nations in order to facilitate the verification activities of the United Nations Special Commission [hereinafter UNCOM] and the IAEA into sites described by Iraq as 'sensitive'.[427] On 31 October 1998, however, Iraq ceased to cooperate with the UNCOM and IAEA, reducing further any guarantee that Iraq complies with its obligations under the *NPT.*[428]

The Iraqi incident resulted in the revision and strengthening of the safeguards system. The revised safeguards system is designed to keep track of both declared and undeclared nuclear materials and activities of States. The revised safeguards system grants more access to the IAEA on nuclear activities of States. To implement the new system, the IAEA has invited States to sign an Additional Protocol to their existing safeguards agreements that would increase its powers in the safeguarding of nuclear materials. As of 31 December 1998, the IAEA Board of Governors was successful in concluding Additional protocols with 38 States. Of these 38, five (5) Additional Protocols had already entered into force and one (1) is being implemented.[429]

---

[425]Articles 24.1 and 25, *Charter of the United Nations*, entry into force 24 October 1954, 1 U.N.T.S. xvi.
[426]Safeguards System for the 21st Century, *supra* note 422.
[427]*1998 IAEA Annual Report, supra* note 230.
[428]*Ibid.*

2. Convention on the Physical Protection of Nuclear Materials

The safeguards agreement system under the *NPT* framework was for the purpose of safeguarding these nuclear materials from their owner-governments or other governments that may be tempted to divert these materials for proliferation purposes.[430] The possibility of diversion of nuclear materials by civilian elements has become a major concern.[431] In response to the increasing risks facing civilian diversion of nuclear materials, the *Convention on the Physical Protection of Nuclear Material* was adopted.[432] It was opened for signature on 3 March 1980 and entered into force on 8 February 1987.[433] As of 1 April 1999, 64 States had become parties.[434]

The *Convention on Physical Protection* was conceived under the *NPT* framework[435] and confirms the right of all States to develop and apply nuclear energy for peaceful purposes and their legitimate interests in the potential benefits to be derived from the peaceful application of nuclear energy. It establishes the framework from which the international community can facilitate the safe use, storage and transfer of nuclear

---

[429]IAEA Press Release, " Implementation of IAEA Safeguards in 1998", 17 June 1999, IAEA PR 99/6, On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/pressrelease/prn0699.html> (Date accessed: 30 June 1999).

[430]G. Bunn "Physical Protection of Nuclear Materials, Strengthening Global Norms," On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/bulletin/bull394/bunn.html> (Date accessed: 15 July 1999).

[431]*1998 IAEA Annual Report, supra* note 230.

[432]*The Convention on the Physical Protection of Nuclear Material*, adopted May 1980, entry into force, 8 February 1987, IAEA INFCIRC/274/Rev.1. [Hereinafter *Convention on Physical Protection*].

[433]*Addendum to the Convention on the Physical Protection*, October 1995, IAEA INFCIRC/274/ Rev.1/ Add.5.

[434]IAEA, "Status of the *Convention on the Physical Protection of Nuclear Material,*" On line: IAEA Web site <http://www.iaea.org/worldatom/glance/legal/cppn.htlm > (Date last updated: 1 April 1999).

[435]The *Convention on Physical Protection* was a U.S. initiative in 1974 that was endorsed at the 1975 *NPT* review conference.

material, as well as recovery and return of stolen nuclear material. It also provides for penal provisions for commission of prohibited acts.

The security provisions of the *Convention on Physical Protection* are instituted from the moment a nuclear material departs from a facility of the shipper in the State of origin and ends with the arrival at a facility of the receiver within the State of ultimate destination.[436] This means that the even if nuclear material has not left the nuclear facility, Contracting States are already obligated to provide security measures for nuclear materials bound for international transport.

The nuclear material covered under this *Convention* are plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore-residue; and any material containing one or more of the foregoing.[437] These nuclear materials may be used to manufacture nuclear weapons or explosives.

Under this Convention, a State Party shall take appropriate steps within the framework of its national law and consistent with international law to ensure as far as practicable that, during international nuclear transport, nuclear material within its territory, or on board a ship or aircraft under its jurisdiction insofar as such ship or aircraft is engaged in the transport to or from that State, is protected at the levels described in Annex I of the *Convention*.[438] The levels of physical protection of nuclear

---

[436]Article 1, *Convention on Physical Protection, supra* note 432.
[437]*Ibid.* Article 1(a), *Convention on Physical Protection.*
[438]*Ibid.* Article 3, *Convention on the Physical Protection.*

material depend on its form and weight.[439] Again, protection measures under this Convention necessarily include radiation containment measures.[440]

In particular, the State of origin and the Receiving State are not allowed to permit the international transport of nuclear material unless there is an assurance of its physical protection.[441] The transit by land or inland waterways or in airports or seaports in States not parties to the Convention is not allowed unless the Transit State receives assurance for the physical protection of the nuclear material while in transit.[442] The sending and receiving States are thus responsible for identifying and informing in advance all States that the nuclear material is expected to transit by land or internal waterways, or whose airports or seaports it is expected to enter.[443] Whenever appropriate, State Parties concerned shall also exchange information with each other or international organizations for the purpose of protecting threatened nuclear material, verifying the integrity of the shipping container or recovering unlawfully taken nuclear material.[444]

The exchange of information regarding any international transport of nuclear material, however, is shrouded under the vague but useful cloak of "confidentiality." Article 6 of the Convention provides that State Parties are not required to provide any information which they are not permitted to communicate pursuant to their national law or which would jeopardize the security of the State concerned or the physical protection of nuclear material.

---

[439] *Ibid.* Annex II of the *Convention on the Physical Protection.*
[440] *Ibid.*
[441] *Ibid.* Article 4 (1, 2, and 3), *Convention on the Physical Protection.*
[442] *Ibid.*
[443] *Ibid.* Article 4 (5) *Convention on the Physical Protection*
[444] *Ibid.* Article 5 (2) *Convention on the Physical Protection.*

Moreover, in addition to sending assurances of physical protection, the State Parties involved in the international transport of nuclear material have the responsibility of coordinating recovery and response operations in the event of any unauthorized removal, use or alteration of nuclear material or in the event of credible threat thereof.[445] Other State Parties, in accordance with their national law, are required to provide co-operation and assistance to the maximum feasible extent in the recovery and protection of such material to any State that so request.[446]

The *Convention on Physical Protection* considers the intentional commission of the following acts as punishable under the national law of State Parties. These are:

1) An act without lawful authority which constitutes the receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material and which causes or likely to cause death or injury to any person or substantial damage to property; or the attempt to commit the above act;

2) A theft or robbery of nuclear material; or the attempt to commit the above acts;

3) An embezzlement or fraudulent obtaining of nuclear material; or the attempt to commit the above act;

4) An act constituting a demand for nuclear material by threat or use of force or by any other form of intimidation;

5) A threat to use nuclear material to cause death or serious injury to any person or substantial property damage;

6) A threat to commit a threat or robbery in order to compel a natural or legal person, international organization or State to do or to refrain from doing any act;

7) Or an act which constitutes the participation in any of the acts described above.[447]

---

[445] *Ibid.* Article 5 (1) *Convention on the Physical Protection*
[446] *Ibid.* Article 5 (2) *Convention on the Physical Protection*
[447] *Ibid.* Article 7 *Convention on the Physical Protection.*

3. *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation*

Threats and actual acts of piracy and robbery, as mentioned in Chapter 3, intensify the security risks attached to the carriage of nuclear materials. Radioactive materials have high commercial, political, and military value. Fears that a vessel carrying nuclear materials is a floating magnet attracting terrorists and other criminal elements (pirates and robbers) is not a far-fetched claim.

It was upon the urging of the UN General Assembly, in UNGA Resolution 40/61 of 9 December 1985, that the IMO studied violence at sea in the context of safety in navigation. The IMO Assembly came up with "Measures to prevent unlawful acts that threaten the safety of ships and the security of their passengers and crews."[448] The IMO MSC subsequently prepared detailed guidelines intended to assist States when reviewing and where necessary strengthening port and on-board security measures.[449]

Not satisfied with recommendatory measures that the IMO prepared, the Governments of Austria, Egypt, and Italy proposed and presented a draft Convention during the 1987 57th session of the IMO Council. The draft Convention was to provide for a comprehensive framework to suppress unlawful acts committed against the safety of maritime navigation.[450] The IMO organized an international Conference for the adoption of the draft. On 10 March 1988, the *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation* [hereinafter *IMO Unlawful Acts Convention*]

---

[448]IMO resolution A.584(14).

[449]*Law of the Sea Report of the Secretary-General,* U.N.G.A. 41st Session, 28 October 1986, U.N.G.A. Doc.: A/41/742. Please refer to IMO Document MSC/Circ.443, 26 September 1986.

was adopted in Rome and it entered into force on 1 March 1992.[451] To date, it has 41 Contracting States which represent 43.71% of the world shipping tonnage.[452]

The main purpose of this Convention is to ensure that appropriate action, either extradition or prosecution, [453] are undertaken against persons committing the following acts[454] under Article 3:

(a) seizes or exercises control over a ship by force or threat thereof or any other form of intimidation;

(b) performs an act of violence against a person on board a ship that is likely to endanger the safe navigation of that ship;

(c) destroys a ship or causes damage to a ship or to its cargo which is likely to endanger the safe navigation of that ship;

(d) places or causes to be placed on a ship, by any means whatsoever, a device or substance which is likely to destroy that ship, or cause damage to that ship or its cargo which endangers or is likely to endanger the safe navigation of that ship;

(e) destroys or seriously damages maritime navigational facilities or seriously interferes with their operation, if any such act is likely to endanger the safe navigation of a ship;

(f) communicates information which is known to be false, thereby endangering the safe navigation of a ship;

(g) injures or kills any person, in connection with the commission or the attempted commission of any of the offenses set forth above.

---

[450]*Law of the Sea Report of the Secretary-General*, U.N. G.A. 42nd Session, 8 November 1987, U.N.G.A. Doc.:A/42/688, at 81. [Hereinafter *1987 Law of the Sea Report*].

[451]*Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation*, done in Rome, March 10, 1988, entry into force 1 March 1992, 27 I.L.M. 668 (1988). [Hereinafter *IMO Unlawful Acts Convention.*].

[452]IMO, "Summary of Status of Conventions", On line: IMO Web site <http://www.imo.org/convent/summary.html> (Last date updated: 30 June 1999).

[453]Article 10 *IMO Unlawful Acts Convention*, *supra* note 451.

[454]*Ibid.* The attempt to commit, as well as to abet in any of the acts penalized are likewise punishable under Article 3(.2). *IMO Unlawful Acts Convention.*

The *IMO Unlawful Acts Convention* does not provide for protection or security measure in the vulnerable areas. The Contracting States are obligated to either extradite or punish the offender within their territory or control.

Alarmed with the continuing threats and dangers posed by robbery and piracy at sea, the IMO came up with two circulars in 1993 to assist States and ship-owners in responding to acts of piracy and robbery. The first circular is the 'Recommendations to Governments for combatting piracy and armed robbery against ships.'[455] This circular analyzes the types of attacks encountered by ships in different parts of the world and suggests possible counter-measures that could be employed by Rescue Co-ordination Centres and security forces. The second circular is 'Guidance to shipowners and ship operators, shipmasters and crews on preventing and suppressing acts of piracy and armed robbery against ships.'[456] This circular contains advice on measures that could be taken onboard to prevent attacks or, when they occur, to minimize the danger to the crew and ship.

F. Prior notification and consultation

Under international law, States have the right to be informed and consulted when hazardous wastes and substances are moved to their territories or jurisdictions for disposal or storage purposes. The nuclear legal regime had to develop its own set of rules regarding the transboundary movement of radioactive wastes because radioactive wastes were expressly excluded from the coverage of the 1989 *Basel Convention on the Control*

---

[455]IMO MSC/Circ.622.
[456]IMO MSC/Circ.623.

of Transboundary Movements of Hazardous Waste and their Disposal.[457] Article 1.3 of the *Basel Convention* states: "wastes which, as a result of being radioactive, are subject to other international control systems, including international instruments, applying specifically to radioactive materials, are excluded from the scope of this Convention."

Two instruments contain rules on prior notification and consultation on the movement of radioactive wastes: the *Code of Practice on the International Transboundary Movement of Radioactive Waste*[458] and the *Joint Convention.*[459]

The *Code of Practice,* a recommendatory document, applies to all international transboundary movements of radioactive wastes.[460] The sovereign right of every State to prohibit the movement of radioactive waste into, from or through its territory is affirmed in the *Code of Practice.*[461] Any international transboundary movement of radioactive wastes must thus, be undertaken with the prior notification and consent of the sending, receiving and transit States, in accordance with their respective law and regulations.[462]

---

[457]*Basel Convention, supra* note 145,

[458]*Code of Practice on the International Transboundary Movement of Radioactive Waste,* 13 November 1990, IAEA INFCIRC/386. [Hereinafter *Code of Practice*].

[459]*Joint Convention, supra* note 145.

[460]*Ibid.*

[461]*Ibid.* Article III.3.

[462]Article III.5 *Code of Practice, supra* note 458. Moreover, States involved in the international transboundary movement of radioactive waste are also mandated under the *Code of Practice* to take appropriate steps necessary, including the adoption of laws and regulations, to ensure that the international transboundary movement of radioactive waste is carried out in accordance with the *Code Practice* (Article III.9); to take appropriate steps to introduce into its national laws and regulations relevant provisions as necessary for liability, compensation or other remedies for damage that could arise from the international transboundary movement of radioactive waste (Article III.8); to establish the administrative and technical capacity and regulatory structure to manage and dispose of such waste in a manner consistent with international safety standards (Articles III.4 and III.7, first sentence); to co-operate at the bilateral, regional and international levels for the purpose of preventing any international transboundary movement of radioactive waste that is not in conformity with the *Code of Practice* (Article III.11); and to take the

The rules concerning the transboundary movement of radioactive wastes in the *Joint Convention* are based on the *IAEA Code of Practice*,[463] and thus reflect the prior notification and consultation rule of the recommendatory instrument. Prior notification and consultation involves only the Sending, Transit and Destination States.[464] The Coastal States, whose only link to these international transfers is the use of their maritime zones by vessels carrying radioactive wastes, are excluded from the system of prior notification and consultation. The main reason why Coastal States are excluded is the

---

appropriate steps necessary to permit readmission into its territory of any radioactive waste previously transferred from its territory when the transfer of radioactive waste cannot be completed (Article III.10).

[463]W. Tonhauser and O. Jankowitsch, "The Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", 60 NLB 9 (1997) at 17.

[464]Article 27.1 of the *Joint Convention, supra* note 145, reads as follows:

Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which as a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which as a State of origin shall take the appropriate steps to re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

navigational freedom of foreign vessels under customary international law, which is affirmed under Article 27(3)(I) of the *Joint Convention*.[465]

The right of innocent passage and the freedom of navigation are established under customary international law and codified in the *LOSC*. The only requirement that *LOSC* imposed upon foreign vessels in the passage through territorial waters is contained in Article 23. Vessels carrying nuclear materials and radioactive waste are required to carry documents and observe special precautionary measures established by international agreements while exercising their right of innocent passage. Vessels that are carrying nuclear materials and radioactive waste passing through the EEZ are bound to observe the marine environmental protection measures of the Coastal State.[466] As long as the passage of the vessel does not violate the marine protection regulations, it may pass through the EEZ beyond the regulatory reach of the Coastal State.

In addition, Article 211 of the *LOSC*, requires that the laws and regulations of the Coastal States to protect their marine environments must not hamper innocent passage of foreign vessels. Thus, as long as passage of the foreign vessels carrying nuclear materials are within the requirements of the *LOSC*, prior notification to and consultation with Coastal States are not sanctioned under international law.

As of 11 August 1999, the *Joint Convention* had 39 signatory States and 11 Contracting Parties. Of the seven (7) major nuclear power generating States, only

---

[465]*Ibid.* Article 27(3)(I) of the *Joint Convention* reads: "Nothing in this Convention prejudices or affects (I) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law."
[466]*Ibid.* Article 56 (2), *LOSC, supra* note 135.

Germany had ratified it on 13 October 1998.[467] Japan did not sign nor ratify the *Joint Convention*.[468]

G. Contingency and emergency measures

1. Communications system

Chapter IV of *SOLAS* mandates a radio-based communications system. Since 1970, however, IMO worked to institute a satellite-based system of communications in anticipation of the congestion in radio traffic. The *1988 (GMDSS) Amendments to SOLAS*[469] as well as the *Convention on the International Maritime Satellite Organization, 1976*[470] accommodated new technology to improve communications to assist vessels in distress, improve the efficiency and management of ships, maritime public correspondence services and radiodetermination capabilities.[471] The GMDSS system requires every ship to carry equipment designed to improve its chances of rescue following an accident. These equipments include satellite emergency position indicating radio beacons and search and rescue transporders for the location of the ship or survival craft.[472]

---

[467]IAEA, "Status of Signatories of Multilateral Instruments Opened for Signature on 29 September 1997," On line: IAEA Web site < http://www.iaea.or.at/ worldatom/ updates/ status.html > (Date last updated: 11 August 1999).
[468]*Ibid.*
[469]*1988 (GMDSS) Amendments to SOLAS*, entry into force 1 February 1999, *supra* note 227.
[470]*Convention on the International Maritime Satellite Organization, 1976*, adopted 3 September 1976, entry into force 16 July 1979.
[471]IMO, "Maritime Safety", On line: IMO Web site < http://www.imo.org/imo/convent/ safety.htm > (Date accessed: 1 October 1998).

2. During radiological emergencies

The international nuclear regime provides for binding obligations to the environment when an excessive accidental radiological release has occurred. Radiation or nuclear accident refers to an event which leads or could lead to abnormal exposure conditions.[473]

Following the catastrophic consequences of the Chernobyl meltdown in 1986, two Conventions were drafted and adopted to respond to nuclear emergencies. The first is the *Convention on Early Notification of a Nuclear Accident* [hereinafter *Convention on Early Notification*].[474] The second is the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* [hereinafter *Convention on Assistance*].[475]

The *Convention on Early Notification* applies in the event of any accident involving facilities or activities of a State Party or of persons or legal entities under its jurisdiction or control, from which a release of radioactive materials occur or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State.[476] One of the activities governed by the *Convention on Early Notification* is the transport and storage of nuclear

---

[472]IMO, "Action dates" On line: IMO Web site < http://www.imo.org/convent/eifdates.htm > (Date accessed: 17 August 1999).

[473]IAEA Safety Series No. 76, *Radiation Protection Glossary, 1986*, as reprinted in ElBaradie, *supra* note 186 at 174, 198 and 200.

[474]*Convention on Early Notification of a Nuclear Accident*, adopted 24-26 September 1986, entered into force, 27 October 1986, IAEA INFCIRC/335. As of 1 April 1999, there were 84 state parties and 70 signatory parties. The top six nuclear energy producing countries have either signed or ratified the Convention. [Hereinafter *Convention on Early Notification.*]

[475]*Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*, adopted 26 September 1986, entered into force 26 February 1987, IAEA INFCIRC/336. [Hereinafter *Convention on Assistance.*]

fuels and radioactive wastes under Article 1.2(d). Its provisions are thus applicable to the maritime carriage of nuclear or radioactive material by regular cargo vessels.

Notification. In the event of a nuclear accident, the State Party that has jurisdiction or control of the event or activity in question has the responsibility to notify and inform the IAEA and the affected State, which may not necessarily be a State Party.[477] In case of nuclear accidents with radiological significance determined as minimum, the State Party having jurisdiction or control over it has the discretion of notifying the affected States.[478] The responsible State must provide information on the following: the nature of the nuclear accident, the time of its occurrence and its exact location where appropriate.[479] The obligation to notify and inform starts as soon as the radiological event occurs in the State. The *Convention on Early Notification* used the terms "forthwith" and "promptly."[480] Nevertheless, this right to information is limited and dependent on the State that has control and/or jurisdiction of the source of excessive radiation. It is up to the State that has control and/or jurisdiction of the nuclear activity to determine when the radiological event becomes significant for another State.

Consultation. In addition to its duty of notification and information, the responsible State Party also has an additional duty, as far as reasonably practicable, to respond promptly to a request for consultations by the affected State Party for the purpose of minimizing the radiological consequences.[481]

---

[476]Article 1.1, *Convention of Early Notification, supra* note 474.
[477]*Ibid.* Article 2 (a) and (b), *Convention on Early Notification.*
[478]*Ibid.* Article 3, *Convention on Early Notification.*
[479]*Ibid.* Article 2, *Convention on Early Notification.*
[480]*Ibid.* Article 2, *Convention on Early Notification.*
[481]*Ibid.* Article 6, *Convention on Early Notification.*

The *Convention on Assistance* also applies when a radiological emergency or nuclear accident occurs. Since the objective of the *Convention on Assistance* is to minimize the consequences of radioactive releases as well as to protect life, property and environment from radiological releases,[482] State Parties are obliged to cooperate between and among themselves and with the IAEA to facilitate prompt assistance in the event of a nuclear accident or radiological emergency.[483] In the event of a nuclear accident or radiological emergency, whether or not it originates in the affected State Party's territory, assistance can be provided by any State Party, directly or through the mediation of the IAEA.[484]

Assistance to an affected State Party is not automatic. The *Convention on Assistance* stipulates that a State Party request for assistance, whether or not the accident or emergency originates within its territory, jurisdiction or control.[485] State Parties providing assistance, within the limits of their capabilities, must identify and notify the IAEA of the equipment and materials that could be made available to the affected State Party.[486]

Assistance is not available to a State not Party to the Convention. Coastal States who may be vulnerable to potential radiation from vessels with radioactive materials passing through their maritime zones have to be parties to this Convention before they may request for assistance.

---

[482]Article 1, *Convention on Assistance*, *supra* note 475.
[483]*Ibid.*
[484]*Ibid.* Article 2.1 of the *Convention on Assistance.*
[485]*Ibid.*
[486]*Ibid.* Article 2.4 of the *Convention on Assistance.*

In both Conventions, the IAEA plays a significant role in the facilitation of notification and assistance.[487] Article 4 of the *Convention on Early Notification* mandates the IAEA to inform State Parties, Member States, other States which are or may be physically affected and relevant international organizations when it receives a notification regarding a radiological emergency. The IAEA is also responsible under Article 4 of this Convention, to promptly provide any State Party, Member State, or relevant organization, information relevant to minimizing the radiological consequences.[488]

Under Article 5 of the *Convention on Assistance*, the functions of the IAEA, when so requested by a State Party or a Member State, include collection and dissemination of information regarding experts, equipment and materials and methodologies, techniques and available results of research that may be of value to the radiological emergency.[489]

The *Convention on Early Notification* is open to States without nuclear energy generation programs or activities.[490] As of 1 April 1999, there were 84 State Parties to the

---

[487] *1987 Law of the Sea Report, supra* note 450.
[488] Article 2(b) of the *Convention on Early Notification, supra* note 474.
[489] *Ibid.* Article 5 of the *Convention on Assistance, supra* note 475, further mandates the IAEA, when requested by a State Party or a Member State, to assist in (1) preparing both emergency plans in the case of nuclear accidents and radiological emergencies and the appropriate legislation; (2) developing appropriate training programmes for personnel to deal with nuclear accidents and radiological emergencies; (3) transmitting requests for assistance and relevant information in the event of a nuclear accident or radiological emergencies; (4) developing appropriate radiation monitoring programmes, procedures and standards; (5) conducting investigations into the feasibility of establishing appropriate radiation monitoring systems. In addition, the IAEA must also make available to a State Party or to a Member State requesting assistance in the event of a nuclear accident or radiological emergency appropriate resources allocated for the purpose of conducting an initial assessment of the accident or emergency, offer its offices to the Member State or Contracting Party requesting assistance, and establish and maintain liaison with relevant international organizations for the purposes of obtaining and exchanging relevant information and data, and make a list of such organizations available to State Parties, Member States, and the aforementioned organizations.
[490] *Ibid.* See Article 8 of the *Convention on Early Notification.*

Convention that included the major nuclear energy generating States.[491] The *Convention on Assistance*, on the other hand, has seventy-nine (79) States Parties as of 1 April 1999.[492]

3. Salvage

One of the major concerns of States protesting the regular shipments of nuclear materials and radioactive wastes is the alleged weak and overly-commercial nature of the salvage regime. The *1989 International Salvage Convention*[493] was adopted to strengthen the salvage regime and to integrate environmental considerations. The new *Salvage Convention* has two purposes: to encourage salvage measures and to protect the marine environment from the consequences of accidents. The Convention intends to achieve the two purposes by providing an incentive for salvors to take measures to protect the environment, even if those measures may have no useful result. The Convention in Article 14(2) awards a special compensation of up to 30% of the expenses incurred by the salvor by the owner if the salvor has prevented or minimised damage to the environment. The competent tribunal may increase the incentive by up to 100% if it is the fair and just scheme. The salvor is also subjected to a negative incentive if by its negligence, it fails to minimise environmental damage. The salvor may be deprived of the whole or part of its special compensation.[494]

---

[491]IAEA, "Status of the *Convention on Early Notification of a Nuclear Accident*," On line: IAEA Web site < http://www.iaea.org/worldatom/glance/legal/cenna.html > (Date last updated: 1 April 1999).
[492]IAEA, "Status of the *Convention on Assistance*," On line: IAEA Web site < http://www.iaea.org/worldatom/glance/legal/cacnare.html> (Date last updated: 1 April 1999).
[493]*1989 International Salvage Convention*, adopted 28 April 1989, entry into force 14 July 1996, IMO Leg/Conf.7/27, 2 May 1989.
[494]*Ibid.* Article 14(5) *Salvage Convention.*

Coastal States may initiate remedial measures with respect to pollution or threat thereof from a maritime casualty notwithstanding salvage activity by another. Article 9 of the *Salvage Convention* provides:

> Nothing in this Convention shall affect the right of the coastal State concerned to take measures in accordance with generally recognised principles of international law to protect its coastline or related interests from pollution or the threat of pollution following upon a maritime casualty or acts relating to such a casualty which may reasonably be expected to result in major harmful consequences, including the right of the coastal state to give directions in relation to salvage operations.

As of 1 May 1999, the *Salvage Convention* has 45 Contracting States, representing only 26.82 of the world tonnage.[495] The insignificant number of Contracting Parties to this Convention is one of the reasons why Coastal States are apprehensive about the maritime shipment of nuclear materials and radioactive wastes.

H. Liability and accountability

The international liability conventions for damages arising from nuclear harm are all civil liability conventions. These Conventions are: The *OECD Convention on Third Party Liability in the Field* of *Nuclear Energy (Paris Convention)*;[496] the *Brussels Convention Supplementary to the Paris Convention of 29th July 1960 on Third Party Liability in the Field of Nuclear Energy*;[497] the *Convention on Civil Liability for Nuclear Damage (Vienna Convention)*;[498] the *Joint Protocol Relating to the Application of the*

---

[495]IMO, *Summary of Status of Conventions as of 1 May 1989, supra* note 452.
[496]*Convention on Third Party Liability in the Field* of *Nuclear Energy*, 29 July 1960, entry into force 1 April 1968, [hereinafter *Paris Convention*], 956 U.N.T.S. 251.
[497]*Brussels Convention Supplementary to the Paris Convention of 29th July 1960 on Third Party Liability in the Field of Nuclear Energy*, 31 January 1963, entry into force 4 December 1974, 1041 U.N.T.S. 358.
[498]*Convention on Civil Liability for Nuclear Damage* [hereinafter *Vienna Convention*], 29 May 1963, entry into force 12 November 1977, 1063 U.N.T.S. 256.

Vienna Convention and the Paris Convention;[499] the *Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material*;[500] and *Convention on the Liability of Operators of Nuclear Ships*.[501]

The basic features of the civil liability Conventions for nuclear harm are:

- exclusive liability channeled exclusively to the operator of the nuclear installation involved;
- absolute or strict liability;
- limitations on the amount of liability;
- compulsory financial security; and
- judgments enforceable in any of the States parties. [502]

The *Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material* is the liability regime applicable to the maritime carriage of nuclear material. The IAEA, the OECD/NEA and the IMO sponsored this Convention.[503] Prior to the *Civil Liability for Maritime Carriage of Nuclear Material*, there was a lot of confusion as to which liability regime would apply for any harm arising from the maritime carriage of nuclear material.[504] Both the operator of the nuclear installation from which the nuclear material came from and the owner of the vessel carrying the nuclear material could have been made liable under separate liability regimes. The

---

[499]*Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention*, 21 September 1988, entry into force 27 April 1992; 42 NLB 56 (1988).
[500]*Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material*, adopted December 1971, entry into force 15 July 1975, IAEA INFCIRC/500.
[501]*Convention on the Liability of Operators of Nuclear Ships*, 25 May 1962, not yet in force, 57 A.J.I.L. 268 (1963).
[502]OECD/NEA, *supra* note 213 at 21-27.
[503]*Ibid.* at 60.

operator of the nuclear installation might be held liable under the *Paris* and *Vienna Conventions*. The owner of the vessel could also be held liable if its Flag State is a Party to any of the maritime civil liability regimes. The international organizations decided to channel the liability to the operator of the nuclear installation. Thus, under Article 1 of the *Civil Liability for Maritime Carriage of Nuclear Material*, any person who might be held liable for nuclear damage in the course of maritime carriage by virtue an international convention or a national law, is exonerated if the operator of a nuclear installation is liable for such damage under either the *Paris* or the *Vienna Conventions*. Thus, the *Civil Liability for Maritime Carriage of Nuclear Material* did not establish a new civil liability regime. It merely clarified the entity liable in case of nuclear damage arising from the maritime carriage of nuclear materials.

The civil liability conventions for nuclear harm have been criticized on several grounds.[505] However, since liability for nuclear harm is not the focal point of this study,

---

[504]*Ibid.* at 59.

[505]The accident in Chernobyl resulted in an extensive damage to property and injury to persons as well as contamination of the soil, water and air in many countries in Europe. The damages, including costs for preventive, mitigating, and remedial measures ran into billions of dollars. The civil liability conventions, in particular the *Vienna* and the *Paris Conventions* were found to be inadequate. Some of the weaknesses of the two Conventions are: "insufficient coverage geographically, insufficient compensation, restrictive definition of nuclear damage, overly brief time limits for the submission of claims, difficulties in the proof of causation and of damage, excessive exonerations and lack of provision for compensation if an exoneration applies, lack of priorities in the distribution of compensation, lack of harmonization between the two conventions and among the parties of each convention, military facilities are not expressly included, the difficulty and expense of private lawsuits conducted by individual victims, inability of municipal courts to deal with possibly thousands of claimants, as well as with complex scientific and technical evidence, and the lack of recognition of State responsibility for activities within a State's jurisdiction or control, and the corresponding incentive for States to ensure that their nuclear facilities are as safe as possible." *Ibid.* at 105 to 106.

only the issues relevant to the concerns of Coastal States and the separate protection of the marine environment will be discussed.

One of the drawbacks of the civil liability conventions in the context of maritime carriage of nuclear materials and radioactive wastes is their non-applicability for damages suffered in the territory of non-contracting States. Under the *Paris Convention,* Contracting States may extend the benefits of the convention to non-member States.[506] But the extension of benefits to non-contracting States is discretionary, not obligatory.[507]

The geographical membership of both the *Vienna* and the *Paris Conventions* is limited. Many Coastal States, potential victims to risks of excessive radiation from the maritime shipments of nuclear materials and radioactive wastes are not members[508] and thus do not merit any benefit from these conventions. Another problem is the fact that some States heavily engaged in international shipments of INF materials and radioactive wastes, like Japan, are not members of these conventions.[509]

The definition of nuclear damage under these conventions is too narrow and does not include damage to environment. They also exclude preventive, mitigating, and clean-up costs. Both the *Paris Convention*[510] and the *Vienna Convention*[511] limit the term

---

[506]Article 3 *Paris Convention, supra* note 496.
[507]*Ibid.*
[508]The Parties to the *Vienna Convention* are: Argentina, Armenia, Bolivia, Brazil, Bulgaria, Cameroon, Chile, Croatia, Cuba, Czech Republic, Egypt, Estonia, Hungary, Lithuania, Macedonia, Mexico, Niger, Peru, Philippines, Poland, Romania, Slovenia, Trinidad and Tobago, and Yugoslavia. The Parties to the *Paris Convention* are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.
[509]Injured parties, however, may file claims against Japan under its *Law No. 147 of 17 June 1961 on Compensation for Nuclear Damage* as amended on 31 March 1989. Claims must be filed in Japan. This places an undue burden on victim parties who are from another country. OECD/NEA, *supra* note 213 at 70.
[510]Article 3 of the *Paris Convention, supra* note 496.

"nuclear damage" to loss of life, or any personal injury, or loss or damage to property. Damage to the marine environment and marine organisms are clearly not covered in these conventions.

In 1997, the IAEA convened a Diplomatic Conference at IAEA Headquarters in Vienna, 8-12 September 1997 to respond to the gaps and weaknesses of the liability regime for nuclear harm, particularly the *Vienna Convention*.[512] The gaps and weaknesses of the liability regime for nuclear harm had been revealed following the Chernobyl accident.[513] The IAEA worked for seven (7) years to study the liability regime and recommend revisions before the Diplomatic Conference was convened in 1997.[514] Representatives from over 80 States[515] attended and adopted a Protocol to amend the

---

[511]Article 1(k) of the *Vienna Convention, supra* note 498.

[512]IAEA, "Diplomatic Conference on Nuclear Liability concludes", 12 September 1997, IAEA PR 97/21, On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/pressrelease/prn2197.html> (Date accessed: 30 July 1999).

[513]*Ibid.*

[514]*Ibid.*

[515]The Governments of the following States were represented at the Conference: Algeria, Argentina, Armenia, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Czech Republic, Denmark, Ecuador, Egypt, Finland, France, Georgia, Germany, Greece, Guatemala, Holy See, Hungary, India, Indonesia, Iran, Islamic Republic of, Iraq, Ireland, Israel, Italy, Japan, Jordan, Korea, Republic of, Kuwait, Latvia, Lebanon, Lithuania, Luxembourg, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Slovakia, Slovenia, South Africa, Spain, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Thailand, The former Yugoslav Republic of Macedonia, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay, Viet Nam and Yemen.

1963 *Vienna Convention on Civil Liability for Nuclear Damage*[516] and also adopted the *Convention on Supplementary Compensation for Nuclear Damage.*[517]

These two instruments address major concerns that may favor all potentially affected Coastal States and the marine environments. The Protocol grants jurisdiction to Coastal States over actions for nuclear damage arising from transports passing through their maritime zones, including the exclusive economic zones. The geographical scope of the Vienna Convention has also been expanded by the Protocol, now benefiting even non-Contracting States. A Contracting State may exclude from the application of this Convention damages suffered in a non-Contracting State only when the latter has a nuclear installation and does not accord equivalent and reciprocal benefits.[518] The above proviso ensures that a non-Contracting State that has nuclear activities does benefit from the Convention.

The Protocol has expanded the definition of nuclear damage to include environmental damage. Aside from loss of personal life and loss of or damage to property, nuclear damage now also includes: economic loss arising from loss or damage to life or property, costs to repair the environment, economic loss due to significant impairment of environment, and costs of preventive measures. [519]

---

[516]*Vienna Convention on Civil Liability for Nuclear Damage* of 21 May 1963 as amended by the Protocol of 12 September 1997 [hereinafter *1997 Protocol to the Vienna Convention*], IAEA GOV/INF/822/Add. 1-GC(41)/INF/13/Add. 1.

[517]*Convention on Supplementary Compensation for Nuclear Damage*, On line: IAEA Web site <http:www.iaea.org/worldatom/update/annex2.html> (Date accessed: 10 October 1999). [hereinafter *Convention on Supplementary Compensation*].

[518]Article I A *1997 Protocol to the Vienna Convention, supra* note 516.

[519]*Ibid.* Article 1 (k) of the *1997 Protocol to the Vienna Convention.*

The *Convention on Supplementary Compensation* is designed mainly to supplement the *Vienna Convention* should the funds prove insufficient to compensate for the damages. The supplementary fund will constitute mainly of contributions from States Parties with nuclear installations. The basis of contribution would be the installed nuclear capacity, for those States with nuclear installations.[520] Article IV 1 (b) of *the Convention of Supplementary Compensation* provides that States on the minimum United Nations rate of assessment with no nuclear reactors shall not be required to make contributions.

As of 6 September 1999, out of the more than 80 States that attended the Conference and signed the Final Act for the two instruments, only two States had ratified them - Romania and Morocco.[521] The two Contracting States - Romania and Morocco - are not major nuclear energy generating States, nor are they engaged in transporting across international boundaries large volumes of radioactive materials.

While it may indeed be too soon to tell whether these two instruments will live to their promise of reforms, one cannot help but cast doubts. It took seven (7) years before these two Conventions were adopted. The draft instruments of both Conventions underwent intense consultations and negotiations in the international community.[522] One would think that consensus was already achieved because of the length of time it took to prepare the Conventions. The slow ratification process, however, belies a sense of unanimity and willingness to start the reforms on the part of the international community, particular the nuclear energy generating States.

---

[520]Article IV 1 (a) *Convention on Supplementary Compensation, supra* note 517.
[521]On line: IAEA Web site <http://www.iaea.org/worldatom/updates/status.html> (Date last updated: 6 September 1999).

IV. Analysis of the legal regime

The two worldviews appear to be reflected in the legal regime governing the maritime carriage of radioactive materials, with non-anthropocentrism gaining ground. The recent developments, particularly in the civil liability scheme and the *Salvage Convention*, now include both the concerns and interests of the Coastal States and the marine environment.

Anthropocentrism, however, remains the dominant ethics and philosophy. The primacy accorded to the right of States to undertake nuclear activities for peaceful and beneficial purposes despite the high risks to radiation exposure reflects an obvious bias in favor of economic priorities and interests. The commercial shipping interests promoted and maintained in the maritime safety regime have been a perfect complement to the economic and development interests of the nuclear legal regime. The assumption underlying the legal regime is that the benefits outweigh the costs and risks involved in the activity. This is a misleading and an unjust assumption because the entities that bear the risks do not enjoy the benefits. Only the States involved in the shipments benefit from the activity. Coastal States, whose maritime zones may be used by vessels carrying radioactive materials, are the ones exposed to the risks of the carriage. Spent fuel, reprocessed fuel such as MOX fuel and high level radioactive wastes, unless they are vitrified wastes from reprocessed plutonium or uranium, still possess harmful radioactivity. When a maritime accident occurs and radiation is released from the

---

[522]OECD/NEA, *supra* note 213 at 11 to 12.

radioactive materials, Coastal States may be in a highly vulnerable position because of their proximity to the source of radiation.

However, the legal regime does not contain participatory processes wherein all potentially affected entities may have a voice. There are no processes such as environmental impact assessment and prior notification and consultation wherein all potentially affected entities, States and non-States, may participate before any decision is made regarding a shipment. The so-called environmental impact assessment studies undertaken by various national research centers do not comply with the guidelines set by UNEP. Rather, these studies are research and experimental studies that did not even provide and formulate mitigating measures.

There is also a lack of participatory processes in the contingency plans and emergency measures. Again, the affected State becomes involved by way of receiving information, only when the danger is already imminent. The legal regime does not permit potentially affected Coastal States, to participate in the emergency system.

The primacy of the right of States to undertake nuclear activities for peaceful purposes has a serious implication for the Coastal States, particularly developing States. The authoritative survey of the IAEA regarding radiation protection capabilities of developing countries concluded that developing States

> simply lack the necessary infrastructure to implement a radiation protection policy based on international standards...They lack the basic legislation and supporting regulations, as well as effective national authorities, qualified manpower, and necessary equipment.[523]

---

[523]G. Handl, "Internationalization of Hazard Management in Recipient Countries: Accident Preparedness and Response", *supra* note 144. Handl quoted Rosen, *Adequate Radiation Protection: A Lingering Problem*, 29 IAEA Bulletin 34, at 34-5 (1987), at 107.

The legal regime left out one very important aspect, which is to ensure the capability of all potentially affected States to respond to the risks when they occur. The legal regime does not empower all potentially affected entities but rather renders them helpless in the face of potential risks created by other States. For example, the victim States under the *Convention on Notification* are supposed to determine for themselves whether a radiological emergency exists. The problem, again, is that developing Coastal States do not have the capacity to determine a radiological emergency at all.

The vulnerability of Coastal States against the potential widespread and excessive radiation is intensified because of lack of prior information and consultation about these shipments. The *Code of Practice* nor the *Joint Convention* nor any of the maritime safety laws contain any provision for prior notification and consultation with States other than between and among States of origin, destination or transit. The rationale is that to provide information would be to grant veto powers on Coastal States, in violation of the customary and conventional navigational freedoms.

States engaged in the shipment of radioactive materials suggested that the VTS and the communication systems in the maritime safety regime are sufficient and substantially respond to the requirement of information demanded by Coastal States. The communication systems set-up in the maritime safety regime does not constitute information and consultation responsive to the risks posed by the maritime carriage of radioactive materials. The information that is most proper in this situation should not only relate to the position of the vessel at any given point. The information given should also include the kind and amount of radioactive material carried by the vessel passing through their maritime zones. This type of information would assist Coastal States in determining

the level of contingency and emergency measures they might establish to protect them from the risks of the carriage. Gunther Handl calls this type of information risk communication. Risk communication is

> routine, i.e. non-emergency, flow of information about risks of hazardous installations or processes, either from industry to government, from government to the public, or from industry to the public. As an element of public policy for both minimizing consequences of accidents and preventing them in the first place, their importance can hardly be exaggerated.[524]

Risk information contains information about the hazards involved in the activity as well as instructions to the potentially affected communities what to do should an emergency occur. The lack of risk information to potentially affected entities was concluded to be a significant factor that aggravated the consequences of some of the worst industrial accidents in recent years, such as the Sveso accident in Italy.[525]

The preventive measures remain focused on safety standards and regulations for human health and safety. The upcoming *Safety Standards Series No. ST-1* still does not provide separate protection measures for the environment. The 1990 GESAMP study cautions against this approach because this does not take into account the population effects such as survival, growth and reproductive performance of marine organisms. Even the tests on the packaging conducted by national nuclear research centers cannot be the basis for asserting that a separate protection for the non-human members of the biotic community exists. Those tests were geared to assess the technical safety of packaging. While studies to test the adequacy of packaging are very important, studies should also be

---

[524] *Ibid.* at 111.
[525] *Ibid.*

conducted to determine the effect of artificial radioactive release to the marine environment if and when accidents transpire.

One would think that the principles of precautionary approach and generational equity would be expressly included or at the very least, alluded to in the new *Safety Standards Series No. ST-1* but this is not the case. The new regulations retain the largely anthropocentric framework of the old regulations. The main concern is to facilitate and assist States in their right to undertake nuclear activities for peaceful and beneficial purposes.

While it can be argued that the very notion of safety standards is preventive, a feature essential in the precautionary approach, this does not necessarily point to the adoption of a precautionary approach. The essence of the precautionary approach is preventive *and* anticipatory of any risks involved without waiting for scientific certainty.[526] Measures that are deemed to implement the precautionary approach include the use of clean and appropriate processes, environmental impact assessment, and research that will be the basis in assessing the long-term effects of the activity and in developing the corresponding legal and policy options.[527] The legal regime, as mentioned earlier, lacks environmental impact assessment procedures. Until now, the GESAMP has not been able to undertake research on the long-term effects of excessive radiation on the marine environment and marine organisms. Considering the uncertainty of the risks involved in the shipment and the lack of environmental impact assessment procedures, States that continue to engage in shipping radioactive materials, appear not to employ caution within the meaning of precautionary approach.

---

[526]D. Freestone and E. Hey, *supra* note 98 at 12.

The legal regime also does not provide a forum for the inclusion of generational equities. This is a serious void considering that radioactive materials, plutonium, for example, if and when released in harmful and excessive quantities, may continue its contamination of the environment and of the human population for thousands of years. The non-inclusion of generational equities is apparent in the fact that the containers allowed under the *Safety Standards Series No. ST-1* are not required to last as long as the radioactive materials in them. Research has revealed that containers for radioactive materials last as long as 40 years only, in contrast to the half-lives of many radioactive materials, particularly plutonium, amounting to thousands of years. The possible explanation for this is perhaps technology to manufacture packaging that may last for thousands of years does not yet exist. It is therefore highly probably that containers that sink in the bottom of the ocean may release excessive and harmful radioactivity after the maximum number of years that they are supposed to last.

The current legal regime regulating the maritime carriage of radioactive materials is what deep ecologists call shallow ecology. Shallow ecology approaches environmental problems on a superficial and myopic level.[528] Shallow ecology will ask the following questions: 1) What is the activity? 2) What are the benefits and costs the potential or

---

[527]*Ibid.* at 13.

[528]A. Naess, *supra* note 41 at 200. A. Brennan has a similar description of this type of decision-making. He calls it shallow analysis in decision-making. Shallow analysis "purports to be a reasoned statement of objectively sensible environmental priorities." It enumerates the environmental issues but it does not provide a comprehensive and interconnected account of these issues. He gives as example the pollution problems accompanying the use of automobiles. The shallow analysis recommends emissions control and car-sharing. There is no admission that the "manufacture and use of the private motor car is a major factor in the depreciation of natural capital, waste of energy and the generation of avoidable pollution." A. Brennan, "Environmental decision-

actual harm resulting from the activity? 3) What are the possible preventive measures that can be put in place? 4) Is there a liability and compensation scheme to answer for the harm caused by the activity?

The problem of harmful radiation exposure is managed by weighing the economic benefits against its costs. The risks are controlled principally by establishing permissible radiation standards and containment measures.[529]

In this approach, there is no attempt to identify and anticipate the probable results of pollution to the larger ecosystem and to the social environment, in particular, to communities that are vulnerable to the risks posed by the activity.[530] Only the short-term consequences upon property and person are compensated and considered. The long-term and non-economic effects are overlooked.

The shallow ecology regime has a strong belief on compensation and reparation as a way of resolving disputes and harms. A non-anthropocentric approach, however, reveals that the ideas of reparation and restoration are deceptive. One is deceived into believing that compensation will restore the parties and the non-human environment to the condition before the occurrence of harm. Environmental ethicists call the notion of restoration of nature a big lie, a myth.[531] A degraded environment can never be restored to its former condition.[532]

The question, is then asked, why is there a seemingly contradictory ethics and philosophy present in the legal regime? There is no contradiction. While

---

making", in R. J. Berry (ed.), *Environmental Dilemmas, Ethics and Decisions,* (London: Chapman & Hall, 1993) at 9.

[529]*Ibid.*

[530]M. Zimmerman, "General Introduction", in M. Zimmerman, *supra* note 16 at v.

[531]Brennan, *supra* note 528 at 15.

anthropocentrism remains the dominant ethics and philosophy, non-anthropocentric ethics and philosophy are attempting to gain ground. The manner of the non-anthropocentric greening, however, was never intentional and strategic. There was never any conscious discussion in the legal regime, either in the nuclear law or in maritime safety law, that any changes in them should include the abandonment of anthropocentric ethics and philosophy and the adoption of non-anthropocentrism. Any transformation in the legal regime that appear non-anthropocentric has been brought about by either a catastrophe such as the Chernobyl accident, or intense public pressure, such as the INF Code. There was never a fundamental reassessment of the ethics and philosophy underlying the legal regime. There is thus no corresponding transformation of the entire legal regime, except in the liability system and in the *Salvage Convention*. Unfortunately, both of these conventions operate only when harm has already occurred.

The insularity of the legal regime within the IMO and the IAEA contributed to its anthropocentric bias. It must be remembered that the IMO State membership, currently 98% of the world tonnage, represents shipping interests, not Coastal States' interests. The Contracting States of other conventions of maritime safety are shipping States, not Coastal States. The IAEA is also composed of nuclear energy generating States, not potentially affected States. The conventions that the IAEA facilitate are ratified and implemented by nuclear energy generating States. Both organizations are obviously not the most objective venues for forging regulations and laws that balance the concerns of shipping and nuclear energy States, all potentially affected States, and the marine environment.

---

[532] *Ibid.*

V. Conclusion

The legal regime governing the maritime shipments of radioactive materials is one of the most advanced and comprehensive. Despite this comprehensiveness, the regime lacks significant aspects to make it truly responsive to the concerns of all potentially affected States and the marine environment. The principal factor that contributed to this oversight is the anthropocentric bias of ethics and philosophy underlying the legal regime. The next challenge, then, is find ways to integrate non-anthropocentric ethics and philosophy in the legal regime, and this challenge is the subject of the next Chapter.

Chapter 5

Theory meets practice: conclusion and proposals

I. Summary

Earlier, it was noted that ethics and philosophy embody the spirit of the legal system. The impact of ethics and philosophy upon particular laws and regulations, however, may not necessarily be apparent or clear. Ethicists themselves are skeptical and doubtful as to how ethics are translated into laws and legal decisions. Locating and being conscious of the underlying ethical basis of law, however, is important for two reasons. First, it reveals the parameters and limits of law as a means of protecting the environment and managing the environmental dilemma. Second, by such revelation, strategies to resolve the environmental issues may be formulated on a more realistic basis.

This thesis has revealed that the limitations of the legal regime governing the maritime carriage of radioactive materials are largely a result of the anthropocentric bias of the regime. Anthropocentrism sees nothing wrong in a regime that manages the dilemma posed by the shipment to the exclusion of potentially affected entities that are not part of the official transaction. As well, the anthropocentric framework also permits the marginalization of the interests of the marine environment.

The strategies that must be formulated in order to respond to the shortcomings discussed above must be guided by a non-anthropocentric approach. The next section will discuss a strategy for the non-anthropocentric greening of the legal regime governing the maritime carriage of radioactive materials.

II. Fragmented incrementalism: an approach to the non-anthropocentric greening of the legal regime governing maritime carriage of radioactive materials

The underlying ethical and philosophical premise of international law, which is anthropocentric, is the main challenge to the non-anthropocentric greening of international law. The international legal regime that was developed to govern the maritime carriage of radioactive materials was influenced by its anthropocentric bias. A related challenge is the determination of the legal standing of the non-human members and parts of the biotic community. Can the legal status of non-human members of the biotic community be recognized under an anthropocentric law? Should they be accorded rights by the legal system? At the very least, non-human species must be accorded a separate protection scheme because their interests are separate and different from human interests.

The non-anthropocentric greening of international law is not going to be easy and will have to hurdle ethical, philosophical and structural challenges. Non-anthropocentric ethics and philosophy "do not require conformity to a set of norms so much as a commitment to rethinking, reevaluating, and reinventing our approach to collective life at the most fundamental level."[533] Hence, the non-anthropocentric greening has implications not only on the ethical and philosophical premise of the law but also on the structural or institutional foundations.

---

[533]K. Mickelson, "Carrots, Sticks, or Stepping Stones: Differing Perspectives on Compliance with International Law" in T. Schoenbaum, J. Nakagawa and L. C. Reif (eds.), *Trilateral Perspectives on International Legal Issues: From Theory into Practice*, (New York: Transnational Publishers, 1998) at 47.

There are two general paths that the non-anthropocentric greening may pursue. The first path is comprehensive or broad and aims to respond to all the issues regarding the environment. The second path is fragmented incrementalism.

International law derives its existence from the principle of sovereignty of States.[534] Consent of States, in any of the three general forms recognized under international law as sources: treaty, custom, and general principles of law, is the principal factor that makes a rule legal under international law.[535] Palmer observes that all three forms of law are "frequently cumbersome...slow and time-consuming"[536] principally because of the requirement of consent of States. He cited as an example the *Convention on the Regulation of Antarctic Mineral Resource Activities*[537] that "will not enter into force because of the widespread conviction that is provisions do not sufficiently protect the Antarctic environment."[538] Two further examples are the *1997 Protocol to the Vienna Convention* and the *Convention on Supplementary Compensation* mentioned in Chapter 4. These two Conventions were negotiated soon after the 1986 Chernobyl accident but it was not until 1997 that they were finally adopted by the IAEA. To date, only two States have ratified the two Conventions, none of which are major players in the nuclear and shipping industries. As to when these two Conventions will enter into force cannot be predicted. Unfortunately, many liability Conventions are vigorously pursued or revitalized only when disasters occur.

---

[534]Higgins, *supra* note 105.
[535]*Ibid.*
[536]G. Palmer, "New Ways to Make International Environmental Law" (1992), 86 A.J.I.L. 259 at 271.
[537]*Convention on the Regulation of Antarctic Mineral Resource Activities*, 2 June 1988, 27 I.L.M. 860 (1988).
[538]Palmer, *supra* note 536 at 272.

Sir Geoffrey Palmer thus proposes "new ways to make international law for the environment."[539] He recommends a new institution responsible for undertaking new ways to make international law and for the implementation of the measures necessary to protect the environment.[540] By amending the *United Nations Charter* to include a new Chapter on the Environment, a new UN organization called the International Environment Organization could be established.[541] This proposed international institution[542] would have the following principal features: 1) it would be representative of

---

[539]*Ibid.* at 259.
[540]*Ibid.* at 280.
[541]*Ibid.*
[542]Palmer's new environmental institution would have the following features:

(1) A General Conference comprising of all members, to be called together annually and more often if the Governing Council so decides. The conference shall consist of four representatives from each member; two shall be government delegates and the two others shall represent business and environmental organizations, respectively.
(2) A Governing Council of forty people - twenty representing governments, ten representing business organizations and ten representing environmental organizations.
(3) The ability of the conference to set international environmental regulations by a two-thirds majority of the votes cast by delegates present. The regulations would become binding without further action. There would also be provision for recommendations to be made to members.
(4) A Director-General and staff of the International Environment Office, to have explicit international responsibilities for educating people about the global environmental problems and what they can do to help.
(5) The office to have defined functions for gathering information and monitoring compliance, including verification of compliance with the regulations. There should be regular reviews of the environmental policies of member states and their compliance with the regulations.
(6) A thorough preparatory process, in which there are ample notice, thorough scientific and technical preparation, and consultation before regulations are made.
(7) Formal provision for authoritative and widely representative scientific advice and papers to be available to the organization.
(8) Detailed requirements for nations to report annually on action taken to implement agreed regulations. The environment and business representatives would be required to report separately from governments.

States, industries and environmental organizations; and, (2) it would be capacitated to enact binding regulations by a two-thirds majority only, and not necessarily unanimous consent, which is the usual rule under international law.

Palmer realizes that this proposed path is full of obstacles, the principal structural hindrance being the veto of the permanent member States of the Security Council of the United Nations.[543] The permanent members of the Security Council have veto powers in any amendment to the *UN Charter*. As well, international politics and the dangers, perceived and/or actual, of a supra-international powerful bureaucracy stand in the way of a new international institution.[544] Powerful States like the United States of America, incidentally one of the permanent members of the UN Security Council, would probably not support the creation of a new powerful international organization.[545]

An alternative strategy should, therefore, be developed and adopted to take these challenges into consideration. One concept that is suggested here is fragmented

---

(9) Provision for any member to be able to refer such complaints to a commission of inquiry for a full report. The commission shall consist of three appropriate experts of recognized impartiality and be chaired by a lawyer. The commission is to make findings of fact and rule on the steps to be taken to deal with the complaint and the time by which the steps must be taken. Refusals by governments to accept these findings are to be referred to the full conference.

(10) Discretion of the council to refer such complaints to a commission of inquiry for a full report. The commission shall consist of three appropriate experts of recognized impartiality and be chaired by a lawyer. The commission is to make findings of fact and rule on the steps taken to deal with the complaint and the time by which steps must be taken. Refusals by governments to accept these findings are to be referred to the full conference.

(11) Authority for the council to recommend measures to the conference to secure compliance when it is lacking. *Ibid.* at 281.

[543] *Ibid.*

[544] *Ibid.* at 282.

[545] *Ibid.*

incrementalism.[546] This strategy envisions changes at different levels of international law - global, regional, sub-regional, bilateral. It is incremental because it acknowledges that changes must be gradual, not abrupt.

This strategy may either become a strategy by default[547] or a proactive, strategic approach to reforms. Since the comprehensive approach similar to what Palmer has suggested is unrealistic, a fragmented incremental approach does appear to be the only option. However, this approach can also be proactive, strategic and comprehensive. It can be proactive and strategic when it is utilized in a deliberate and organized manner. An example of how a proactive and strategic fragmented incrementalism can work is the strategy adopted for the reforms on the water sector in the Philippines. The Philippine water law is biased in favor of the development aspects. The sustainable use of water is a secondary objective. Enacting a comprehensive law for the management and development of water resources and establishing one national organization to manage the entire water sector were identified as the most critical strategies in reforming the water sector. The challenges facing the legislation of a new law, however, are enormous. Thus, aside from drafting a bill that provides for the integrated and comprehensive management of the water sector, the Task Force on Water Resources Development and Management [hereinafter Task Force], also pushed for a parallel, fragmented and incremental reform strategy. The Task Force negotiated with many governmental agencies and local

---

[546]This concept was developed by D. VanderZwaag, "Regionalism and Arctic Marine Environmental Protection: Drifting between Blurry Boundaries and Hazy Horizons", in D. Vidas and W. Ostreng, *Order for the Oceans at the Turn of the Century*, (The Hague: Kluwer Law International, 1999) at 246.

[547]Dr. VanderZwaag posits that this strategy is largely by default since comprehensive measures to reform international law for environmental protection may be unrealistic, discussion dated 21 October 1999.

government units and worked on convincing them to institute changes within their areas of jurisdiction even without a new law. Not all agencies and local governments were of course, responsive to the changes. However, some agencies were convinced. One agency that was convinced to undertake research activities was the Department of Environment and Natural Resources [hereinafter DENR].[548] No new funds were allocated for research and development for the water sector because this might need legislative approval. Rather, what the Secretary of the DENR allowed was the expansion of the mandates of some of the existing research activities that were already undertaken to include water research, if applicable. For example, the Mining unit of the DENR was tapped to conduct groundtruthing or validation of the data previously gathered on water resources. The Mining unit was approached because it possesses the necessary facilities and expertise to undertake survey and research activities underground. The Mining unit was required to conduct a separate activity but it was required to gather data on water along with mining data whenever they undertake regular research and data gathering. Other initiatives were started in some local government units and local water districts. What keep all these separate, fragmented initiatives together are the four main objectives mentioned earlier.

The fragmented incrementalism strategy can remain comprehensive as long as it recognizes the connections between and among different issues. Comprehensiveness is not abandoned just because there is a recognition that the environmental dilemma can be

---

[548]Information in this section was gathered when the author worked as part of the legal team for the Task Force on Water Resources Development and Management and the Department of Environment and Natural Resources, Republic of the Philippines, from 1997 to 1998. Additional information may be obtained at On line: United Nations Web

managed and approached at different levels and in different venues. What will keep this strategy of fragmented incrementalism from going nowhere is a vision. In the greening of international law, the vision is non-anthropocentric ethics and philosophy.

Below are some of the proposals for action within the fragmented incrementalism approach. These proposals contain both substantive and institutional aspects. The appropriate institutional mechanism is very important in carrying out reforms. One of the factors that contributed to the lack of participation of all potentially affected States and other entities is what Prof. Elisabeth M. Borgese calls the institutional gap. Institutional gaps occur when there is no corresponding institution that manages the problem or even when the institution exists, it is outdated.[549]

These proposals are: mandatory application of recommendatory codes; participation of non-governmental organizations; collaboration between IAEA and IMO; establishment of regional arrangements; and the internationalization of the nuclear issue.

A. Mandatory codes

It is true that many environmental instruments are of non-binding nature. The legal status, per se, of international environmental instruments may not be crucial in ensuring that environmental protection measures are carried out. For example in the case of *Safe Transport Regulations*, recommendatory provisions are adopted by a majority of IAEA member States. However, a compulsory instrument is welcome because it encourages stability in the regime. The right of States to undertake nuclear activities

---

site <http://www.un.org/esa/agenda21/natlinfo/countr/philipi/natur.htm#freshw> (Date accessed: 31 October 1999).

[549]E. Borgese, *The Oceanic Circle, Governing the Seas as a Global Resource*, (Tokyo: United Nations University Press, 1998) at 132.

should be accompanied by a binding obligation to observe safety standards and regulations. This corollary obligation reduces the opportunity of unscrupulous as well as inexperienced States to abuse or misuse the right to undertake nuclear and shipping activities. The right to undertake nuclear activities is still upheld but such right must be accompanied by a binding obligation.

The mandatory application of the recommendatory codes and regulations that govern the maritime transport of nuclear materials and radioactive wastes is already being pursued. The organization that is pursuing the revisions of the INF Code is the IMO. Several IMO Committees have reviewed and approved of the proposal to make mandatory the INF Code. The IMO Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC) during its 4th session from 22-26 February 1999 approved and finalized the draft amendments to the INF Code for inclusion in Chapter VII of the *SOLAS*, with the aim of making it mandatory.[550] The IMO MSC, reviewed the INF Code, during its 68th session in May-June 1997 agreed that the INF Code should be made mandatory.[551] The review of the INF Code was carried out in co-operation with the IAEA and the UNEP.[552]

B. Participation of non-governmental organizations

Participation by non-State actors in the international sphere is an accepted practice. In the controversy concerning the shipment of plutonium, Greenpeace

---

[550]IMO DSC - 4th session: 22-26 February 1999, On line: IMO Web site <http://www.imo.org/meetings/dsc/4/dsc41.htm > (Date accessed: 19 July 1999).
[551]IMO MSC - 68th session: May 28 to June 6, 1997 On line: IMO Web site <http://www.imo.org/imo/meetings/msc/68/inf.htm > (Date accessed: 17 August 1999).

International was an active participant and this had been possible because it has an observer status with IMO.[553] It is suggested that the IAEA grant similar observer status to Greenpeace, if it has not already done so.[554] As well, other non-governmental organizations that have an interest in the nuclear dilemma should also be allowed to participate in the nuclear energy discourse and implementation of safety regulations. The meaningful and sustained participation of non-governmental organizations and other stakeholders would not be maximized in an unstructured and adversarial setting.

C. Collaboration between IAEA and IMO

The collaboration between IAEA and IMO should go beyond establishing safety requirements for the safe transport of nuclear materials and radioactive wastes. These two organizations should facilitate the resolution of issues related to the shipments as well as lead in the identification of related issues outside of the shipping and nuclear fields.

In recent years, especially after the Chernobyl accident, the two organizations, together with other relevant organizations, have collaborated on emergency response measures in case of radiological emergencies. The two organizations work to harmonise emergency notification, assistance and response activities. They are assisted by the

---

[552]IMO MEPC - 40th session: 18-25 September 1997 On line: IMO Web site <http://www.imo.org/meetings/mepc/40/mepc404.htm> (Date accessed: 17 August 1999).

[553]IMO, "List of Non-governmental Organizations in Consultative Status with IMO", On line: IMO Web site <http://www.imo.org/imo/ngos.html> (Date accessed: 10 June 1999).

[554]The IAEA Web site does not inform whether the IAEA invites international organizations to participate in their meetings and sessions as observers. The IMO Web site on the other hand, enumerates the non-governmental organizations that may sit in the various IMO meetings.

United Nations Office for Outer Space Affairs, UNESCO, ILO, UNIDO, UNEP, OECD/NEA, WMO, WHO, and UNSCEAR.[555]

What remains lacking in the collaborative efforts of the IAEA and the IMO is the lack of participation of organizations representing the interests of all potentially affected States and the marine environment. The IAEA and the IMO should pay attention to the peculiar situation of potentially affected Coastal States in the maritime shipments of radioactive materials. The emergency procedures developed by these two organizations should capacitate not only Flag States, States of origin and destination, but also Coastal States, particularly developing countries.

D. Regional arrangements

Regional institutional arrangements may be critical in carrying out environmental obligations, both preventive and remedial, of the maritime carriage of nuclear materials and radioactive wastes. The nature of maritime carriage is that it is an activity in motion, and may present risks to more than one State at a time within the same geographical area. If, for example, the State of origin and the Flag State are required to undertake independent and separate EIAs in all the maritime zones that the vessel may use in its passage, an administrative nightmare may ensue. It is therefore practical and sensible to undertake preventive and precautionary measures at a regional level. As well, undertaking separate preventive measures at the national level may not only be

---

[555]IAEA, "Emergency Notification, Assistance, and Response", On line: IAEA Web site <http://www.iaea.org/worldatom> (Date last updated: 01 February 1999); IAEA, " The Convention on Early Notification and Assistance", On line: IAEA Web site <http://www.iaea.org/ns/rasanet/conventions/earnotcon.htm#Top > (Date last updated: 25 January 1999).

impractical but inappropriate in the context of oceans environment where maritime zones are mere artificial boundaries.

The substantive reform that a regional arrangement may be able to maximize is the expansion and implementation of the meaning of *all potentially affected States* to include States that are not officially part of the transaction. The regional arrangement envisioned may implement the following measures: environmental impact assessment, prior notification and consultation, and emergency and contingency measures. All these measures may be taken up on a regional basis, rather than on a national level..

It may not be necessary to establish new regional arrangements for the safe and secure carriage of nuclear materials and radioactive wastes. There are existing regional structures whose mandates may be expanded or modified in order to accommodate the safety and security concerns of Coastal States regarding nuclear materials and radioactive wastes. Prof. Borgese cites the UNEP Regional Seas Programme[556] as the most appropriate institutional approach to improve ocean governance at a regional level.[557] Although this program started out on a rather limited sectoral basis, it has now been modified to adopt a comprehensive approach to oceans management. In its Global Programme of Action, the UNEP envisions collaboration with other organizations

> in a wider context, encompassing, inter alia, concern for human health (WHO), productivity of coastal areas (FAO), loss of biodiversity (CBD and others), radiation protection and marine pollution monitoring (IAEA), retarded development and poverty (UNDP), shifting democratic patterns (UNCHS/Habitat), declining food security (FAO, WFP), global

---

[556]The UNEP Regional Seas Programme was an outcome of the 1972 Stockholm Conference. It now has thirteen regional areas including the Mediterranean, Arabian Gulf, Gulf of Guinea, South-East Pacific, Red Sea and Gulf of Aden, Caribbean, Indian Ocean and East Africa, and South Pacific. P. Sands, *supra* note 6 at 296-297.

[557]Borgese, *Oceanic Circle, supra* note 549 at 146.

environmental change (IGBP of ICSU), nature conservation (WWF, IUCN).[558]

Existing regional arrangements regulating the transboundary movement of hazardous wastes and radioactive wastes may be tapped. There are regional arrangements. An example is the *Convention on Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region* [hereinafter *Waigani Convention*].[559] Like the *Joint Convention*, the *Waigani Convention* excludes Coastal States and other potentially affected entities that are not legally part of the shipments from the prior notification and consultation system. However, mandates and objectives of regional conventions like the *Waigani Conventions* might be expanded to include all potentially affected entities. Building on this existing arrangements may be a realistic strategy because the notions of the regional organization and cooperation are already accepted.

---

[558]*Ibid.* at 146 to 147. Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, 3 November 1995, U.N. Doc. UNEP (OCA) /LBA/IG.2/7.

[559]*Convention on Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region* [hereinafter *Waigani Convention*], adopted 16 September 1995, not yet in force. Another regional convention where the regional prior notification and consultation may be established for shipments of radioactive materials is the *1996 Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and Their Disposal*, 1 October 1996. This Protocol aims to prevent, abate and eliminate pollution in the Mediterranean Sea caused by transboundary movement and disposal of hazardous wastes. It employs the system of prior notification and consultation among States of Origin and States of Destination. Coastal States are excluded in the Protocol's system of prior notification and consultation. It is recommended that the system of prior notification and consultation in the Mediterranean Sea region be expanded to include all potentially affected Coastal States. As reprinted in the International Environment Reporter, March 1997, 35:0551-0557.

E. Internationalization of the nuclear issue

It was noted that neither the IAEA nor the IMO represents the interests and concerns of all affected States and the marine environment. The issues arising from the maritime carriage of nuclear materials and radioactive wastes, like other issues of ocean space, are related with other ocean issues. The notion that the problems confronting the oceans are interrelated and must be considered as a whole is not a new concept.[560] This is the view underlying the *LOSC* as well as Chapter 17 of Agenda 21. Yet, the discussion and decisions of many oceans related issues, including the maritime shipments of radioactive materials are confined within narrow legal regimes.[561] It is not surprising because as argued earlier, the nuclear regime and the maritime regime represent principally the interests of the nuclear and shipping industries, not of other potentially affected States and the marine environment. The discussion of nuclear issues should be taken out of its nuclear and maritime limitations and should be elevated to the international level. It is at the international level where the interests of all potentially affected entities and the marine environment may be properly and adequately represented and considered.

The most obvious international body where oceans related issues can and have been taken up as a whole is the United Nations General Assembly [hereinafter U.N.G.A.]. The U.N.G.A. has been conducting annual review and discussion of oceans

---

[560]See Advisory Committee on Protection of the Sea (ACOPS) , "Towards enhanced ocean security into the third millennium", Report of the ACOPS/GLOBE Conference entitled "Towards enhanced ocean security into the third millennium", Stockholm, 31 January - 2 February 1998.

[561]Paragraph 46, Commission on Sustainable Development (CSD), *Oceans and Seas Report of the Secretary-General*, CSD 7th session, 19-30 April 1999, U.N. E/CN.

and law of the sea but this yearly activity has been criticized as inadequate for two reasons.[562] First, it is undertaken in one (1) day only. One suggestion to rectify this shortcoming is the establishment of a standing committee of the whole of the GA that can adequately prepare for and follow-up on the annual debate.[563]

Another criticism lodged against the annual debate is the limited participation of non-State actors.[564] The establishment of a global forum by the U.N.G.A. wherein even non-State entities may participate was recommended in order to deal with the various issues confronting the oceans in an integrated manner.[565] An example of this global forum is the world oceans observatory suggested by the Independent World Commission on the Oceans. The function of such a body, composed of all relevant stakeholders, including civil society, would be to monitor ocean governance and act as an "external watch" on ocean affairs.[566]

Whatever international body or forum is established, the issues concerning the expansion of the term "potentially affected entities" and the legal status of the marine environment may appropriately be taken up only at the international level.

Another forum where the maritime shipment of nuclear materials and radioactive wastes issues might be elevated is in a global conference. A global conference on nuclear activities and their impact on the environment could provide a venue for national and local governments and non-governmental organizations (NGOs) to debate on issues,

---

17/1999/4, On line: United Nations Web site <http://www.un.org/esa/sustdev/sg4-99.pdf.> (Date accessed: 30 August 1999).

[562]*Ibid.* Paragraph 47.

[563]*Ibid.*

[564]*Ibid.*

[565]*Ibid.*

[566]*Ibid.* Paragraph 49.

international standards and guidelines that regulate nuclear activities and collaborate on measures and proposals for action.[567] The current proposals advocated by different groups, including some of the proposals mentioned above may also be taken to this global conference. The advantage of a global conference is that it would be open to all UN member States, not just IAEA or IMO member States. As well, non-State actors outside of the nuclear energy industry might participate in such a conference. The significant transboundary risks posed by nuclear activities justify the move of placing the debate beyond the nuclear and maritime agenda.

Organizing a global conference on the nuclear issue is admittedly an unrealistic goal at the present time. It will be up to non-State entities and States outside of the nuclear industry to campaign for a conference of this nature.

III. Conclusion

This thesis has examined the controversy concerning the shipments of radioactive materials, particularly, plutonium, MOX and radioactive wastes. The foundation of the controversy is the conflict between anthropocentric and non-anthropocentric ethics and philosophy. The existing legal regime for the maritime carriage of radioactive materials is principally anthropocentric or human-centered. Since anthropocentric ethics and philosophy are the same cause for degradation of the environment, the interests and concerns of other potentially affected entities are not meaningfully considered in the existing legal regime.

---

[567]United Nations Department of Public Information, "UN Conferences: What Do They Accomplish?", August 1997, UN Doc. DPI/1825/Rev.4.

This thesis asserts that an essential key to institutionalizing reforms in the legal regime is to pursue and apply non-anthropocentric ethics and philosophy. Non-anthropocentric ethics and philosophy do not possess nor explain all the answers to environmental problems. However, they serve as compasses, steering the legal regime towards a path of respect and protection for both humans and non-humans, for recognition of both the economic and the non-economic.

Prof. Borgese's final words in her book, *The Oceanic Circle*, aptly summarizes the main points of this thesis.

> The emerging ecological world view, our new respect for nature and the value of all species in biodiversity will lead us to build a social, economic, and political order that reflects this world view and its values, or maybe we choose this world view because we have realized that no other can save our human universe. The respect we will have for each other we will have for all living things. Respect for life encompasses both. Peace and harmony with nature will enhance peace and harmony among the people of the earth.[568]

[568]Borgese, *Oceanic Circle, supra* note 547 at 198.

BIBLIOGRAPHY

Table of Conventions

Charter of the United Nations, entry into force 24 October 1954, 1 U.N.T.S. xvi

United Nations Convention on the Law of the Sea, adopted 10 December 1982, entry into force 16 November 1994, 21 I.L.M. (1982)

Statute of the International Atomic Energy Agency (As Amended up to 28 December1989), entry into force 29 July 1957, as reprinted in M. ElBaradei, E. Nwogugu, E. and J. Rames, (eds.), *The International Law of Nuclear Energy Basic Documents Part 1*, (Dordrecht: Martinus Nijhoff Publishers, 1993)

Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlateltolco Treaty), adopted 14 February 1967, entry into force 22 April 1968, 634 U.N.T.S. , No. 9068

Treaty on the Non-Proliferation of Nuclear Weapons, adopted 1 July 1968, entry into force 5 March 1970, 729 U.N.T.S. 161

African Nuclear Weapon Free Treaty (Pelindaba Treaty), adopted 11 April 1996, IAEA INFCIRC/512

South Pacific Nuclear Free Zone Treaty, adopted 6 August 1985, entry into force 11 December 1986, IAEA INFCIRC/331

Convention on Third Party Liability in the Field of *Nuclear Energy*, adopted 29 July 1960, entry into force 1 April 1968, (*1960 Paris Convention)*, 956 U.N.T.S. 251.

Brussels Convention Supplementary to the Paris Convention of 29th July 1960 on Third Party Liability in the Field of Nuclear Energy, 31 January 1963, entry into force 4 December 1974, 1041 U.N.T.S. 358.

Convention on Civil Liability for Nuclear Damage (Vienna Convention), adopted 29 May 1963, entry into force 12 November 1977, 1063 U.N.T.S. 256.

Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention, adopted 21 September 1988, entry into force 27 April 1992; 42 NLB 56 (1988).

Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material, adopted December 1 971, entry into force 15 July 1975, IAEA INFCIRC/500

Convention on the Liability of Operators of Nuclear Ships, adopted 25 May 1962, not yet in force, 57 A.J.I.L. 268 (1963)

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, adopted 5 September 1997, not yet in force, IAEA Doc. GC/INF/821-GC(41)/INF/12,RWSC/DC/Sr.5; 36 I.L.M. 1433.

Convention on Early Notification of a Nuclear Accident, adopted 24-26 September 1986, entered into force, 27 October 1986, IAEA INFCIRC/335

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted 26 September 1986, entered into force 26 February 1987, IAEA INFCIRC/336

Convention (No.115) Concerning the Protection of Workers from Ionising Radiations, adopted by the General Conference of the ILO at its 44th session, Geneva, 22 June 1960, entry into force, 17 June 1963, 42 U.N.T.S. 1962

Convention on the Physical Protection of Nuclear Material, adopted May 1980, entry into force, 8 February 1987, IAEA INFCIRC/274/Rev.1.

France and the Federal Republic of Germany Joint Declaration on Co-Operation Between the Two Countries in the Field of Peaceful Uses of Nuclear Energy, 6 June 1989, 44 NLB (1989) pp. 60-61

Germany and United Kingdom Joint Declaration on Co-operation in the Peaceful Uses of Nuclear Energy, 25 July 1989, 44 NLB (1989) pp. 60-61

1990 Agreement Between France And Japan On Co-Operation In The Peaceful Uses Of Nuclear Energy, 46 NLB (1990) p.86

1993 Agreement Between France And Japan On Co-Operation On Radioactive Waste, 54 NLB (1994) p. 66.

Convention on the International Maritime Organization, adopted 6 March 1948, entry into force 17 March 1958, IMO Doc. 023.82.08E; U.N.T.S. vol. 289, p.3

International Convention for the Safety of Life at Sea, adopted 1 November 1974, entry into force 25 May 1980, 1184 U.N.T.S. 2.

Convention on the International Maritime Satellite Organization, 1976, adopted 3 September 1976, entry into force 16 July 1979

Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation, adopted March 10, 1988, entry into force 1 March 1992, 27 I.L.M. 668

1989 International Salvage Convention, adopted 28 April 1989, entry into force 14 July 1996, IMO Leg/Conf.7/27, 2 May 1989

Convention on Environmental Impact Assessment in a Transboundary Context, done at Espoo, Finland, adopted 25 February 1991, 30 I.L.M. 800

Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal, adopted 22 March 1989, entry into force 5 May 1992, Cm 984; 28 I.L.M. 657

Convention on Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region [hereinafter *Waigani Convention*], 16 September 1995, not yet in force

1996 Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and Their Disposal, 1 October 1996, as reprinted in the International Environment Reporter, March 1997, 35:0551-0557

Table of Cases

Corfu Channel Case, I. C. J. Reports (1949) 1

Continental Shelf Case, I.C.J. Reports (1982) 18

Eastern Greenland case, (1933) PCIJ, Ser. A/B, no. 53, pp.52.

Lac Lanoux Arbitration (France v .Spain) 24 I.L.R. 101 (1957)

Legality of the Use by a State of Nuclear Weapons in Armed Conflict, Advisory Opinion of 8 July 1996, I.C.J. Reports (1996) 226

Nuclear Tests Case, I.C.J. Reports (1986) 14

Request for an Examination of the Situation in Accordance with Paragraph 63 of the Court's Judgment of 20 December 1974, in the Nuclear Tests (New Zealand v. France) *Case*, I.C.J. Reports (1995) 288

Trail Smelter, U.N. R.I.A.A. Vol. 3, p. 1965

IAEA Documents

IAEA, *The Annual Report for 1993*, IAEA Doc. no.:GC (XXXVIII)/2 & Corr.1, July and 19 August 1994

IAEA, *The Annual Report for 1997* On line: IAEA Web site <http:// www. iaea.org/ worldatom/inforesource/annual/anrep97/97anreppdf.html> (Date accessed: 10 August 1999)

IAEA, *The Annual Report for 1998* On line: IAEA Web site <http:// www. iaea.org/ worldatom/inforesource/annual/anrep98/98anreppdf.html> (Date accessed: 17 August 1999)

IAEA, *The Physical Protection of Nuclear Material*, September 1975, IAEA INFCIRC 225.

IAEA, *1985 Edition of the Transport Regulations*, as amended in 1990IAEA Safety Series No. 6, (IAEA, Vienna:1990)

IAEA, *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Materials (1985 Edition)* Third Edition (as Amended 1990), (IAEA, Vienna: 1990

IAEA, *The Agency's Safeguard System* (1961, as Extended in 1964), IAEA INFCIRC/26 and Add.1; *The Agency's Safeguard System* (1965), IAEA INFCIRC/66; *The Agency's Safeguard System* (1965, as Provisionally Extended in 1966), IAEA INFCIRC/66/Rev.1; *The Agency's Safeguard System* (1965, as Provisionally Extended in 1966 and 1968); IAEA INFCIRC/66/Rev.2.

IAEA, *Code of Practice on the International Transboundary Movement of Radioactive Waste*, 13 November 1990, IAEA INFCIRC/386

Cooperation Agreement between IAEA and IMO, 10 April 1962, IAEA INFCIRC/20/Add.1.

IAEA, *1990 Recommendations of the International Commission on Radiological Protection*, as reprinted in M. ElBaradie, et al, *The International Law of Nuclear Energy Basic Documents Part I,* (Dordrecht, Martinus Nijhoff Publishers: 1993) at 159-169

IAEA, *Protection from Radiation Sources Not Under Control: Accidents,* IAEA Pre-publication document of Safety Series No. 72 Rev. 1, December 1992, reprinted in ElBaradie et al, *The International Law of Nuclear Energy Basic Documents Part I,* (Dordrecht, Martinus Nijhoff Publishers: 1993) at 438

IAEA Safety Series No. 76, *Radiation Protection Glossary, 1986,* as reprinted in ElBaradie, et al, *The International Law of Nuclear Energy Basic Documents Part I,* (Dordrecht, Martinus Nijhoff Publishers: 1993) at 174, 198 and 200.

IMO documents

International Maritime Dangerous Goods Code, Volume IV Class 7, (IMO Sales No. 200 86.10E) (1986)

Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium, and High-Level Radioactive Wastes in Flasks on board Ships, IMDG Code Supplement, 1994 Consolidated Edition (IMO Sales number: IMO-200E)

Amendments to the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships and Adoption of Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code, IMO Resolution A.853(20), On line: IMO Web site http://www.imo.org/assembly/853854.htm (Date accessed: 15 July 1999)

International Safety Management Code, adopted by the IMO in November 1993, Assembly resolution A.741 (18).

UN Documents

Stockholm Declaration, Report of the United Nations Conference on the Human Environment, U.N. Doc. A/CONF.48/14/Rev.1, at 3 (1973), 11 I.L.M. 1416 (1972)

Rio Declaration, Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992 (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. 1

Agenda 21, *United Nations Conference on Environment and Development*, Rio de Janeiro, Brazil, 3-14 June 1992, Report:A/CONF.151/26/Rev.1 (3 vols.) + vol.I/Corr.1, voll.III/Corr.1 (Sales No.:93.I.8).

Environmental Protection and Sustainable Development - Legal Principles and Recommendations, Experts Group on Environmental Law of the World Commission on Environment and Development, U.N. Doc.WCED/86/23/Add.1 (1986), A/42/427, Annex I

ILC, *Report of the ILC on the Work of its Fiftieth Session*, 20 April - 12 June 1998, 27 July - 14 August 1998, U.N.G.A.O.R. Fifty-third session, Suppl. No. 10 (A/53/10), p. 11

UN Commission for Sustainable Development Department for Policy Coordination and Sustainable Development, *Report of the Export Group Meeting on Identification of Principles of International Law for Sustainable Development*, Geneva, Switzerland, 26-28 September 1995, On line: UN Web site < http://gopher.un.org/00/esc/cn17/1996/backgrnd/law/txt > (Date accessed: 10 August 1999

UN Commission for Sustainable Development, *Integrating environment and development in decision-making Report of the Secretary General*, General Discussion on Progress in the Implementation of Agenda 21, Focusing on the Cross-Sectoral Elements of Agenda 21 and the Critical Element of Sustainability, 28 March 1995, CSD 3rd Session, 11-28 April 1995 Item 3 of the provisional agenda, U.N. E/CN.17/1995/1

UNEP Governing Council Decision, *Goals and Principles of Environmental Impact Assessment*, 17 June 1987, UNEP/GC.14/17, Annex III, UNEP/GC/DEC/14/25

Law of the Sea Report of the Secretary-General, U.N.G.A. 41st Session, 28 October 1986, U.N.G.A. Doc.: A/41/742

Law of the Sea Report of the Secretary-General, U.N. G.A. 42nd Session, 8 November 1987, U.N.G.A. Doc.:A/42/688, at 81

Oceans and the Law of the Sea: Law of the Sea Report of the Secretary-General, 20 October 1997, Fifty-second session, Agenda item 39(a), UN Doc. A/52/487

Oceans and Law of the Sea Report of the Secretary-General, 5 October 1998, Fifty-third session, Agenda item 38(a), UNGA Doc. A/53/456

Oceans and Seas Report of the Secretary-General, CSD 7th session, 19-30 April 1999, U.N. E/CN. 17/1999/4

Zone of Peace and Cooperation of the South Atlantic-Report of the UN Secretary-General, 24 October 1995, U.N. Doc.no.:A/50/671

IAEA Report to the UN General Assembly, Forty-fourth Session, 6 October 1989. U.N.G.A. Doc.:A/44/339/Add.11-E/ 1989/ Add.11

Letter dated 17 August 1992 from the Charge d'affaires a. i. of the Permanent Mission of Solomon Islands to the United Nations Addressed to the Secretary-General (Communique of the 23rd South Pacific Forum, Honiara, Solomon Islands, 8-9 July 1992), U.N. Doc.:A/47/391, 20 August 1992

Letter dated 18 May 1995 from the Permanent Representative of Indonesia addressed to the Secretary General (Communique of Ministerial Meeting of the Coordinating Bureau of the Non-Aligned Countries, in Bandung, Indonesia, 25-27 April 1995) U.N. Doc. No.: A/49/920-S/1995/489, 16 June 1995

Letter dated 18 September 1995 from the Charge d'affaires a.i. to the Permanent Mission of Papua New Guinea to the United Nations Addressed to the Secretary-General (Communique of the 26th Pacific Forum, Madang, Papua New Guinea, 3-15 September 1995), U.N. Doc. A/50/475, 26 September 1995

Procedures for the Assessment of Liability Concerning Damage to the Environment Caused by Dumping at Sea, Eleventh Consultative Meeting of Contracting Parties to the London Dumping Convention, October 1988, LDC 11/6/1, 6 July 1988, extract reprinted in the United Nations Office for Ocean Affairs and the Law of the Sea, *Annual Review of Ocean Affairs, Law and Policy, Main Documents* (1988 Vol. III), (Florida: UNIFO Publishers, 1990) at 1290

Charter for Economic Rights and Duties of States, adopted on 12 December 1974, U.N.G.A. Res. 3281(XXIX), 29 U.N.G.A.O.R. Supp. (No.31) at 51, U.N. Doc. A/9946 (1974).

Commission on Sustainable Development (CSD), *Oceans and seas Report of the Secretary-General*, CSD 7th session, 19-30 April 1999, U.N. E/CN. 17/1999/4, On line: United Nations Web site <http://www.un.org/esa/sustdev/sg4-99.pdf.> (Date accessed: 30 August 1999).

Books

L. Aldo, *A Sand County Almanac and Sketches Here and There* (London: Oxford University Press, 1949)

American Law Institute, *Restatement (Third) of the Foreign Relations Law of the United States* (The American Law Institute, 1987), reprinted at E.B. Weiss, et al (eds.), *International Environmental Law Basic Instrument and References* (U.S.A.: Transnational Publishers, Inc., 1992) at 196

P. Birnie and A. Boyle, *International Law and the Environment*, (Oxford: Clarendon Press, 1992)

E. M. Borgese, *The Oceanic Circle Governing the Seas as a Global Resource*, (Tokyo: United Nations University Press, 1998)

D. Botkin, M. F. Caswell, J. E. Estes, and A. A. Orio (eds.) *Changing the Global Environment, Perspectives on Human Involvement* (San Diego, California: Academic Press, Inc., 1989)

A. E. Boyle and M. R. Anderson (eds.), *Human Rights Approaches to Environmental Protection* (Oxford: Clarendon Press, 1996)

Joint Group of Experts on the Scientific Aspects of Marine Pollution, *The State of Marine Environment, Reports and Studies GESAMP No. 39* (Nairobi: U.N.E.P., 1990)

H. Hohmann, *Precautionary Legal Duties and Principles of Modern International Environmental Law The Precautionary Principle: International Environmental Law*

Between Exploitation and Protection, (London: Graham & Trotman/Martinus Nijhoff, 1994)

A. Hurrell and B. Kingsbury (eds), *The International Politics of the Environment, Actors, Interests and Institutions*, (Oxford: Clarendon Press, 1992)

IAEA, *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Materials (1985 Edition)* Third Edition (as Amended 1990), (IAEA, Vienna: 1990)

IAEA, *Maritime Carriage of Nuclear Materials*, (Proceedings of a Symposium) Stockholm, 18-22 June 1972, (Vienna: IAEA, 1973)

IAEA, *Legal Series No. 8, A Selection of Papers Presented at the Seminar on the Development of Nuclear Law and the Inter-regional Training Course on the Legal Aspects of Nuclear Energy*, (Vienna: IAEA, 1972)

IAEA, *Sustainable development and nuclear power*, On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/> (Date accessed: 10 August 1999).

N. Luhmann, *Ecological Communication*, (Chicago: The University of Chicago Press, 1989)

M. ElBaradei, E. Nwogugu, E. and J. Rames, (eds.), *The International Law of Nuclear Energy Basic Documents Part 1*, (Dordrecht: Martinus Nijhoff Publishers, 1993)

A. F. Férre and P. Hartel, (eds.) *Ethics and Environmental Philosophy, Theory Meets Practice* (Athens and London: The University of Georgia Press, 1994)

D. Freestone and E. Hey (eds.), *The Precautionary Principle and International Law, The Challenge of Implementation*, (The Hague: Kluwer Law International, 1996)

J. Gowdy and S. O'Hara, *Economic Theory for Environmentalists*, (Boca Raton: St. Lucie Press, 1995)

G. Handl and R. E. Lutz, *Transferring Hazardous Technologies and Substances The International Legal Challenge,* (London: Graham & Trotman, 1989)

E. C. Henry, *The Carriage of Dangerous Goods by Sea The Role of the International Maritime Organization in International Legislation,* (New York: St. Martin's Press, 1985

R. Higgins, *Problems and Process, International Law and How We Use It*, (Oxford: Clarendon Press, 1994)

D. Hunter, J. Salzman, and D. Zaelke, *International Environmental Law and Policy* (New York: Foundation Press, 1998)

Independent World Commission on the Oceans, *The Ocean Our Future* (UK: Cambridge University Press, 1998)

Frowein and Wolfrum, (eds.), *Max Planck Yearbook of United Nations Law*, Vol. 2 (1998)

E. Katz, *Nature as Subject, Human Obligation and Natural Community*, (Lanham: Rowman & Littlefield Publishers, Inc., 1997)

V. Lamm, *The Utilization of Nuclear Energy and International Law*, (Budapest: Akademiai Kiado, 1984)

D. E. Marietta, Jr and L. Embree, (eds.) *Environmental Philosophy and Environmental Activism* (United States of America: Rowman and Littlefield Publishers, Inc.,1995)

D.B. McGraw (ed), *International Law and Pollution* (Philadelphia: University of Pennsylvania Press, 1991)

R. L. Murray, *Understanding Radioactive Wastes*, 4th ed. (Columbus: Battelle Press, 1994)

OECD/NEA, *Liability and Compensation for Nuclear Damage An International Overview*, (Paris: OECD/NEA, 1994)

P. K. Park, et al. (eds), *Radioactive Wastes and the Ocean*, (U.S.A.: John Wiley & Sons, 1983)

P. Sands, *Principles of international environmental law*, Vol. 1 *Frameworks, standards and implementation*, (Manchester and New York: Manchester University Press, 1995)

T. J. Schoenbaum, et al (eds.), *Trilateral Perspectives on International Legal Issues: From Theory Into Practice*, (New York: Transnational Publishers, Inc., 1998)

K. S. Shrader-Frechette, *Burying Uncertainty: Risk and the Case Against Geological Disposal of Nuclear Waste*, (Berkeley: University of California Press, 1993)

United Nations Department of Public Information, *United Nations and Nuclear Non-Proliferation*, (New York: United Nations Publication, 1995)

D. Vidas and W. Ostreng (eds.), *Order for the Oceans at the Turn of the Century* (The Hague: Kluwer Law International, 1999)

E. B. Weiss, (ed.), *Environmental Change and International Law*, (Tokyo: United Nations University Press, 1992)

E. B. Weiss, *In Fairness to Future Generations: International Law, Common Patrimony and Intergenerational Equity* (1989)

E.B. Weiss, et al, *International Environmental Law, Basic Instruments and References,* (United State of America: Transnational Publishers, Inc., 1992)

E. B. Weiss (ed.), *Environmental change and international law: New challenges and dimensions*, (Japan: United Nations University Press, 1992)

M .Zimmerman (Gen. Ed.), *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993)

Articles and Papers

A. E. Boyle, "Nuclear Energy and International Law: An Environmental Perspective" in the British Year Book of International Law 1989 (Oxford: Clarendon Press, 1990)

M. Bookchin, "[From] Defending the Earth", in *Alternative Perspectives on Environmental Philosophy*

A. Brennan, "Environmental decision-making", in R. J. Berry (ed.), *Environmental Dilemmas, Ethics and decisions,* (London: Chapman & Hall, 1993)

G. Bunn "Physical Protection of Nuclear Materials, Strengthening Global Norms," On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/bulletin/bull394/bunn.html> (Date accessed: 15 July 1999)

J. B. Callicott, "Technology and the Evolving Concept of Nature", in F. Ferre and P. Hartel, *Ethics and Environmental Policy, Theory Meets Practice*, (Athens and London: The University of Georgia Press, 1994)

J. B. Callicott, "Environmental Philosophy Is Environmental Activism: The Most Radical and Effective Kind", in D. E. Marietta, Jr and L. Embree, (eds.) *Environmental Philosophy and Environmental Activism* (United States of America: Rowman and Littlefield Publishers, Inc.,1995)

J. Cameron and J. Abouchar, "The Status of the Precautionary Principle in International Law," in D. Freestone and E. Hey, *The Precautionary Principle and International Law, The Challenge of Implementation* (The Hague: Kluwer Law Internationa, 1996)

B. Devall, "[From] Deep Ecology and Radical Environmentalism", Society and Natural Resources 4(1):247

E. Dodson Gray, "Come Inside the Circle of Creation, The Ethic of Attunement," F. Ferre and P. Hartel (eds.), *Ethics and Environmental Policy, Theory Meets Practice*, (Athens and London: The University of Georgia Press, 1994)

F. Du Bois, "Social Justice and the Judicial Enforcement of Environmental Rights and Duties", in A. E. Boyle and M. R. Anderson (eds.), *Human Rights Approaches to Environmental Protection* (Oxford: Clarendon Press, 1996)

A.M. Freke, "The Application of Radiological Protection Principles to the Transport of Radioactive Materials", in (Proceedings of a Symposium) Stockholm, 18-22 June 1972, *Maritime Carriage of Nuclear Materials* (Vienna: IAEA, 1973) at 15-26

I.L.S. Gray and I.F. White, "Restructuring The IAEA Transport Regulations", On line: <http:/www.nuke-energy.com/iaeatrans.html> (Date accessed:21 June 1999)

L. Gundling, "Prior Notification and Consultation", in G. Handl and R. E. Lutz, *Transferring Hazardous Technologies and Substances The International Legal Challenge*, (London: Graham & Trotman, 1989), p. 63

B. Gunn, "Can Environmental Ethics Save the World?", in F. Férre and P. Hartel, (eds.) *Ethics and Environmental Philosophy, Theory Meets Practice* (Athens and London: The University of Georgia Press, 1994)

G. Handl, "Internationalization of Hazard Management in Recipient Countries: Accident Preparedness and Response", in G. Handl and R. E. Lutz, *Transferring Hazardous Technologies and Substances The International Legal Challenge*, (London: Graham & Trotman, 1989), p. 106

L. Johnson, "IAEA Treaty Making Activities in 1997" in Frowein and Wolfrum, (Eds.), *Max Planck Yearbook of United Nations Law*, Vol. 2 (London: Kluwer Law International, 1998), p. 53

A. De Kageneck and C. Pinel, "The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management" 47 I.C.L.Q. 410 (April 1998)

A. Naess, "The Deep Ecological Movement: Some Philosophical Aspects," M .Zimmerman (Gen. Ed.), *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993)

G. Palmer, "New Ways to Make International Environmental Law", 86 A.J.I.L. 259 (1992)

R. Pedrozo, "Transport of Nuclear Cargoes by Sea", J. Maritime Law and Commerce, Vol. 28, No. 2 (April 1997) p.207

R.B. Pope and J.D. McClure, "Estimated Annual Worldwide Shipments of Radioactive Material" (Packaging and Transportation of Radioactive Materials, PATRAM '86 Symposium), Davos, 16-20 June 1986, Packaging and Transportation of Radioactive Materials, Proceedings of a Symposium, Vol. 1 (Vienna: IAEA, 1987)

R. Rawl, "Safe transport of radioactive material" On line: IAEA Web site <http://www. iaea. org/worldatom/inforesource/bulletin/bull391/rawl.html> (Date accessed: 10 August 1999)

A. Salleh, "Working with Nature: Reciprocity or Control?", in M. Zimmerman, *Environmental Philosophy From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993)

R. Seitz, "Sustainable development & electricity generation: Comparing impacts of waste disposal" 38 IAEA Bull. No. 2 (1996) On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/bulletin/bulletinv38n2/html> (Date accessed: 17 August 1999).

B.A. Semenov and N.Oi, "Nuclear fuel cycles: Adjusting to new realities", *IAEA Bulletin*, 3/1993, reproduced in the *United Nations and Nuclear Non-Proliferation*, United Nations Department of Public Information (United Nations Publication, New York:1995

C. D. Stone, "Should Trees Have Standing? - Toward Legal Rights for Natural Objects", 45 S. Cal. L. Rev. 450 (1972)

L. M. Talbot and World Resources Institute, "Man's Role in Managing the Environment", in D. Botkin, M. F. Caswell, J. E. Estes, and A. A. Orio (eds.) *Changing the Global Environment, Perspectives on Human Involvement* (San Diego, California: Academic Press, Inc., 1989)

P. W. Taylor, "The Ethics of Respect for Nature", in M .Zimmerman (Gen. Ed.), *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993)

P. Taylor, "The State of the Marine Environment: A Critique of the Work and Role of the Joint Group of Experts on Scientific Aspects of Marine Pollution (GESAMP)", Marine Pollution Bulletin, Vol. 26, No.3, pp. 120-127 (1993)

W. Tonhauser and O. Jankowitsch, "The Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", 60 Nuclear Law Bulletin 9 (December 1997) at 17

D. VanderZwaag, "Regionalism and Arctic Marine Environmental Protection: Drifting between Blurry Boundaries and Hazy Horizons", in D. Vidas and W. Ostreng (eds.), *Order for the Oceans at the Turn of the Century* (The Hague: Kluwer Law International, 1999)

D. VanderZwaag, "The Precautionary Principle in Environmental Law and Policy: Elusive Rhetoric and First Embraces", In press, Journal of Environmental Law and Practice.

K. Warren, "The Power and the Promise of Ecological Feminism", in M. Zimmerman (Gen. Ed.), *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice-Hall, Inc., 1993)

E. B. Weiss, "Intergenerational equity: A legal framework for global environmental change", in E. Brown Weiss (ed.), *Environmental change and international law: New challenges and dimensions*, (Japan: United Nations University Press, 1992)

S. Williamson, "The Special Problems Involved in the Maritime Carriage of Fissile Materials", in (Proceedings of a Symposium) Stockholm, 18-22 June 1972, *Maritime Carriage of Nuclear Materials* (Vienna: IAEA, 1973) at 29

M. Zimmerman, "General Introduction", in M. Zimmerman, *Environmental Philosophy, From Animal Rights to Radical Ecology*, (New Jersey: Prentice Hall, 1993)

IAEA Articles

IAEA Press Release, " Implementation of IAEA Safeguards in 1998", 17 June 1999, IAEA PR 99/6, On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/pressrelease/prn0699.html> (Date accessed: 30 June 1999)

IAEA, "International Safeguards and the Peaceful Uses of Nuclear Energy", On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/factsheets/safeguards.html> (Date accessed: 17 August 1999

IAEA, "Assignment of Nuclear Activities to Physical Protection Categories", IAEA Doc. INFCIRC/225/Rev.3, August 1993, On line: IAEA Web site, <http://www/iaea.org/worldatom/program/protection/infcirc225/infcr230.html,> (Date accessed: 10 July 1999)

IAEA Press Release, "International Chernobyl Conference Concludes in Vienna", 17 April 1996, IAEA PR 96/7, On line: IAEA Web site < http://www.iaea.org/wordlatom/inforesource/pressrelease/pm796.html > (Date accessed: 17 August 1999)

IAEA, "International Radiation and Waste Safety Standards," On line: IAEA Web site <http://www.iaea.org/worldatom/ > (Date last updated: 26 February 1999)

IAEA, "Radiation Safety, Excerpt from the IAEA Annual Report for 1994," On line: IAEA Web site <http://www.iaea.org/worldatom/inforesource/annual/anr9410.html > (Date accessed: 17 August 1999)

IAEA, "Emergency Notification, Assistance, and Response", On line: IAEA Web site <http://www.iaea.org/worldatom> (Date last updated: 01 February 1999)

IAEA, " The Convention on Early Notification and Assistance", On line: IAEA Web site <http:// www.iaea.org/ns/rasanet/conventions/earnotcon.htm#Top > (Date last updated: 25 January 1999)

IAEA Secretariat, "Report on Legally Binding and Non-Binding International Instruments and Regulations Concerning the Safe Transport of Radioactive Materials and their Implementation, 16 April 1998, IAEA GOV/1998/17

IAEA, *The IAEA's Safeguards System, Ready for the 21st Century,* On line: IAEA Web site < http://www.iaea.org/worldatom/inforesource/other/safeguards2/intro.html> (Date accessed: 21 June 1999)

IMO Articles and documents from meetings of various IMO committees

IMO FSI -5th session: 13-17 January, 1997, On line: IMO Web site< http://www.imo.org/meetings/fsi/5/fsi3.htm > (Date accessed: 10 August 1999).

IMO FSI - 6th session:22-26 June 1998, On line: IMO Web site < http://www.imo.or/meetings/fsi/6/fsi0.htm > (Date accessed: 10 August 1999)

IMO FSI - 7th session: 22-26 March 1999, On line: IMO Web site <http://www.imo.org/meetings/fsi/7/fsi.htm > (Date accessed: 10 August 1999)

IMO Legal Committee 75th session: 21-25 April 1997, On line: IMO Web site http://www.imo.org/meetings/leg/75/legnb.htm (Date accessed: 16 August 1999).

IMO Legal Committee 78th session: 19-23 October 1998, On line: IMO Web site http://imo.org/imo/meetings/leg/78/leg78.htm (Date accessed: 16 August 1999).

IMO Legal Committee - 79th session: 19-23 April 1999, On line: IMO Web site http://www.imo.org/imo/meetings/leg/79/leg79.htm (Date accessed: 17 August 1999).

IMO MEPC - 41st session: 30 March - 3 April 1998 On line: IMO Web site <http://www.imo.org/imo/meetings/mepc/41/dsc41.htm> (10 June 1999)

IMO DSC - 4th session: 22-26 February 1999, On line: IMO Web site <http://www.imo.org/meetings/dsc/4/dsc41.htm > (Date accessed: 19 July 1999).

IMO MSC - 68th session: May 28 to June 6, 1997 On line: IMO Web site <http://www.imo.org/imo/meetings/msc/68/inf.htm > (Date accessed: 17 August 1999).

IMO MEPC - 40th session: 18-25 September 1997 On line: IMO Web site <http://www.imo.org/meetings/mepc/40/mepc404.htm> (Date accessed: 17 August 1999).

IMO, *The Safe Transport of Dangerous, Hazardous or Harmful Cargoes by Sea,* IMO Information Paper, J/3737, May 1988, extracted reprinted in *Annual Review of Ocean Affairs: Law and Policy, Main Documents 1988 Volume III,* (Florida: UNIFO Publishers, Inc., 1990) at 1159

IMO MSC, *Reports on Acts of Piracy and Armed Robbery Against Ships*, IMO MSC/Circ.925, 30 June 1999, On line: IMO Web site <http://www.imo.org/circs/msc/piracy/925.pdf > (Date accessed: 10 August 1999).

IMO, "World Maritime Day 1997 Optimum maritime safety demands a focus on people" On line: IMO web site <http://www.imo.org/wmd/wmd97/htm.> (Date accessed: 17 July 1999)

IMO, "IMO and dangerous goods at sea," January 1996, On line: IMO Web site <http://www.imo.org/focus/ascii/imdg2.txt> (Date accessed: 17 July 1999).

IMO News, "Lassoing the cowboys - the ISM Code is coming!" 12 March 1996, On line: IMO Web site < http://www.imo.org/news/396/ismcode.htm > (Date accessed: 27 July 1999).

IMO, "70% of fleet set to meet ISM target, says IMO", On line: IMO Web site; <http://www.imo.org/news/3&497/ismcode.htm > (Date accessed: 27 July 1999)

IMO, "Safety of Navigation" On line: IMO Web site http://www.imo.org/focus/safnav/safcontl.htm > and < http://www.imo.org/focus/ safnav/safenav7.htm> (Date accessed: 27 July 1999)

COGEMA Articles

COGEMA, "Return Shipment of vitrified residues from France to Japan," On line: COGEMA Web site <http://www.cogema.fr/dossiers_gb/dossier2.html > (Date accessed: 17 August 1999)

COGEMA NEWS, "Departure Of The First Shipment Of Recycled (Mox) Fuel To Japan" 22 July 1999, On line: COGEMA Web site <http://www.cogema.fr/actualites_gb/communiques/index.html> (Date accessed: 17 August 1999)

COGEMA, "Reprocessing and Recycling", On line: COGEMA Web site <http://www.cogema.fr/activities_gb / recyclage/index.html > (Date accessed: 17 August 1999)

Articles from other sources

UN Press Release, "Ad Hoc Committee To Prepare Anti-Terrorism Instruments Concludes Third Session At Headquarters," 15 - 26 March, 1999, 26 Mar 1999, L/2918. On line: UN Web site <http://www.un.org/> (Date accessed: 25 June 1999)

Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations, "Shipping and Navigation", On line: United Nations International Year of the Ocean Home Page < http://www.un.org/Depts/los/IYO97/index.html > (Date last updated: 10 August 1998)

UNEP, "Access to Environmental Information", On line: UNEP Home Page <http://www.unep.org/unep/access.htm> (Date accessed: 30 August 1999).

UN Economic and Social Development, "Earth Summit + 5, Five Years After Rio: Where Do We Stand? ", On line: UN Economic and Social Development Home Page< http://www.un.org/ecosocdev/geninfo/sustdev/5years.htm >(Date accessed: 30 August 1999)

United Nations Department of Public Information, "UN Conferences: What Do They Accomplish?" August 1997, UN Doc. DPI/1825/Rev.4.

Yearbooks

Netherlands Institute for the Law of the Sea, *International Organizations and the Law of the Sea, Documentary Yearbook 1992, Vol. 8*, (London: Graham & Trotman/Martinus Nijhoff, 1994) _

Netherlands Institute for the Law of the Sea , *International Organizations and the Law of the Sea Documentary Yearbook 1993 Vol. 9,* (London: Graham & Trotman/Martinus & Nihjoff, 1993)

Netherlands Institute for the Law of the Sea, *International Organizations and the Law of the Sea, Documentary Yearbook 1995, Vol. 11*, (The Hague: Martinus Nijhoff Publishers, 1998)

UNIFO, *Annual Review of Ocean Affairs: Law and Policy, Main Documents 1988 Volume III,* (Florida: UNIFO Publishers, Inc., 1990)

Web sites

On line: United Nations Web site <http://www.un.org/>

On line: IMO Web site <http://www.imo.org/ >

On line: IAEA Web site <http://www.iaea.org/ >

On line: COGEMA Home page < http://www.cogema.fr/ >