



turn back the toxic tide

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Comments on the EPA's Intent to Issue the US Navy Approval for the Disposal of PCBs

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January 19, 2006

I. Comment - Artificial Reefing

Artificial Reefing is A Form of Waste Dumping

The disposal of end-of-life vessels under the pretext of “artificial reefing” greatly concerns BAN. Last October 1, 2004, BAN furnished the EPA Office of Water comments on its Proposed Guidelines for Artificial Reefing of Vessels. In our comments, BAN highlighted the major issues concerning waste dumping via “artificial reefing”, which we believe needs to be reiterated in this submission. The main points are as follows:

First, the practice of waste dumping via “artificial reefing” is a form of toxic trade or transboundary movement of pollution issue. Wastes dumped within the US territorial waters, particularly persistent organic pollutants (POPs), such Polychlorinated biphenyls (PCBs) in the case of the ex-Oriskany, do not remain stagnant within the area of the reef. The EPA itself publicly recognizes that POPs “...circulate globally via the atmosphere, oceans, and other pathways, POPs released in one part of the world can travel to regions far from their source of origin.”¹ We will discuss this issue further in the following section on PCBs.

Second, allowing this practice ultimately absolves the owners of the vessels (those that benefited from their existence) from taking full responsibility over their vessel's toxic constituents in the first instance. The true cost of dealing with the environmental contaminants is passed on to the environment and impacted communities. The practice also foments a great disincentive in the future, for ship owners to demand non-toxic vessels, and designed with recycling in mind.

Third, BAN is greatly concerned about the practice of dumping valuable steel resources at sea rather than accomplishing far more appropriate resource recovery in an environmentally sound and sustainable manner. The globally recognized waste management hierarchy² strongly suggests that dumping waste at sea is not the environmentally preferable option. In this regard, the United States should be fostering a robust and state-of-the-art ship recycling infrastructure helping American scrap steel and shipbreaking industries, instead of looking for cheap disposal options that directly undermine the worthwhile development of these industries.

Finally, we believe that dumping end-of-life vessels at sea sends a dangerous cultural message that the natural world and in particular our marine environment can be used as humanity's trash bin. The notion that nature can be "improved upon" by artificial constructs, is a dangerous one as it presupposes that humans understand ecology fully and it further presupposes that nature should not be preserved to the extent possible as it is, regardless of whether human beings value it in its natural state or not.

In sum, BAN firmly believes that disposal of obsolete vessels at sea should only be undertaken if recycling and resource recovery is not possible. In the absence of such possibility, all hazardous substances and wastes, including PCBs in any form and at any concentration level should be removed to the extent possible prior to ocean dumping of waste vessels.

For more details on our comments on the EPA's Proposed Guidelines for the Artificial Reefing of Vessels, please visit:

<http://www.ban.org/Library/BANComments%20on%20Reefing%20Guidance.pdf>

II. Specific Comments - Disposal of PCBs

A. PCBs are carcinogens with no safe levels of exposure – the risk of cancer increases with increased exposure to the carcinogen

"PCBs are probable cancer-causing agents; therefore, all contact should be reduced to the lowest possible level. Many scientists believe that there is no safe level of exposure to PCBs."³ This statement came from EPA Region 10's advisory on PCBs, and is echoed by other government agency warnings.⁴ This policy is further reflected and is consistent with the EPA's drinking water Maximum Contaminant Level Goals (MCLG) for PCBs which is set at zero,⁵ the level of protection which the EPA considers would not cause any of the potential health problems caused by PCBs.⁶

The same level of precaution is exacted by the revised Delaney Clause under the Food Quality Protection Act of 1996, which places a ban on cancer causing food and color additives. These preventive policies echo the prevailing wisdom against carcinogens like PCBs that the risk of cancer increases with increased exposure to the toxin, thus it is desirable that no exposure occur.

Yet, in spite these very stringent policy goals on food and water against PCBs, the EPA based on the risk assessments conducted by the Navy is intent on approving the disposal of the same

highly persistent organic pollutant into the marine environment increasing exposure and contaminating fish and other various aquatic organisms, which people will later consume.

B. The risk of dumping 700 lbs of PCBs in the ocean is a needless risk

The whole investigation of the EPA on whether the 700 lbs of PCBs left in the ex-Oriskany will pose an unreasonable risk of injury to human health and the environment is based on a fundamental assumption - that it is necessary to leave the 700 lbs of PCBs in the vessel in the first place. This premise is critical, because if the PCBs can be removed from the vessel, then the PCB risk is completely obviated. Yet, in spite of its importance, the validity of this premise has not been substantiated by any supporting evidence or documentation other than the assertion made by the US Navy.

The US Navy together with the US Maritime Administration (MARAD) have consistently utilized the excuse of leaving toxic waste in their vessels destined for disposal because removing such wastes would unduly affect the structural integrity of the vessel. As we shall see this mantra is more an excuse to cheaply dispose of a waste rather than overriding sense to do the right thing.

The claim made by the US Navy and MARAD is at best disputable. US shiprecycling industry experts have expressed the view that PCB removal can be done without harming the vessel's structural integrity. A point of reference to support their assertion is the USS Spiegel Grove. The Spiegel Grove is a 501 ft. vessel, the largest so far, that has been rendered as an artificial reef, off Florida's Key Largo coast in 2002. Reports indicate that extensive removal of the PCB cabling, insulation, and ventilation gaskets was conducted on the vessel by US shiprecyclers, at the cost of \$1.6 million.⁷ Clearly, if this procedure was successfully applied on one vessel, its application to another can be replicated.

Even assuming that the removal of non-liquid PCBs may jeopardize the integrity of the ship, the vessel's integrity can hardly be seen as a vital consideration when the vessel itself is going to be dumped into the ocean. Towing such ships with flotation devices no matter what the integrity of the structure is clearly feasible. The higher goal of preventing the dangerous PCBs in the vessels from migrating into the marine environment should trump these other issues.

From the foregoing, there appears to be no compelling justification for leaving PCBs in the ex-Oriskany on the basis of the vessel's structural integrity.

C. The Navy assessments proceeds on the wrong premise in evaluating the risk of dumping PCBs in the marine environment, and provides no concrete assurances against the risk they are taking

The Navy's Ecological Risk and Human Health Assessments begin on the wrong premise as the studies evaluate the risk of dumping PCBs in the marine environment. The Assessments furnish the readers with sophisticated calculations and projections of PCB emissions from the ex-

Oriskany, yet both fail to address the most fundamental question all, whether sinking 700 lbs of PCBs with the ex-Oriskany is a risk that is avoidable or not. It simply presumes that there is a need to dump 700 lbs of PCBs in the ocean.

The Assessments are also limited as they fail to quantify the negative health outcomes that can occur if the sophisticated calculations prove to be erroneous, compared to relative cost of removing the PCBs out of the vessel.

No concrete assurances are provided by the benchmarks adopted in the Assessments that sufficiently protect the environment and human health. First, there is a lack of clearly defined criteria to assess the experimental data and assumptions which the studies used. One needs to simply refer to section 7, Uncertainties, of the Ecological Risk Assessment, for instance, to glean the tenuousness of some of the assumptions made by the study.

Section 7, admits that the Navy failed to provide a complete inventory of PCBs onboard, from the types of PCBs on board to their quantity. This data is crucial, considering it will affect leach rate projections and more importantly since some types of PCBs are more toxic than others, their behavior as a mixture in the marine environment needs to be studied closely. In order to fill this gap, the Ecological Risk Assessment made adjustments in the calculation to address the leach rate question, but no clear criteria was developed to assess the missing data gap on the reaction of the various PCB mixtures in the marine environment. What would really be necessary to provide the proper data would be to monitor the sites for several decades. In such a case, if a problem does occur it will be too late to address it. The damage would have been done.

Second, there is also a failure to consider the various other sources of PCB in the Florida coast, which fish species that are expected to populate the ex-Oriskany may be exposed to. The Ecological Risk study for instance makes the assumption that the food web around the reef is a closed one, where the marine species do not spend any time or obtain any food outside the influence of the sunken vessel.⁸ This may be critical omission.

Certain species of reef fishes tend to migrate from one reef to another for feeding. Considering that the Florida coast is peppered with artificial reefs that are made from various materials such as tires to vessels, there are multiple PCB sources that may account for additional PCB loading among migrating reef fish species that can impact the food chain risk assessment around the ex-Oriskany.

The study also does not take into account the inherent PCB body burdens the fish and other organisms already carry when they first populate the artificial reef. The Ecological Risk study only considered the ex-Oriskany as the only source of PCB contamination among the marine species that inhabit it. Since fish, birds, and marine mammals are especially sensitive to the effects of PCB's, where even concentrations of less than a part per billion in eggs can impair the growth of these animals, or alter the normal growth of the young,⁹ any miscalculation can lead to serious consequences to the marine life the will come into contact with the ex-Oriskany.

Further, the benchmark levels utilized in the Human Health study to determine the acceptability of the cancer risk created by the PCBs in the ex-Oriskany, do not adequately protect individuals

who eat greater than average amounts of PCB contaminated fish. Moreover, the Human Health study's claim that "consumers of commercial fisher's catch will have a lower fraction of fish ingested from the artificial reef site than was derived for the recreational fisher, since they will be consuming commercial fish caught from a larger geographic region",¹⁰ is without certainty given that the study simply assumed a closed system without accounting for fish migration.

The foregoing issues raise the bar of uncertainty higher than what is acceptable. Aside from the risk being avoidable, which we discuss in the following section, the EPA and the US Navy should observe the internationally accepted precautionary principle; that when faced with scientific uncertainty on the consequences of an action, but are judged to have some potential for major or irreversible negative consequences, then it is better to avoid that action. In this case, it is better for the EPA to prohibit the disposal of PCBs in the Florida coast.

D. As a toxic waste disposer, the US Navy must be held responsible for the post disposal maintenance, monitoring, and corrective actions on the dump site

As the generator of the toxic wastes, the US Navy must be held responsible for the post disposal maintenance, monitoring, and corrective action on the dump site. It is very important to note that in practice, the EPA requires financial assurances for closure by storers and disposers of PCB waste to cover closure costs. As we have discussed earlier, artificial reefing is for all intents and purposes waste dumping or disposal. In this case, the EPA must require the Navy to be financially responsible to assume all necessary Supplemental Monitoring Programs,¹¹ and most importantly, require the Navy to develop remediation plans and provide financial assurances to cover the costs of the "closure" of the dump site, if PCBs levels become alarmingly high. The EPA must make a determination on when these obligations are triggered and when the responsible party is freed from maintaining such obligations.

E. The US EPA's intent to approve the disposal of 700 lbs of PCBs in the ocean violates prevailing international law and globally accepted policy on PCB disposal

166 nations have through one treaty or another recognized the seriousness of the global problem of persistent organic pollutants such as PCBs, and agreed upon measures to deal with such a pollutants. As we shall see the very practice that the US EPA will be abetting flies in the face of known and internationally established standards of dealing with PCBs.

1. OECD

On December 14, 1960, 20 nations adopted the Convention on the Organisation for Economic Co-operation and Development (OECD) to promote global market economy. Today, the OECD is composed of 30 of the wealthiest nations in the world; the US is one of the original members of the OECD.

In order to achieve its goals, the OECD can promulgate decisions that are generally binding on its members, and make recommendations.¹² The OECD has promulgated decisions in the areas of finance to the environment, and has even looked at the issue of PCBs. OECD Decision C(87)2/Final specifically touches on the issue of PCB disposal, and in its chapeau it makes two crucial remarks:

“Considering that the ultimate objective of international action to control PCBs is to eliminate entirely their release to the environment;

Considering, therefore, the need for additional, more stringent measures to control new and existing uses of PCBs and the disposal of PCBs and wastes containing PCBs;”

Decision C(87)2/Final (Decision) proceeds to, among others, recommend that member countries, as far as practicable, ensure that disposal of PCB containing wastes is carried out in a manner that avoids the release of PCBs into the environment.¹³

The members of the OECD clearly saw the danger of releasing PCBs into the environment and have recommended to its members to adhere to such high standard, as far as practicable. The US being a member of the OECD is failing to respect this recommendation in good faith if it allows the disposal of the ex-Oriskany without removing all the remaining PCBs on board.

As we have discussed earlier, there appears to be no technical hindrance in removing all the PCBs onboard the ex-Oriskany. Other OECD members, such as Canada, are respecting the recommendation.

In the area of ship disposal, Canada appropriately does *not* use a risk-based approach. The Canadian clean-up standard for ocean disposal of vessels calls for “...any equipment or components suspected of containing PCBs must either be removed or certified that the equipment or component does not contain PCBs.”¹⁴

If ship reefing must be done, which we believe is highly dubious based on the waste management hierarchy and for the reasons we have elaborated upon previously, the Canadian approach respecting the OECD Decision, among others, is the correct approach environmentally and legally to follow (see also below re: Stockholm and London Conventions).

2. *Basel Convention*

The Basel Convention on the Control of the Transboundary Movement of Hazardous Waste and Their Disposal, adopted in March of 1989 seeks to minimize transboundary movements of hazardous wastes, their generation, and promote environmentally sound management of hazardous and other wastes which are unavoidable. While the United States has failed to ratify the Basel Convention, they have signed it, and thereby indicated intent to ratify it.

While most of the thrust of the Basel Convention has to do with transboundary movement of hazardous wastes, Basel also exists to promote environmentally sound management of hazardous

wastes and has created numerous technical guidance documents on various waste streams. One of these guidance documents deals with PCBs.

The Basel Convention Technical Guidelines for Environmentally Sound Management of Wastes Consisting of, Containing or Contaminated with Polychlorinated Biphenyls, Polychlorinated Terphenyls or Polybrominated Biphenyls¹⁵ does not consider ocean disposal as either a means of destruction or irreversible transformation of PCBs waste as required by the Stockholm Convention, nor does it consider ocean disposal as a means of PCB disposal in the case when destruction or irreversible transformation “does not represent the environmentally preferable option”.

The Basel Guidelines considers various environmentally sound destruction options, such as Alkali Reduction, Base Catalyzed Decomposition, Gas Phase Chemical Reduction, etc. to be in line with the mandates of the Stockholm Convention on POPs (the Stockholm requirements are discussed in the succeeding section) – ocean disposal is by no means a method of POPs *destruction*.

3. *Stockholm Convention*

The Stockholm Convention, which entered into force May 17, 2004, is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). 112 nations have now ratified this Convention.

POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. POPs migrate globally and can cause damage wherever they travel. PCBs are POPs, and are in fact one type of several POPs slated for global elimination under the Stockholm Convention.¹⁶ The United States has not ratified the Stockholm Convention yet, but has signed it and indicated every intention of ratifying it.

The Stockholm Convention among other things defines how the international community must manage POPs wastes. Article 6 (d) of the Stockholm Convention provides that each Party must:

“Take appropriate measures so that such wastes, including products and articles upon becoming wastes, are:

x x x

- (ii) *Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, including those that maybe developed pursuant to paragraph 2, and*

relevant global and regional regimes governing the management of hazardous wastes;”

The Stockholm Convention is unequivocal in its mandate that POPs content of substances, such as PCBs, must be destroyed or irreversibly transformed, or if the POPs content is low or destruction or irreversible transformation is not an environmentally sound option to undertake environmentally sound management options for the POPs wastes.

The Basel Convention as noted above has been tasked to work with the Stockholm Convention to determine the various environmentally sound options that can satisfy the mandate of the Stockholm Convention. And as previously highlighted, disposal at sea is *not* enumerated as an environmental option for dealing with PCBs nor does it meet the mandate of Article 6.

The United States is a signatory to the Stockholm Convention, and is bound to respect and not undermine the Convention’s provisions. Based on its international obligations, it is imperative for the US EPA to stay its intent to approve the artificial reefing of the ex-Oriskany until all PCBs are removed from the vessel.

4. London Convention and the 1996 Protocol

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,¹⁷ otherwise known as the London Convention, entered into force in August 30, 1975. The United States *is* a party to this Convention.

The London Convention covers the deliberate disposal at sea of wastes or other matter from vessels, aircraft, and platforms. It controls and prevents marine pollution through several means: by prohibiting the dumping of certain hazardous materials; requiring special permits for the dumping of a number of other identified materials; and requiring a general permit for the sea dumping of other wastes or matter.

The disposal or dumping of vessels and platforms or other man-made structures at sea is generally prohibited under the London Convention.¹⁸ An exception to this prohibition is when materials “capable of creating floating debris or otherwise contributing to pollution of the marine environment has been removed to the maximum extent”.¹⁹

Parties to the Convention are urged to take appropriate measures within their territory to prevent and punish conduct in contravention of the provisions of this Convention,²⁰ and to “ensure by the adoption of appropriate measures that such vessels and aircraft owned or operated by it act in a manner consistent with the object and purpose of this Convention”.²¹

In addition to its outstanding obligations under the London Convention, it is worth considering the United States’ further obligations under the London Convention’s 1996 Protocol.²²

The 1996 Protocol will supersede the Convention once the 1996 Protocol enters into force, and with this change, more stringent obligations are forthcoming. Although the 1996 Protocol

provides a narrow possibility for the dumping of vessels, similar to the original London Convention, one of the most important provisions that impact the planned disposal at sea of the ex-Oriskany is that, Contracting Parties must be mindful of the objectives of the Protocol and the General Obligations.

The objective of the 1996 Protocol is as follows:

Contracting Parties shall individually and collectively protect and preserve the marine environment from all sources of pollution and take effective measures, according to their scientific, technical and economic capabilities, *to prevent, reduce and where practicable eliminate pollution* caused by dumping or incineration at sea of wastes or other matter. Where appropriate, they shall harmonize their policies in this regard.²³ (Emphasis supplied)

The thrust of the objectives are three-fold, prevent, reduce, and eliminate. These are the standards that the US EPA should bear in mind as it considers the artificial reefing of the ex-Oriskany.

Supporting the objectives are the general obligations established in Article 3 of the Protocol. One of the important Party obligations is to take the *precautionary approach* whereby "appropriate preventative measures are taken when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects."²⁴

Given what we have learned above about the risky assumptions made by the US Navy in its studies and that the studies fail to provide certainty of adequate protection for human health and the environment, it is clear that the precautionary approach applies in this instance.

Further, the 1996 Protocol places responsibilities on polluters when it states that "the polluter should, in principle, bear the cost of pollution"²⁵ and it emphasizes that Contracting Parties should ensure that the Protocol should not simply result in pollution being transferred from one part of the environment to another.²⁶

Most immediately the EPA needs to study the legal implications of the term found in the London Convention "maximum extent" with respect to removal of hazardous materials. By any fair interpretation such strong language implies "to the extent possible".

Thus EPA's allowance of PCBs or any other toxic substance that *can* be removed prior to ocean disposal is insupportable even under the original London Convention to which the USA is a party.

III. Conclusion

Among the locals in the island of Luzon, in the Philippines there is a common saying about taking unnecessary risks that it's like picking up a rock and hitting yourself repeatedly on the head with it. This metaphor completely captures the nature of the Navy proposal to dump 700

lbs of toxic PCBs in the ocean which the US EPA is thinking of abetting.

As we have noted, the current proposal embodies a risk that is completely unnecessary. The fundamental question that needed to be addressed at the beginning of this inquiry is whether the risk being undertaken by the US government is avoidable or not. Only if the risk is unavoidable should the government, in this case both the Navy and the EPA, look into the existence of an unreasonable risk of injury to human health and the environment if they need to push through with the proposal.

Based on past toxic waste remediation projects on other US end-of-life vessels, such as the USS Spiegel Grove, and on proposals from US Shiprecyclers, it is apparent that the remaining 700 lbs of PCBs in the ex-Oriskany can be removed without impairing the vessel's structure. Regretfully, these facts were either ignored or overlooked, and we now find ourselves teetering before an untenable choice of playing Russian roulette with the health of people and the marine environment.

PCBs and their known endocrine disruptive effects are active at extremely low levels. The EPA itself recognizes that carcinogens such as PCBs have no safe level of exposure. Yet at this juncture they are turning their heads away from the very danger they themselves admit to. Moreover, the fact that the US Navy wants to ram through with disposing the ex-Oriskany in the coast of Florida provides cold comfort with the knowledge that they developed Ecological Risk and Human Health Assessments that favors their proposal. The Assessments among other, did not establish credible criteria to assess some of the assumptions taken, and the actionable benchmarks used to assess risk levels provide no protection to individuals who do not conform to the standard models on which the benchmarks are based.

Needless to say the practice which the US Navy is pursuing, using the marine environment to dispose of PCBs is in contravention to international laws and norms some of which are immediately binding on the United States.

In sum, the risk assessments conducted in this case is a misleading process; it lulls the sensibility of people to accept a given risk without questioning whether that risk is needed to be taken in the first place. Why we need to hit our heads with a rock and those of the generations after us for the next 100 years or so, only the US Navy and the EPA would know.

END

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¹ See: <http://www.epa.gov/oppfead1/international/pops.htm>

² Report of Ad hoc meeting of Government designated experts (Nairobi, 9-11 December 1991) UNEP/CHW/WG.2/1/3. Under the United Nations Environment Program, government-designated experts have outlined the elements of an international strategy and an action program for dealing with wastes, including technical guidelines for environmentally sound management of hazardous wastes:

1. Prevent the generation of wastes;
2. Reduce to a minimum the wastes generated by economic activities;
3. Recover, reuse and recycle the greatest possible quantity of those wastes which are still generated; and
4. Dispose of, in an environmentally sound manner, any remaining waste.

³ See: <http://yosemite.epa.gov/R10/OWCM.NSF/0/a9578719c73ad1de882569ed00782e89?OpenDocument>.

⁴ See: <http://www.state.nj.us/health/eoh/peoshweb/pcbib.htm>

⁵ http://www.epa.gov/safewater/contaminants/dw_contamfs/pcbs.html

⁶ *Id.*

⁷ See: <http://www.gulfcoastgateway.com/apps/pbcs.dll/article?AID=/20051002/NEWS01/510020328/1006> and <http://www.spiegelgrove.info/>.

⁸ Section 5-1, ex-Oriskany Artificial Reef Project Human Health Risk Assessment, see at: <http://www.epa.gov/region4/air/lead/documents/ex-Oriskanyartificialreefprojecthumanhealthriskassessment6-05-drftfinal.pdf>

⁹ Rice, C.P., P. W. O'Keefe and T.J. Kubiak. 20023. Sources, Pathways and Effects of PCB's Dioxins and Dibenzofurans. Pp 501- 573 In: Hoffman, D.J., B.A. Rattner, G.A. Burton and J. Cairns, Jr. Handbook of Ecotoxicology, 2nd Ed. Lewis Pub. Boca Raton FL.

¹⁰ *Supra* note 7, at section 6-1.

¹¹ Paras. 17 and 18, Draft for Risk-Based Disposal of PCB Bulk Waste.

¹² Article 5, Convention on the Organization for Economic Cooperation and Development.

¹³ Art. III (2), Decision C(87)2/Final.

¹⁴ Environment Canada. 2001b. Clean-Up Standard for Ocean Disposal of Vessels. Revision 1 – July 2001 Environment Canada, Environmental Protection Branch, Pacific and Yukon Region. http://www.pyr.ec.gc.ca/EN/ocean-disposal/english/cleanupstandard_jul01_e.htm#38

¹⁵ See at <http://www.basel.int/techmatters/index.html>.

¹⁶ Annex A, Stockholm Convention on Persistent Organic Pollutants.

¹⁷ See at http://www.imo.org/Conventions/contents.asp?topic_id=258&doc_id=681#7. [hereinafter London Convention].

¹⁸ Art. 4 and Annex 1, London Convention.

¹⁹ Annex 1, Section 11(d), London Convention.

²⁰ Art. VII (2), London Convention.

²¹ Art. VII (4), London Convention.

²² 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, see at http://www.imo.org/Conventions/contents.asp?topic_id=258&doc_id=681#7. [hereinafter 1996 Protocol].

²³ Art. II, 1996 Protocol.

²⁴ Art. III (1), 1996 Protocol.

²⁵ Art. III (2), 1996 Protocol.

²⁶ Art. III (3), 1996 Protocol.