Introduction to special issue on the precautionary principle and its operationalisation in international environmental regimes and domestic policymaking

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This special issue of *IJGEI* focuses on the precautionary principle, an instrument for decision making that could usher in a sea change in domestic and international forums if widely implemented. The precautionary principle initially emerged during the mid-1960s in the former West Germany (Gullett, 1997). The essence of the early conception of *vorsorge* ('foresight' or 'taking care') was the belief that environmental damage could be prevented or minimised through careful, forward-looking planning, as well as the adoption of 'best practices' in environmental management (Riordan, 1995; Von Moltke, 1992). The *vorsorgeprinzip* ('precautionary principle' or 'foresight principle') was used by the German government and other northern European countries to address many pressing issues in the 1970s and 1980s, including North Sea pollution, acid rain and climate change.[1]

The principle emerged at the international level in the 1980s. Since its first explicit incorporation in an international document in 1987,[2] the concept 'has been included in virtually every recent treaty and policy document related to the protection and preservation of the environment,'[3] as well as in national legislation and regulations in many States[4] and applied by many domestic courts.[5] On this basis, some commentators and policymakers contend that the Principle has attained, or is approaching attainment, of the status of customary international law.[6] However, many others question this conclusion, citing both dissent by important States and the absence of a unified definition.[7]

Intrinsic to the precautionary principle is an express rejection of a focus on the assimilative capacity of the environment, which heretofore held sway in the arena of

international environmental decision making.[8] The assimilative capacity concept emphasises the ability of scientists to use predictive modelling to accurately ascertain the carrying capacity of, and the magnitude of threats to, the environment, as well as society's technological capacity to mitigate such threats once detected.[9] It also presumes that there is sufficient time to act to avoid harm from such threats once they have been detected.[10] However, revelations in the past thirty years of unanticipated long-term damage associated with many substances that were heretofore presumed to be safe, including DDT, PCBs, and chlorofluorocarbons, put the lie to these assumptions.[11] Moreover, there has been growing recognition that many of the global environmental threats faced by this generation, and most likely many generations beyond, including climate change and threats to biodiversity, pose the specter of virtually unbounded and irreversible impacts,[12] providing a strong rationale for more risk-averse assessment and management strategies.

By contrast, under the precautionary principle:

> "... emphasis is placed on (1) the vulnerability of the environment; (2) the limitations of science to accurately predict threats to the environmental, and the measures required to prevent such threats; (3) the availability of alternatives (both methods of production and products) which permit the termination or minimisation of inputs into the environment; and (4) the need for long-term, holistic economic considerations, accounting for, among other things, environmental degradation and the costs of waste treatment."[13]

The precautionary principle has been characterised as a 'public policy guideline for environmental issues' (Myers, 1993) which 'ensures that a substance or activity posing a threat to the environment is prevented from potentially adversely affecting the environment, even if there is no conclusive scientific proof linking that particular substance or activity to environmental damage.'[14]

The Principle is premised on four basic assumptions:

- there is a threat of harm, either credible or known
- the situation presents a lack of scientific certainty or evidence
- cause and effect relationships are not yet proven
- there is a necessity or duty to act (deFur and Kaszuba, 2002).

A representative example of the Principle is found in the Convention for the Protection of the Marine Environment of the North-East Atlantic[15] (OSPAR Convention):

> "[P]reventive measures are to be taken when there are reasonable grounds for concern that substances or energy introduced, directly or indirectly, into the marine environment may bring about hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea, even when there is no conclusive evidence of a causal relationship between the inputs and the effects."[16]

Some versions of the principle incorporated into recent international environmental treaty regimes, soft law instruments, and national legislation also mandate the use of the best available technology or best management practices to prevent harm to the environment,[17] consistent with a shift from an emphasis on environmental effects to environmental management.[18] More radically, some incarnations of the Principle have reversed the traditional burden of proof to establish the safety of practices or activities.[19]

Unfortunately, most incarnations of the precautionary principle in international environmental treaty regimes to date 'provide few, if any operable guidelines for policy makers nor . . . constitute a rigorous analytical schema.'[20] In many cases, *no* guidance is provided to policy makers in implementing the principle, such as in the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS, which simply provides that 'the Parties shall apply the precautionary principle' in the context of conservation, research and management measures.[21] As one commentator has observed, '[the principle] seem[s] more like a 'sound bite' rather than a principle rooted in the law.'[22]

As a consequence, policy makers are often confused about their obligations in applying the principle, or blithely sign agreements that incorporate the principle knowing that it is likely to be unenforceable given its vagueness.[23] Thus, it should come as little surprise that the principle has seen extremely limited implementation by States at the national level or in international regimes.[24] Clearly, effective operationalisation of the precautionary principle in MEAs is 'dependent on more detailed criteria . . . '[25]

A second major issue has been the relationship of the precautionary principle to risk-based assessments. While some policymakers and commentators contend that the precautionary principle has a role to play in the conducting of risk assessment, and in risk management (Majone, 2002), others have contended that risk assessment 'captures neither the spirit nor the intentions of the precautionary principle' because it presumes, *inter alia* that risks can be accurately identified and quantified and that we can accurately identify exposure rates for environmental stressors (Santillo et al., 1998).

The articles in this special issue seek to address both these issues. In the first article, *Perspectives on Precaution: The Role of Policymakers in Dealing with the Uncertainties of Agricultural Biotechnology*, Dane Scott examines the markedly different perspectives of the USA and the European Union on the approval of genetically modified organisms (GMOs) and the role of policymakers in dealing with the substantial uncertainties of both the potential benefits and adverse impacts associated with biotechnology in the agricultural sector. The piece outlines the respective conceptions of the precautionary principle by the US and the EU from the perspective of the primary arguments advanced for rapid introduction of GMOs by the US and the much slower approach advocated by the EU. Ultimately, Scott concludes the policymakers should deal with the 'unavoidable uncertainty' associated with the introduction of GMOs into the environment by applying a version of the precautionary principle that does not reverse the burden of proof for establishing safety, but rather employs an incremental approach that sanctions the initial introduction of GMOs that appear to meet the greatest needs and pose the fewest risks, and to build upon our experience in making future decisions. The article includes a detailed schema for assessing potential risks of GMOs and needs and benefits.

In the second piece, *The Precautionary Principle: Torn between Biodiversity, Environment-related Food Safety and the WTO*, Makane Moïse Mbengue and Urs P. Thomas examination the application of the precautionary principle at the World Trade Organisation (WTO), especially concerning environmental protection and public health. In assessing the recent decisions of the WTO's Dispute Settlement Body (DSB) the authors conclude that while the DSB appears to be amenable to taking into account scientific complexity and the attendant need for precautionary policymaking, including in the context of trade-related measures to protect the environment, it construes the application of the precautionary principle narrowly, requiring a proper risk assessment procedure. It is difficult to assess, the authors conclude, the DSB's stance on the

precautionary principle because in recent disputes, the Parties invoking the principle have failed to provide adequate scientific evidence to support their positions.

In *Policy by Analogy: Precautionary Principle, Science and Polybrominated Diphenyl Ethers*, authors Gouin, Bocking and Mackay, suggest that the risk assessment process for potentially hazardous substances can be guided, in part, by analogy. The authors argue that by taking advantage of knowledge obtained for the PCBs in the past we can better implement precautionary measures with respect to similar substances, such as the PBDEs. Moreover, they contend that the use of analogies in chemical risk assessments provide regulatory bodies with 'sufficiently sound science,' facilitating application of the precautionary principle in this context.

In *Precautionary Local Politics and Coping with Risks of Radiofrequency Fields in Spain*, Josep Espluga examines the response of local councils in Spain to the growing concern over the potential adverse health effects that might be associated with base stations for cellphones. Espluga contends that local councils apply a form of precautionary principle in imposing a moratorium on the siting of new aerials in cities and villages, as well as restrictive regulatory regimes that include reference points and protective distances that exceed the standards established by the Spanish government and the EU. In suggesting that these precautionary measures were largely driven by public concern, Espluga discusses the public process of gathering information about the possible risk of cellphone base stations and the drivers of public perceptions of risk.

In *The Precautionary Approach at the International Tribunal for the Law of the Sea: The Southern Bluefin Tuna Cases*, Howard Schiffman examines one of the rare instances in which the precautionary principle has been applied in the context of marine conservation, the Southern Bluefin Tuna case before the International Tribunal for the Law of the Sea (ITLOS). Schiffman suggests that the decision has helped to define the contours of the precautionary principle in the context of a contemporary fisheries dispute. Schiffman concludes that a number of the judges provided strong support for a precautionary approach rather than 'principle,' the former being a guiding concept for policy makers, the latter being a more binding legal mechanism. Secondly, Schiffman contends that the Southern Bluefin Tuna decision demonstrates that judges in international tribunals are amenable to applying the precautionary principle, including in the context of provisional measures.

Finally, in *Precaution in Global Environmental Politics*, Radoslav Dimitrov conducts a comparative study of the application of the precautionary principle in four cases of global environmental politics: ozone depletion, acid rain, deforestation and coral reef degradation. Dimitrov concludes that policy makers apply the precautionary principle selectively. Governments do apply the PP under conditions of uncertainty about some aspects of the problem but demand complete information on other aspects. Moreover, different types of research-derived information play uneven roles in international policy making. Dimitrov's study also offers recommendations on where to focus scientific research on ecological problems in ways that strengthen efforts to introduce responsible environmental policy, including in the context of application of the precautionary principle.

References

deFur, P. and Kaszuba, M. (2002) 'Implementing the precautionary principle', *Sci Total Env't.*, Vol. 288, pp.155–157.

Gullett, W. (1997) 'Environmental protection and the 'precautionary principle: a response to scientific uncertainty in environmental management', *Envtl. & Planning L.J.*, Vol. 14, No. 1, pp.52–55.

Majone, G. (2002) 'What price safety? The precautionary principle and its policy implications', *J. Common Market Studies*, Vol. 40, No. 1, pp.89, 98–101.

Myers, N. (1993) 'Biodiversity and the precautionary principle', *Ambio*, Vol. 22.

Riordan, T. (1992) 'The precautionary principle in contemporary environmental politics', *Envtl. Values*, pp.191–193.

Santillo, D. et al. (1998) 'The precautionary principle: protecting against failures of scientific method and risk assessment', *Marine Pollution Bull.*, Vol. 30, No. 12, pp.939, 941–932.

von Moltke, K. (1992) 'The precautionary principle', *Env't.' Apr., p.2.*

Notes

[1] Douma, W.T. (2002) *The Precautionary Principle*, European Environmental Law Homepage, <http://www.eel.nl/virtue/precprin.htm>, site visited on Jan. 5, 2002. For example, in applying the principle in the context of North Sea pollution, northern European States agreed to:

> " . . . accept the principle of safeguarding the marine ecosystem of the North Sea by reducing polluting emissions of substances that are persistent, toxic and liable to bioaccumulate at source by the use of best available technology and other appropriate measures. This applies especially when there is reason to assume that certain damage or harmful effects on the living resources of the sea are likely to be caused by such substances, even where there is no scientific evidence to prove a causal link between emissions and effects."

Ministerial Declaration, Second International Conference on the Protection of the North Sea (1987).

[2] The London Declaration (1987) Ministerial Declaration. Second International Conference on the Protection of the North Sea (Nov. 24–25, 1987), <http://odin.dep.no/md/nsc/declaration/022001–990245/index-dok000-bn-a.html>.

[3] Freestone, D. and Hey, E. (1996) 'Origins and development of the precautionary principle', in: D. Freestone and E. Hey (Eds.) *The Precautionary Principle and International Law 3*. Examples of treaties and policy documents incorporating the precautionary principle include: the Stockholm Convention on Persistent Organic Pollutants, 40 I.L.M. 532 (2001), at art. 1, art. 8(9), Annex C(V)(B); the World Trade Organisation, Agreement on the Application of Sanitary and Phytosanitary Measures (1994), at art. 5(7); the United Nations Framework Convention on Climate Change, opened for signature, June 4, 1992, reprinted in 31 I.L.M. 849 (1992), at art. 3(3); the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 31 ILM 1312 (1992), at art. 2(5); the Convention on the Protection of the Marine Environmental of the Baltic Sea, 3 YIEL 1 (1992), at art. 3; the Montreal Protocol to the Vienna Convention for the Protection of the Ozone Layer, *Protocol on Substances that Deplete the Ozone Layer*, 26 ILM 1541, 1551 (1987); and the Declaration of the Second International Conference on the Protection of the North Sea, *Ministerial Declaration Calling for Reduction of Pollution*, 27 ILM 835, 838 (1987), at Preamble, para. VII; art. XV(ii); art. XVI(1).

[4] Arvidsson, Y. (2002) *The Precautionary Principle: Experiences from Implementation into Swedish Law*, IIIEE Reports, 2001:7 (2001), at 2, 9–10, <http://www.iiiee.lu.se/information/library/publications/reports/2001/Ylva-Arvidsson.pdf>, site visited on July 1, 2002.

[5] See Van der Endt-Louwerse, B.V. et al. *v. State Secretary of Transportation, Public Works and Water Management*, IJM 2001/99, Netherlands Administrative Law Division of the Council of State, Apr. 26, 2001 (Court annulled a permit allowing extraction of shell from Wadden Sea based on precautionary principle, holding that uncertainties about impact of extraction on ecosystem remained even after assessment of best available information and that benefit of the doubt should result in protecting the Wadden Sea); *Latitude Fisheries Pty., Ltd. v. Australian Fisheries Management Authority*, (2002) FCA 416 (Australian government required to adhere to the precautionary principle in implementing the State's Fisheries Management Act); *In the Matter of Water Use Permit Applications, Waiahole Ditch Combined Contested Case Hearing*, 9 P.3d 409, 466–467 (Hawaii 2000) (Commission on Water Resource Management required to act in accordance with precautionary principle).

[6] 'Based on its rapid and widespread acceptance by national actors, the principle may be approaching the status of customary international law.' Burns, W.C. and Mosedale, T.D. (1997) 'European Implementation of CITES and the proposal for a council regulation (EC) on the protection of species of wild fauna and flora', *Geo. Int'l. Envtl. L. Rev.*, Vol. 9, No. 195, pp.389–417 n.195; Birnie, P. and Boyle, A. (2002) *International Law and the Environment*, (2nd ed.), 120, No. 12; Communication on the Precautionary Principle, Communication from the Commission of the European Communities, COM(2000)1 final (Feb. 2, 2000), para. 3–4, <http://europa.eu.int/comm/off/health consumer/precaution.htm>, site visited on June 7, 2003 (precautionary principle has become 'a full-fledged and general principle of international law').

[7] See Godduhn, A. and Duffy, L.K. (2003) 'Multi-generation health risks of persistent organic pollution in the far north: use of the precautionary approach in the Stockholm convention', *Envtl. Sci. and Pol'y*, Vol. 6, pp.391–349 ('Several governments . . . have claimed precaution to be a guiding principle with customary international law status, but most nations remain with international courts: undecided'); Dobos, D. (2002) 'The necessity of precaution: the future of ecological necessity and the precautionary principle', *Fordham Envtl. L.J.*, Vol. 13, pp.375–391 (Proposition that the precautionary principle now constitutes customary international law 'is seriously undermined by the varied formulations of the principle and its resulting vagueness'); Kwiatkowska, B. (2000) 'Southern Bluefin Tuna (New Zealand v. Japan; Australia v. Japan), order on provisional measures (Itlos Cases Nos. 3 and 4), *Am. J. Int'l. L.*, Vol. 94, pp.150–155 (quoting Judge Laing in the *Southern Bluefin Tuna Case*: 'it is not possible, on the basis of the materials available and arguments presented on this application for provisional measures, to determine whether, as the applicants contend, customary international law recognises a precautionary principle'; Palmeter, D. and Mavroidis, P.C. (1998) 'The WTO legal system: sources of law', *Am. J. Int'l L.*, Vol. 92, pp.398–407 (1998) (citing the holding of the Appellate Body of the World Trade Organisation in *EC – Measures Concerning Meat and Meat Products (Hormones)* that it remained unclear whether the precautionary principle had ripened into a principle of general or customary international law); Applegate, J.S. (2002) 'The taming of the precautionary principle', *Wm. And Mary Envtl. L. and Pol'y Rev.*, Vol. 27, pp.13, 14–15 ('There also remains some very important and powerful skeptics of the precautionary principle, principally the USA, the international trade community represented by the WTO, and national and transnational economic enterprises').

[8] Hey, E. (1992) 'The precautionary concept in environmental policy and law: institutionalising caution', *Geo. Int'l Envtl. L. Rev.*, Vol. 4, pp.303–305. *See also* Bamako Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes Within Africa, 30 I.L.M. 773, at art. 4(3)(f).

[9] *Idem.* at 306; Gullett, *supra* note 1, at 56; Fullem, G. (1995) 'The precautionary principle: environmental protection in the face of scientific uncertainty', *Williamette L. Rev.*, Vol. 31, pp.495, 497–498.

[10] Barton, C. (1998) 'The status of the precautionary principle in australia: its emergence in legislation and as a common law doctrine', *Harv. Envtl. L. Rev.*, Vol. 22, pp.509–511.

[11] Gullett, *supra* note 1, at 56; Koppe, J.G. and Keys, J. (2002) 'PCBs and the precautionary principle', in: P. HarremoÎs et al. (Eds.) *The Precautionary Principle in the 20th Century*, pp.64–78.

[12] Myers, N. (1996) 'Biodiversity and the precautionary principle', *Law, Values and the Environment*, Vol. 42 (If current mass extinction proceeds unchecked, will 'not only eliminate half or more of all species, but will leave the biosphere impoverished for at least 5 million years – a period twenty times longer than humankind itself has been a species'); Fullem, *supra* note 11, at 495.

[13] Hey, *supra* note 10, at 308.

[14] Cameron, J. and Abouchar, J. (1992) 'The precautionary principle: a fundamental principle of law and policy for the protection of the global environment', *B.C. Int'l and Comp. L. Rev.*, Vol. 14, pp.1–2. *See* '1992 Rio declaration on environment and development, principle 5', *I.L.M.*, Vol. 31, p.874 ('lack of full scientific certainty shall not be used a reason for postponing cost-effective measures to prevent environmental degradation').

[15] Convention for the Protection of the Marine Environment of the North-East Atlantic, Sept. 22, 1992, 32 I.L.M. 1069 (1993) [hereinafter OSPAR], available at: <http://www.ospar.org/eng/html/welcome.html>.

[16] *Idem* at art. 2(2)(a).

[17] North Atlantic Salmon Commission, *NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat* (2001), at sec. 3, http://www.nasco.org.uk/html/habitat.html; Second International Conference on the Protection of the North Sea, Ministerial Declaration (London, Nov. 1987), arts. VII, XV(ii), XVII(1); UNEP governing Council, Second Special Session, Nairobi, Kenya, 1–3 Aug. 1990, Decisions No. SS.II/4, at 41 (endorsing an approach to hazardous waste management that includes consideration of raw material selection, product substitution, and clean production technologies and processes 'as a means of implementing a precautionary approach in order to promote production systems which minimise or eliminate the generation of hazardous wastes and optimise use of raw materials, water and energy, for example through recycling'); *See also* MacDonald, J. (1995) 'Appreciating the precautionary principle as an ethical evolution in ocean management', *Ocean Dev. and Int'l L.*, Vol. 26, pp.255–264:

> "Aside from the precautionary principle's theoretical content in international environmental policy, other practical questions still remain where it is applied. In particular, does the principle 'require specific instruments or regulatory approaches'? Many believe that the principle does in fact require specific technologies to control pollution. The notion of requiring the best available technology to be used in emission control has been advanced to serve this end. As yet, however, the international community is still divided on the issue." (citations omitted)

See also Raffensperger, C. et al. (1999) ' . . . and you can mean saying 'yes' to innovation', *Nature*, Vol. 401, pp.207–208:

> "Clean production involves the prevention of harm at source through the use of less material-intensive and toxic production systems and products, and was a logical outcome of the principle's demand for preventive action in the face of uncertainty. The question asked is switched from 'how much pollution is acceptable?' to 'how much can we prevent?'"

As Gullett points out, some formulations of the principle mandate the more discretionary adoption of the 'best available technology not entailing excessive cost' (BATNEEC). Gullett, *supra* note 1, at 58.

[18] Santillo, D. and Johnston, P. (1999) 'Is there a role for risk assessment within precautionary legislation?', *Human and Ecological Risk Assessment*, Vol. 5, No. 5, pp.923–925 ('the precautionary principle also engenders the aspiration to achieve a progressive reduction in environmental burden, without a reliance on the need to identify and quantify specific risks').

[19] Birnie and Boyle supra note 8, at 118; McIntyre, O. and Mosedale, T.D. (1997) 'The precautionary principle as a norm of customary international law', at 19 (unpublished manuscript supplied to the author); Hewison, G.J. (1996) 'The precautionary approach to fisheries management: an environmental perspective', *Int'l J. Marine and Coastal L.,* Vol. 11,

pp.301–307; Van Dyke, J.M. (1996) 'Applying the precautionary principle to ocean shipments of radioactive materials', *Ocean Dev. and Int'l L.,* Vol. 27, pp.379–380; Favre, D. (1993) 'Debate within the CITES community: what direction for the future?', *Nat. Resources J.,* Vol. 33, pp.875–883; Rogers, M.D. (2003) 'Risk analysis under certainty, the precautionary principle, and the new EU chemicals strategy', *Regulatory Toxicology and Pharmacology,* Vol. 37, pp.370–376 (new EU chemicals strategy contemplates reversing burden of proof for certain substances of 'high concern', requiring applicant to demonstrate that proposed use is safe); Government of Canada, A Canadian Perspective on Precautionary Approach/Principle Discussion Document, <http://www.ncr.dfo.ca/cppa/HTML/discussion_e.htm>, site visited on Aug. 13, 2002; North Atlantic Salmon Conservation Commission, Action Plan for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat, *CNL(01)51 (2001),* at sec. 3, <http://www.nasco.int/pdf/nasco_res_habitatpoa.pdf>, site visited on Sept. 29, 2003 (Contracting Parties should 'place the burden of proof on proponents of an activity which may have an impact on habitat'); Convention for the Prevention of Maritime Pollution by Dumping From Ships and Aircraft (15th Meeting of the Oslo Commission), On the Reduction and Cessation of Dumping Industrial Wastes as Sea, Decision 89/1 (14 June 1989) ('dumping of industrial wastes in the North Sea shall cease by 31 December 1989, and in other parts of Convention waters by 31 December 1995 . . . except[ing] those industrial wastes for which it can be shown to the Commission through the Prior Justification Procedure (PJP) both that there are no practical alternatives on land and that the materials cause no harm in the marine environment); Michigan Compiled Law Service, §324.3903 ('The burden of proof is on a manufacturer of a cleaning agent or water conditioner, before distribution for sale or use in this state, to establish that its contents comply with this part and rules promulgated under this part, and will not or is not likely to adversely affect human health or the environment'); State of the Environment Norway-Waste, Principles of an Environmentally Friendly Policy, *GRID-Arendal* (1998) ('In a situation of high potential risk and lack of, or inadequate information, the concept of precaution requires that the onus of scientific proof be on those who intend to draw benefits from the resource and contend that there is no risk; that is, reversal of the burden of proof . . . ')

[20] O'Riordan, T. and Jordan, A. (1995) *The precautionary principle in contemporary environmental politics',* Envtl. Values, Vol. 4, pp.191–192. See also von Moltke, K. (2001) Whither MEAs: The Role of International Environmental Management in the Trade and Environment Agenda, International Institute for Sustainable Development, at 39; Foster, K.R., Vecchia, P. and Repacholi, M.H. (2000) 'Policy forum: risk management – science and the precautionary principle', Sci., Vol. 288, p.979; Ross, J. (1999) 'Legally binding informed consent', *Colo. J. Int'l. Envtl. L. and Pol'y.,* Vol. 10, pp.499–525; Garcia, S.M. (1994) 'The precautionary principle: its implications in capture fisheries management', *Ocean and Coastal Mgmt.,* Vol. 22, pp.99–111.

[21] Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area, 36 I.L.M. 777 (1997), at art. II(4); Agreement on the Conservation of Africa-Eurasian Migratory Water Birds, 5 Y.B. *Int'l Envtl. L.*, p.907 (1995) (In seeking to conserve migratory birds, 'Parties should take into account the precautionary principle').

[22] Katz, D. (2001) 'The mismatch between the biosafety protocol and the precautionary principle', *Geo. Int'l Envtl. L. Rev.*, Vol. 13, pp.949. See also Vanderzwaag, D. (2002) 'The precautionary principle and marine environmental protection: slippery shores, rough seas, and rising normative tides', *Ocean Dev. and Int'l L.*, Vol. 33, pp.165–166:

> "However, getting a clear 'normative fix' on the precautionary principle is difficult. The principle is often called 'elusive' given its general nature and still limited international implementation. The law and literature relating to the precautionary principle has been described as in 'disarray', with great confusion over meaning and detachments from relevant social science and legal literature [citations omitted]."

[23] Arvidsson, *supra* note 6, at 15; Gullett, *supra* note 1, at 58 ('Formulations of the precautionary principle tend to be hortatory in character . . .'); Jordan, A. and O'Riordan, T. (1999) 'The precautionary principle in contemporary environmental policy and politics', Vol. 32 ('The precautionary principle is vague enough to be acknowledged by all governments regardless of how well they protect the environment'); Hickey, J.E. and Walker, V.R. (1995) 'Refining the precautionary principle in international environmental law', *Va. J. Int'l. L.*, Vol. 14, pp.423, 424 and 437.

[24] Vanderzwaag, *supra* note 27, at 176.

[25] Kimball, L.A. (1997) 'Whither international institutional arrangements to support ocean law?', *Colum. J. Transnat'l L.*, Vol. 36, pp.307–324. *See also* Sandlin, P. (1999) 'Dimensions of the precautionary principle', *Human and Eco. Risk Assessment*, Vol. 5, No. 5, pp.889–890.