8

Atmosphere

H. Taubenfeld, 'International Environmental Law: Air and Outer Space', 13 *Natural Resources Journal* 315 (1973); D. Gelsom, *Atmospheric Pollution: A Global Problem* (1992); G. Wetstone and A. Rosencrantz, 'Transboundary Air Pollution: The Search for an International Response', 8 *Harvard Environmental Law Review* 89 (1984); C. Flinterman *et al.* (eds.), *Transboundary Air Pollution: International Legal Aspects of the Co-operation of States* (1986); J. Brunnee, *Acid Rain and Ozone Layer Depletion: International Law and Regulation* (1988); P. Okowa, *State Responsibility for Transboundary Air Pollution in International Law* (2000)

Introduction

The protection of the atmosphere was a relative latecomer to international environment regulation but is now well established. With limited exceptions, until 1979 no treaty sought, as its primary purpose, to place limits on the right of states to allow atmospheric emissions which caused environmental damage. Some treaties had, however, called for general preventive strategies.[1] Since 1979, numerous treaties and other international acts have addressed the protection of the atmosphere. Although there is no atmospheric equivalent to the 1982 UN Convention on the Law of the Sea, international legal instruments have been adopted at the regional and global level which address a range of issues, including: transboundary pollution by sulphur dioxide, nitrogen oxide and volatile [illegible] the protection of the ozone layer; the prevention of climate change; and the protection of the environment of outer space. The precedents set by treaties relating to the protection of other environmental media, in particular the marine environment, have contributed to the development of these rules.

Landmarks in the development of international law in this area include: the 1938 and 1941 decisions in the *Trail Smelter* case; the applications brought to the ICJ by Australia and New Zealand against France with respect to French atmospheric nuclear tests in the Pacific Ocean region; growing evidence in Europe

[1] See chapter 6, pp. 246–9 above.

and North America in the 1970s of acid rain damage from atmospheric emissions of sulphur compounds; the 1986 Chernobyl accident; growing evidence in the 1980s of depletion of the ozone layer; and, most recently, evidence that increased atmospheric concentrations of carbon dioxide and other greenhouse gases are likely to cause temperatures to increase worldwide with consequential adverse effects.[2] Since the first edition of this book, the international community has also become aware of the threat posed by forest fires with transnational effects, such as those in Indonesia in 1997 which caused widespread regional problems.[3]

Trail Smelter Case

The award of the arbitral tribunal in the *Trail Smelter* case is frequently cited to support the view that general principles of international law impose obligations on states to prevent transboundary air pollution.[4] This dispute arose out of damage done to crops, pasture land, trees and agriculture in the United States from sulphur dioxide emissions from a smelting plant at the Consolidated Mining and Smelting Company of Canada at Trail, in British Columbia. Emissions and damage had increased significantly after 1906, and again after 1925 and 1927, leading to the submission of the issue to the US–Canada International Joint Commission established, under the 1909 Boundary Waters Treaty. In February 1931, the Commission adopted a unanimous report awarding the United States US$350,000 to compensate for damage suffered in the period up to January 1932. The Commission also made recommendations concerning damages arising after January 1932 and the use of equipment to reduce further sulphur emissions. In February 1933, the US complained that further damage was occurring, and in April 1935 the two countries signed a convention submitting the dispute to an arbitral tribunal composed of three arbitrators, assisted by two scientists designated, respectively, by the two countries.[5] At the heart of the award is the holding of the tribunal that:

> Under the principles of international law . . . no state has the right to use or permit the use of territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.[6]

[2] See IPCC, *Third Assessment Report: Climate Change 2001* (2001).

[3] See www.unep.org/unep/per/for_fire/fire.htm.

[4] *Trail Smelter* case, 16 April 1938, 11 March 1941; 3 RIAA 1907 (1941); on damages, see chapter 18, pp. 885–6 below.

[5] Convention of the Final Settlement of the Difficulties Arising Through the Complaints of Damage Done in the State of Washington by Fumes Discharged from the Smelter of the Consolidated Mining and Smelting Company, Trail, British Columbia, 15 April 1935, United States–Canada, 162 LNTS 73.

[6] 3 RIAA 1907 at 1965 (1941).

This much-cited passage has been relied upon to justify a range of views concerning the permissibility of certain atmospheric emissions. It is important to remember that the principle cited was applicable *a priori* by virtue of the arbitral *compromis* between the United States and Canada, and that the case is probably of greater significance for that agreement and for its findings on the assessment and measure of the quantum of recoverable damage.

Nuclear testing

Atmospheric nuclear testing was one of the first environmental issues to be addressed by the UN General Assembly in the 1950s.[7] This resulted in the adoption of the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (1963 Test Ban Treaty), which banned nuclear weapons explosions in those places.[8] By 1973, the Treaty had more than 110 parties, including all the major states which possessed nuclear weapons (China, the former USSR, the United Kingdom and the United States) with the exception of France. Between 1966 and 1972, France conducted atmospheric nuclear tests on Mururoa atoll, off their New Caledonian territory in the South Pacific region, and were preparing to conduct a further series of tests commencing in May 1973.[9] Australia and New Zealand commenced proceedings against France before the International Court of Justice (ICJ) to stop those and other nuclear tests in the Pacific. Australia asked the ICJ to declare that the carrying out of further atmospheric nuclear weapon tests was not consistent with applicable rules of international law and to order France not to carry out any further such tests. Australia claimed that the tests would:

1. violate its right to be free from atmospheric nuclear weapon tests by any country;
2. allow the deposit of radioactive fallout on its territory and airspace without its consent;
3. allow interference with ships and aircraft on the high seas and in the superjacent airspace, and the pollution of the high seas by radioactive fallout, thereby infringing the freedom of the high seas.[10]

New Zealand's claim was slightly different: it argued that French nuclear tests violated rules and principles of international law for similar reasons, but framed the application in terms of the violation of 'the rights of all members of the international community' to be free from nuclear tests which gave rise to radioactive

[7] See chapter 2, p. 33 above.

[8] Moscow, 5 August 1963, in force 10 October 1963, 480 UNTS 43.

[9] On subsequent developments declaring the region a nuclear-free zone, see chapter 12, pp. 649–51 below.

[10] *Nuclear Tests* case (*Australia* v. *France*) (Interim Measures) (1973) ICJ Reports 99 at 103.

fallout and the right to be preserved from 'unjustified artificial radioactive contamination of the terrestrial. maritime and aerial environment'.[11] Australia and New Zealand also sought interim measures of protection requiring the French Government to avoid nuclear tests causing the deposit of radioactive fallout on their territory, pending the ICJ's judgments.[12]

France chose not to appear in the case. In June 1973, by eight votes to six the ICJ indicated interim measures of protection which asked France to take no action which might aggravate the dispute or prejudice the rights of the other parties in carrying out whatever decision the ICJ might render.[13] The ICJ did not have an opportunity to address the merits of the case. Following the unilateral declaration by France that it would cease to carry out atmospheric tests, the ICJ held in December 1974 that the declaration made it unnecessary for the case to proceed, since the claims of Australia and New Zealand no longer had any object, and the ICJ.therefore was not called upon to give a decision.[14]

The pleadings put forward in the case by Australia and New Zealand, the oral exchanges between some of the judges and counsel for the two applicant states, and the various opinions set forth by the judges, provide a useful source of evidence as to the relevant international law. Australia argued that the 1963 Test Ban Treaty 'embodied and crystallised an emergent rule of customary international law' prohibiting atmospheric nuclear tests which might have assumed the status of a rule of *jus cogens*.[15] During the oral hearings, Australia was asked by the President of the ICJ, Sir Humphrey Waldock, whether it took the view that 'every transmission by natural causes of chemical or other matter from one state into another state's territory, air space or territorial sea automatically created a legal cause of action in international law without the need to establish anything more'. Australia responded that:

> where, as a result of a normal and natural use by one state of its territory, a deposit occurs in the territory of another, the latter has no cause of complaint unless it suffers more than merely nominal harm or damage. The use by a state of its territory for the conduct of atmospheric nuclear tests is

[11] *Nuclear Tests* case (*New Zealand* v. *France*) (Interim Measures) (1973) ICJ Reports 135 at 139.

[12] See p. 319 above.

[13] *Nuclear Tests* cases (*Australia* v. *France*) (Interim Measures) (1973) ICJ Reports 99; (*New Zealand* v. *France*) (Interim Measures) (1973) ICJ Reports 135; on interim measures, see chapter 5, p. 218 above.

[14] *Nuclear Tests* cases (*Australia* v. *France*) (Jurisdiction) (1974) ICJ Reports 253; (*New Zealand* v. *France*) (Jurisdiction) (1974) ICJ Reports 457; L. Goldie, 'Nuclear Test Cases: Restraints on Environmental Harm', *Journal of Maritime Law and Commerce* 491 (1974); on the French unilateral declaration, see chapter 4, pp. 151–2 above. In 1995, New Zealand requested the ICJ to consider France's resumption of underground nuclear testing, but the ICJ declined jursidiction: see chapter 5, p. 218 above.

[15] *Nuclear Tests* cases (*Australia* v. *France*) (Interim Measures) (1973) ICJ Reports 99; (*New Zealand* v. *France*) (Interim Measures) (1973) ICJ Reports 135.

> not a normal or natural use of its territory. The Australian government also contends that the radioactive deposit from the French tests gives rise to more than merely nominal harm or damage to Australia... [T]he basic principle is that intrusion of any sort into foreign territory is an infringement of sovereignty. Needless to say, the government of Australia does not deny that the practice of states has modified the application of this principle in respect of the interdependence of territories. It has already referred to the instance of smoke drifting across national boundaries. It concedes that there may be no illegality in respect of certain types of chemical fumes in the absence of special types of harm. What it does emphasise is that the legality thus sanctioned by the practice of states is the outcome of the toleration extended to certain activities which produce these emissions, which activities are generally regarded as natural uses of territory in modern industrial society and are tolerated because, while perhaps producing some inconvenience, they have a community benefit.[16]

The exchange illustrates the challenge of striking a balance between the community benefit of 'nominal harm or damage' and the individual right not to be subject to significant harm or damage.[17] In relation to atmospheric pollution, the difficulty in striking that balance may be acute, and the ICJ avoided the issue following the unilateral decision by France to stop carrying out atmospheric nuclear tests. One of the ICJ judges, Judge de Castro, nevertheless took the opportunity, in his dissent, to cite the award in the *Trail Smelter* case, with apparent approval.[18]

Customary law

The issues underlying the *Trail Smelter* and *Nuclear Tests* cases raise the question of whether rules of customary law exist specifically in relation to transboundary or other air pollution. This matter has been considered by the International Law Association (ILA) and the Institut de Droit International (IDI), both of which have adopted resolutions on the subject. Article 3(1) of the ILA's 1982 Montreal Draft Rules on Transboundary Pollution restate customary international law as requiring states 'to prevent . . . transfrontier air pollution to such an extent that no substantial injury is caused in the territory of another state'.[19] The

[16] *Nuclear Tests* cases (*Australia* v. *France*) (Interim Measures) (1973) ICJ Reports 99; (*New Zealand* v. *France*) (Interim Measures) (1973) ICJ Reports 135.

[17] See more generally chapter 6, pp. 235–46 above; and chapter 18, pp. 904–38 below.

[18] *Nuclear Tests* case (*Australia* v. *France*) (1974) ICJ Reports 253 at 389. He stated: 'If it is admitted as a general rule that there is a right to demand prohibition of the emissions by neighbouring properties of noxious fumes, the consequence must be drawn, by an obvious analogy, that the applicant is entitled to ask the Court to uphold its claim that France should put an end to the deposit of radioactive fall-out on its territory.'

[19] ILA 60th Report (1982), Art. 3(1). The ILA, founded in 1873, is a private organisation of lawyers whose objects include 'the study, elucidation and advancement of international law, public and private'. (Art. 2 of the ILA Constitution).

general obligation to refrain from causing pollution which might result in substantial injury is reinforced by Article 4, which provides, *inter alia*, that 'states shall refrain from causing transfrontier pollution by discharging into the environment substances generally considered as being highly dangerous to human health'.

The rule adopted by the IDI in its 1987 Resolution on Transboundary Air Pollution, which does not purport to restate custom, is less strict. Article 2 provides that:

> In the exercise of their sovereign right to exploit their resources pursuant to their own environmental policies, states shall be under a duty to take all appropriate and effective measures to ensure that their activities or those conducted within their jurisdiction or under their control cause no transboundary air pollution.[20]

With the ICJ's 1996 Advisory Opinion on nuclear weapons it is now clear that customary international law – as reflected in state practice, treaties and other international instruments – prohibits states from causing significant environmental damage from transboundary pollution, including atmospheric pollution.[21] The point is confirmed by the ILC's 2001 draft Articles on Prevention of Transboundary Harm.[22] One of the key issues which remains is the identification of the threshold at which significant, and therefore unlawful, damage has occurred. To a certain extent this aspect has been clarified by some of the treaties discussed in the following sections: those which set limits on the individual or collective emissions of certain substances also provide a basis for determining the level at which damage will be more than nominal and in respect of which an action lies under international law. More generally, the opportunity to further develop this issue, through state practice, following the accident at the Chernobyl plant, was lost as a result of the decision by affected states not to press any claim for damages, although several reserved their right to do so.[23]

Urban and transboundary air pollution

I. H. Van Lier, *Acid Rain and International Law* (1981); C. R. Bath, 'US–Mexico Experience in Managing Transboundary Air Resources: Problems, Prospects and Recommendations for the Future', 22 *Natural Resources Journal* 1197 (1982);

[20] 62 AIDI (1987-II), Art. 10 requires states to 'prohibit, prevent and refrain from carrying out any nuclear explosion likely to cause transboundary air pollution of a radioactive nature'. The Institut de Droit International, founded in 1873, is a private association of scholars of public and private international law which aims to facilitate the progress of international law (Art. 1(2) of the IDI Statute).

[21] Chapter 6, pp. 241–6 above. [22] At draft Art. 3; see chapter 6, p. 234 above.

[23] Chapter 18, p. 890 below.

G. Wetstone and A. Rosencrantz, *Acid Rain in Europe and North America: National Responses to an International Problem* (1983); N. D. Bankes and J. Saunders, 'Acid Rain: Multilateral and Bilateral Approaches to Transboundary Pollution Under International Law', 33 *University of New Brunswick Law Journal* 155 (1984); J. Carroll, *Trans-boundary Air Quality Relations* (1990); S. Hajost, 'International Legal Implications of United States Policy on Acid Rain', in D. Magraw (ed.), *International Law and Pollution* (1991), 344; J. Lammers, 'The European Approach to Acid Rain', in D. Magraw (ed.), *International Law and Pollution* (1991), 265; P. Mercure, 'Principes de droit international applicables au phénomènes des pluies acides', 21 *Revue de Droit de l'Université de Sherbrooke* 373 (1991)

Anthropogenic emissions of gases that are prevalent worldwide, both as urban air pollutants and transboundary atmospheric depositions, include oxides of sulphur (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O_3), trace organics (aldehydes, benzene and polyaromatic hydrocarbons), selected trace metals (most notably lead (Pb)) and suspended particulates,[24] as well as air pollution from ships.[25] Sulphur dioxide (SO_2), which is caused by the combustion of high-sulphur-content fossil fuels (coal and oil), contributes to acid rain and is harmful to human health as a potent respiratory tract irritant. Combustion of fossil fuels, particularly from motor vehicles and power stations, also produces two oxides of nitrogen (nitric oxide (NO) and nitrogen dioxide (NO_2), collectively known as NO_x). Ambient concentrations of NO_2 are generally considered to be too low to pose a significant threat to human health, but NO_x, together with hydrocarbons, are important precursors to the formation of tropospheric O_3 and other photochemical oxidants. Sulphur and nitrogen oxides are transported by prevailing winds for distances up to 1,000 km from their original source before returning to the surface of the earth as wet or dry deposits. Monitoring has established that North America and Europe receive fluxes of sulphur and nitrogen of up to ten times the estimated natural flux, and that adverse effects flowing from deposits include the acidification of fresh waters and terrestrial ecosystems. Although these problems have so far been limited to developed countries, there are indications that certain tropical regions in developing countries, including southern China, south-western India, south-eastern Brazil and northern Venezuela, may soon experience significant problems with acidification, in large part due to rapid industrialisation. The urban and transboundary air pollutants are subject to a number of regional arrangements, although outside Europe and North America there are few specific international arrangements.

[24] See UNEP, *Environmental Data Report* (1991), 10, 12 and 37–40.
[25] Chapter 9, p. 444 below.

ECE Regulations Concerning Gaseous Pollutant Emissions from Motor Vehicles

The ECE Regulations Concerning Gaseous Pollutant Emissions from Motor Vehicles have been adopted under the 1958 Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts Which Can Be Fitted and/or Be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of These Prescriptions.[26] The Regulations establish uniform conditions for the licensing of motor vehicles and parts as well as the standardisation of environmental specifications for cars. Regulations have been adopted for gasoline engines,[27] motorcycles and mopeds,[28] diesel engines,[29] and passenger cars equipped with internal combustion engines.[30] Compliance with the standards established under the Regulations ensures type approval for importation into many states.

The 1979 ECE Convention on Long Range Transboundary Air Pollution and its Protocols

R. Churchill, G. Kutting and L. Warren, 'The 1994 UNECE Sulphur Protocol', 7 *Journal of Environmental Law* 169 (1995); J. Wettestad, 'Science, Politics and Institutional Design: Some Initial Notes on the Long Range Transboundary Air Pollution Regime', 4 *Journal of Environment and Development* 165 (1995); J. Wettestad, *Acid Lessons? Assessing and Explaining LRTAP Implementation and Effectiveness* (IIASA Working Paper, 1996)

Introduction

The 1979 ECE Convention on Long-Range Transboundary Air Pollution (1979 LRTAP Convention)[31] addresses the growing problem of acid rain and was developed following the Stockholm Declaration, in particular Principle 21, and

[26] Geneva, 20 March 1958, in force 20 June 1959; 335 UNTS 211. The Convention was formerly called the Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts.

[27] Regulation 83/1989, 1078 UNTS 351, as revised.

[28] Regulation 40/1979, 1144 UNTS 308; Regulation 47/1981, 1255 UNTS 158.

[29] Regulation 49/1982–90, UN Doc. E/ECE/324/Rev.1/Add.48/Rev.3; Regulation 96/1995, UN Doc. E/ECE/324/Rev.1/Add.95.

[30] Regulation 101/1997, UN Doc. E/ECE/324/Rev.2/Add.100.

[31] Geneva, 13 November 1979, in force 16 March 1983, 18 ILM 1442 (1979); www.unece.org/env/lrtap/. [000] states are parties to the Convention. See generally A. Rosencrantz, 'ECE Convention of 1979 on Long-Range Transboundary Air Pollution', 75 AJIL 975 (1981); A. Fraenkel, 'The Convention on Long-Range Transboundary Air Pollution: Meeting the Challenge of International Co-operation', 30 *Harvard International Law Journal* 447 (1989); Jackson, 'A Tenth Anniversary Review of the ECE Convention on Long-Range Transboundary Air Pollution', 2 *International Environmental Affairs* 217 (1990).

the environmental chapter of the Final Act of the 1975 Conference on Security and Co-operation in Europe (CSCE). The 1979 LRTAP Convention is supplemented by eight Protocols (on the financing of the monitoring programme, on the emissions of sulphur, nitrogen oxides, volatile organic compounds, heavy metals and persistent organic pollutants (POPs), and on abatement of acidification, eutrophication and ground-level ozone). It was one of the first treaties to recognise the adverse effects of air pollution over the short and long term.

1979 LRTAP Convention

The 1979 LRTAP Convention established a regional framework to protect man and the environment against air pollution, and includes a general obligation on parties to 'endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution'.[32] This soft commitment, which is without target or timetable, nevertheless establishes a general limitation on the right to emit atmospheric pollutants. The definitions set out in the Convention have been relied upon in other instruments. The definition of 'air pollution' is broad enough to include atmospheric emissions of greenhouse gases and ozone-depleting substances as 'air pollutants', although the use of the word 'resulting' suggests that actual deleterious effects must have occurred and that gases subject to precautionary measures of regulatory action in the absence of actual deleterious effects may not be considered to be pollutants.[33] 'Long-range transboundary air pollution' is defined as:

> air pollution whose physical origin is situated wholly or in part within the area under the national jurisdiction of one state and which has adverse effects in the area under the jurisdiction of another state at such a distance that it is not generally possible to distinguish the contribution of individual emission sources or groups of sources.[34]

The 1979 LRTAP Convention includes general commitments on policies and strategies to combat the discharge of air pollutants, the exchange of relevant information and review of policies, scientific activities and technical measures, and co-operation in research.[35] Consultations are to be held between parties actually affected by, or exposed to, a significant risk of long-range transboundary air pollution, and parties within which and subject to whose jurisdiction a significant contribution originates or could originate from activities carried on or contemplated.[36] While the requirement to consult may appear rather obvious now, it was, at the time, a notable development which influenced subsequent practice in related areas.[37]

Without being bound by any specific commitments for air quality management, the parties nevertheless must develop the best policies and strategies,

[32] Art. 2. [33] Art. 1(a), chapter 1, pp. 6–8 above. [34] Art. 1(b).
[35] Arts. 3, 4 and 7. [36] Art. 5. [37] Chapter 17, pp. 838–40 below.

including air quality management and control measures, in particular by using best available technology which is economically feasible, as well as low- and non-waste technology.[38] Information is to be exchanged on: the emission data of agreed air pollutants; major changes in policies and industrial development and their potential impact; control technologies; the costs of emission control; physico-chemical and biological data relating to the effects of long-range transboundary air pollution and the extent of the resulting damage; and policies and strategies for the control of sulphur compounds and other major oil pollutants.[39]

The LRTAP Convention also establishes a 'Co-operative Programme for the Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe' (EMEP), to monitor sulphur dioxide and related substances and to develop and use comparable or standardised monitoring procedures, and establish monitoring stations as part of an international programme.[40] Institutional arrangements comprise an Executive Body, composed of representatives of the parties to review implementation of the Convention, utilising EMEP's Steering Body, and assisted by the Executive Secretary of the UNECE which carries out secretariat functions.[41]

The 1979 LRTAP Convention has subsequently provided the forum for the adoption of eight protocols establishing more detailed commitments in relation to particular substances. It has also served as a model for subsequent treaties adopted at the global level to address climate change and ozone depletion, and provides a precedent for other regions in their efforts to address acid rain and related transboundary atmospheric problems.

1984 Monitoring and Evaluation Protocol

The first Protocol to the LRTAP Convention provides for 'Long-Term Financing of the Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe'.[42] It seeks to ensure the availability of adequate financial resources to implement EMEP beyond the amounts provided by UNEP and voluntary contributions. The 1984 Protocol provides for financing the costs of the international centres co-operating within EMEP

[38] Art. 6.

[39] Art. 8; this Article includes a footnote which states that '[t]he present Convention does not contain a rule on State Liability as to damage'.

[40] Art. 9. [41] Arts. 10 and 11.

[42] Geneva, 28 September 1984, in force 28 January 1988, 2 SMTE 285; thirty-nine states are parties to the Protocol. Related international monitoring systems include WMO's Background Air Pollution Monitoring Network. The ECE has also established five International Co-operative Programmes on Assessment and Monitoring of Air Pollution Effects on Forests (1985); on Assessment and Monitoring of Acidification in Rivers and Lakes (1986); on Effects on Materials, Including Historic and Cultural Monuments (1986); on Research on Evaluating Effects of Air Pollution and Other Stresses on Agricultural Crops (1987); and on Integrated Monitoring (1988).

on the basis of mandatory contributions covering the annual costs of the EMEP work programme, supplemented by voluntary contributions.[43] The basis of annual contributions is set out in an Annex.[44]

1985 Sulphur Protocol

The second Protocol to the LRTAP Convention concerns the 'Reduction of Sulphur Emissions or Their Transboundary Fluxes by at Least 30 Per Cent' (1985 Sulphur Protocol).[45] It was adopted in response to evidence of widespread damage in parts of Europe and North America to natural resources, and to historical monuments and human health, caused by acidification of the environment from sulphur dioxide, nitrogen oxides and other pollutants from the combustion of fossil fuels. The 1985 Protocol establishes a 'Thirty Per Cent Club' by committing all parties to

> reduce their national annual sulphur emissions or their transboundary fluxes by at least thirty per cent as soon as possible and at the latest by 1993, using 1980 levels as the basis for calculation of reductions.[46]

This inflexible approach to standard-setting has not been adopted in the subsequent Protocols to the 1979 LRTAP Convention because it fails to take account of current and historic emissions and other differentials existing between states. The 1985 Sulphur Protocol envisages further reductions, and revisions were adopted in the 1994 Protocol on Further Reduction of Sulphur Emissions.[47] The 1985 Protocol requires parties to report annually to the Executive Body of the LRTAP Convention on their national, annual sulphur emissions, including the method of calculation, the progress made towards achieving targets (without specifying a particular timeframe), and the national programmes, policies and strategies adopted for reaching targets.[48] EMEP provides the Executive Body with information on annual sulphur budgets and transboundary fluxes and deposits of sulphur compounds.[49] The Protocol provides for the use of the institutional organs established under the 1979 LRTAP Convention. For EC member states, the Protocol has been superseded by the 1988 Large Combustion Directive.[50]

[43] Arts. 2 and 3(1), (2) and (4). [44] Art. 4 and Annex.

[45] Helsinki, 8 July 1985, in force 2 September 1987; twenty-two states are parties to the Protocol; 27 ILM 707 (1988).

[46] Art. 2. To this end, parties agree to develop national programmes, policies and strategies: Art. 6.

[47] Oslo, 14 June 1994, in force 5 August 1998, 33 ILM 1540 (1994); twenty-eight states are parties to the Protocol.

[48] Arts. 4 and 6. On compliance with this reporting requirement, see chapter 5, pp. 180–2 above.

[49] Art. 5. [50] See pp. 336–9 below.

1988 NO_x Protocol

The third Protocol to the LRTAP Convention concerns the 'Control of Emissions of Nitrogen Oxides or Their Transboundary Fluxes' (1988 NO_x Protocol).[51] It is more comprehensive and flexible than the 1985 Sulphur Protocol. It requires the reduction of 'total annual emissions', introducing into international law the concepts of 'national emission standards' and an approach based on 'critical loads aimed at the establishment of an effect-oriented scientific basis'. It also recognises the need to 'create more favourable conditions for exchange of technology'.[52] The 1988 NO_x Protocol specifically requires all parties,

> as soon as possible and as a first step, [to] take effective measures to control and/or reduce their national annual emissions of nitrogen oxides or their transboundary fluxes so that these, at the latest by 31 December 1994, do not exceed their national annual emissions of nitrogen oxides or transboundary fluxes of such emissions for the calendar year 1987 or any previous year to be specified upon signature of, or accession to, the Protocol, provided that in addition, with respect to any party specifying such a previous year, its national average annual transboundary fluxes or national average annual emissions of nitrogen oxides for the period from 1 January 1987 to 1 January 1996 do not exceed its transboundary fluxes or national emissions for the calendar year 1987.[53]

All parties must apply national emission standards to new mobile sources in all major source categories, and introduce pollution control measures for major existing stationary sources.[54] National standards must be based on 'best available technologies which are economically feasible' and take into consideration (without being specifically bound by), *inter alia*, the Technical Annex to the Protocol.[55] The Technical Annex forms an integral part of the Protocol but is only recommendatory.[56] It provides guidance to the parties on identifying 'economically feasible technologies for giving effect to the obligations of the Protocol',[57] and on control technologies for nitrogen oxide emissions from stationary sources (combustion plants, gas turbines and internal combustion engines, industrial process furnaces, and non-combustion processes), as well as from cars.[58]

The parties to the 1988 NO_x Protocol are required to take additional measures. Within six months of the entry into force of the Protocol they must

[51] Sofia, 31 October 1988, in force 14 February 1991; twenty-eight states are parties to the Protocol; 28 ILM 214 (1989).

[52] Preambular paras. 3, 6, 8 and 9. [53] Art. 2(1). [54] Art. 2(2)(a), (b) and (c).

[55] *Ibid.* [56] Art. 10. [57] Technical Annex, para. 2.

[58] The Technical Annex also provides Tables on Performance Standards that can be achieved by Combustion Modifications, Definition of Emission Standards, and Petrol Engine Technologies, Emission Performance, Costs and Fuel Consumption for Emission Standard Levels.

commence negotiations on further steps to reduce national annual emissions, taking into account the best available scientific and technological developments, internationally accepted critical loads, and other elements resulting from work programmes.[59] Parties must also co-operate to establish critical loads, reductions based on critical loads, and measures and a timetable commencing no later than 1 January 1996 for achieving such reductions.[60] Parties are free to adopt more stringent measures than those required by Article 2.[61]

The 1988 NO_x Protocol provides for the exchange of technology to reduce emissions, consistent with national laws, regulations and practices, and requires that unleaded fuel be made sufficiently available to facilitate the international circulation of vehicles equipped with catalytic converters.[62] The Protocol requires parties: to give high priority to research and monitoring through national research programmes and the work plan of the Executive Body; to develop national programmes, policies and strategies to control and reduce emissions under the Protocol; to participate in information exchange; and to report annually to the Executive Body on obligations under the Protocol (including, in particular, levels of national annual emissions, progress in applying national emission standards and on introducing pollution control measures, in making unleaded fuel available, and in establishing critical loads).[63] EMEP provides the Executive Body with calculations of nitrogen budgets, transboundary fluxes, and deposits of nitrogen oxides.[64] The Protocol is implemented under the authority of the institutions of the LRTAP Convention.

1991 Volatile Organic Compounds Protocol

The fourth Protocol addresses the 'Control of Emissions of Volatile Organic Compounds and Their Transboundary Fluxes' (1991 VOC Protocol).[65] Volatile organic compounds (VOCs) are mainly emitted through incomplete combustion of fossil fuels in the engines of motor vehicles,[66] and are released into the atmosphere due to evaporation during refining, distribution and use of petrol and during the use of products containing solvents like paints, glues and inks. In keeping with the developing complexity and sophistication of the earlier Protocols, the 1991 VOC Protocol builds significantly on the base provided by its earlier siblings, and establishes specific targets and timetables committing parties to control and reduce their emissions of VOCs. Unlike the earlier

[59] Art. 2(3)(a). 'Critical load' is defined as 'a quantitative estimate of the exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge': Art. 1(7).

[60] Art. 2(3)(b). [61] Art. 2(4). [62] Arts. 3 and 4.

[63] Arts. 6, 7 and 8. [64] Art. 9.

[65] Geneva, 18 November 1991, in force 29 September 1997; 31 ILM 568 (1992); twenty-one states are parties to the Protocol.

[66] VOCs are defined, unless otherwise specified, as 'all organic compounds of anthropogenic nature, other than methane, that are capable of producing photochemical oxidants by reactions with nitrogen oxides in the presence of sunlight': Art. 1(9).

LRTAP Protocols the parties have a choice of at least three ways to meet this requirement, to be specified upon signature. This reflects the need to adopt differentiated commitments based on a party's emissions and particular geographic and demographic circumstances. The first option is for a party simply to

> take effective measures to reduce its national annual emissions of VOCs by at least thirty per cent by the year 1999, using 1988 levels as a basis or any other annual level during the period 1984 to 1990, which it may specify upon signature of or accession to the present Protocol.[67]

The second option is only available to a party whose annual emissions contribute to tropospheric ozone concentrations in areas under the jurisdiction of one or more other parties, and where such emissions originate only from areas under its jurisdiction that are specified as tropospheric ozone management areas (TOMA) under Annex 1 to the Protocol.[68] A party which chooses this option is required to:

1. reduce its annual emissions of VOCs from the areas so specified by at least 30 per cent by the year 1999, using 1988 levels as a basis or any other annual level during the period 1984–90, which it may specify upon signature of or accession to the present Protocol; and
2. ensure that its total national annual emissions of VOCs by the year 1999 do not exceed the 1988 levels.[69]

The third option is only available to a party whose annual emissions of VOCs in 1988 were lower than 500,000 tonnes and 20 kilogrammes per inhabitant and 5 tonnes per square kilometre. Such a party may opt as soon as possible, and as a first step, to 'take effective measures to ensure at least that at the latest by the year 1999 its annual emissions of VOCs do not exceed the 1988 levels'.[70] Of the states which have signed the Protocol, three chose the option under Article 2(2)(c),[71] three chose the option under Article 2(2)(b)[72] and sixteen chose the option under Article 2(2)(a).[73] One state apparently failed to make the choice.

No later than two years after the Protocol entered into force, each party was required to apply appropriate national or international emissions standards to new stationary sources based on the 'best available technologies which are economically feasible' (BATEF), to apply national or international

[67] Art. 2(2)(a).
[68] Art. 2(2)(b). Currently, Canada has designated two TOMAs within its territory, and Norway has designated the whole of its mainland and parts of its exclusive economic zone as TOMAs: Annex I.
[69] *Ibid.* [70] Art. 2(2)(c). [71] Bulgaria, Greece and Hungary.
[72] Canada (1988 base year), Norway (1989 base year) and Ukraine.
[73] Two taking 1990 as a base year, ten taking 1988 as a base year, one taking 1985 as a base year, and three taking 1984 as a base year.

measures to products that contain solvents and to promote the use of labelling of products specifying their VOC content, taking into consideration Annex II. Within the same timeframe the parties were required to 'apply appropriate national or international emission standards to new mobile sources based on best available technologies which are economically feasible, taking into consideration Annex II,[74] and encourage further public participation in emission control programmes, as well as the best use of all modes of transport and the promotion of traffic management schemes.[75]

No later than five years after the provision entered into force, in areas where international tropospheric ozone standards are exceeded or where transboundary fluxes originate or are expected to originate, each party must apply BATEF to existing stationary sources in major source categories, taking into consideration Annex II; each party must also apply techniques to reduce VOC emissions from petrol distribution sources and motor vehicle refuelling operations, and to reduce the volatility of petrol, taking into consideration Annexes II and III.[76] The Protocol requires that high priority be given to reducing and controlling emissions of substances with the greatest photochemical ozone creation potential, taking into consideration Annex IV, and that states ensure that in product-substitution measures they do not substitute toxic and carcinogenic VOCs and those that harm the stratospheric ozone layer for other VOCs.[77] This last requirement amounts to a requirement that an environmental and health assessment of substitute products be carried out; this is an innovative provision that may influence future international agreements.

Within six months of the Protocol entering into force, the parties were required to commence negotiations on further steps to reduce national annual emissions of VOCs or transboundary fluxes of such emissions and the resulting secondary photochemical oxidant products. They must also co-operate to develop, *inter alia*, control strategies; ensure cost-effectiveness, possibly through the use of economic instruments; and adopt measures and a timetable commencing no later than 1 January 2000 for achieving such reductions.[78] Parties are free to take more stringent measures, and are not relieved by the Protocol from obligations to reduce emissions that may contribute significantly to climate change, the formation of tropospheric background ozone or the depletion of stratospheric ozone, or that are toxic or carcinogenic.[79] The Protocol provides for the exchange of technology, research and monitoring, regular

[74] Art. 2(3)(a)(i) and (ii). Annex II establishes Control Measures for Emissions of VOCs from Stationary Sources.

[75] Art. 2(3)(a)(iii) and (iv). Annex III establishes control measures for Emissions of VOCs from on-road motor vehicles.

[76] Art. 2(3)(b).

[77] Art. 2(4) and (5). Annex IV provides classification of VOCs based on their 'motorchemical ozone creation potential'.

[78] Art. 2(6) and (7). [79] Art. 3(1) and (2).

review and the establishment of national programmes, policies and strategies.[80] Implementation of the Protocol will be verified by the exchange of information and annual reporting requirements; alternatively, the parties undertake to establish a 'mechanism for monitoring compliance' with the Protocol.[81] Once again, the Protocol makes use of the institutions established under the 1979 LRTAP Convention.

1994 Sulphur Protocol

Negotiations under the auspices of the 1985 Sulphur Protocol resulted in the conclusion of the 1994 Oslo Protocol on Further Reduction of Sulphur Emissions, which entered into force on 5 August 1998. Like its predecessor, the 1994 Protocol contemplates future negotiations on further obligations to reduce sulphur emissions.[82] The 1994 Protocol applies and develops the concepts of 'critical loads' and the 'effects-based approach' introduced in the 1988 NO_x Protocol. The basic obligation to which the Parties commit is to

> control and reduce their sulphur emissions in order to protect human health and the environment from adverse effects, in particular acidifying effects, and to ensure, as far as possible, without entailing excessive costs, that depositions of oxidised sulphur compounds in the long term do not exceed critical loads for sulphur given, in annex I, as critical sulphur depositions, in accordance with present scientific knowledge.[83]

The 'critical loads' for sulphur are intended as long-term targets for reductions in sulphur emissions and it is recognised that they will not be reached in a single step. Instead, as a first step, parties are required to meet the targets and timetable for reductions of sulphur emissions specified in Annex II.[84] In line with an effects-based approach, the emission reduction obligations of parties are differentiated, with greater emissions reductions allocated to those countries where the overall benefit would be the greatest.

The Protocol requires the parties to make use of the 'most effective measures for the reduction of sulphur emissions' from new and existing sources, including controlling the sulphur content of fuel, energy efficient measures, promotion of renewable energy and the application of best available control technologies using the guidance provided in Annex IV to the Protocol.[85] The Protocol also permits the parties to apply economic instruments to encourage the adoption of cost-effective approaches to the reduction of sulphur emissions, and to enter into agreements for the joint implementation of the Protocol with other parties.[86]

All parties (other than the United States and Canada) must apply national emissions limits to major new stationary sources, and introduce pollution

[80] Arts. 4 to 7. [81] Arts. 3(3) and 8. [82] Art. 2(8). [83] Art. 2(1).
[84] Art. 2(2) and (3). [85] Art. 2(4). [86] Art. 2(6) and (7).

control measures for major existing stationary sources by 1 July 2004.[87] Parties were also required to apply national standards for the sulphur content of gas oil no later than two years after the Protocol entered into force.[88]

Parties are required to implement their basic obligations under Article 2 through the adoption of national strategies, policies and programmes and by taking and applying national measures to control and reduce sulphur emissions.[89] Each party must collect and maintain information on actual levels of sulphur emissions, and of ambient concentrations and depositions of oxidised sulphur and other acidifying compounds; and on the effects of depositions of oxidised sulphur and other acidifying compounds.[90] The Protocol requires periodic reporting to the Executive Body on national implementation measures and the levels of national annual sulphur emissions.[91]

The Protocol requires parties to facilitate the exchange of technologies and techniques for reducing sulphur emissions. The Protocol also encourages research, development, monitoring and co-operation in respect of various matters relating to: the harmonisation of methods for the establishment of critical loads; the improvement of monitoring techniques and modelling systems; the development of strategies for the further reduction of sulphur emissions; the understanding of the wider effects of sulphur emissions on human health and the environment; emission abatement and energy efficiency technologies; and the economic evaluation of benefits for the environment and human health resulting from the reduction of sulphur emissions.[92]

Like the other Protocols, the 1994 Protocol makes use of the institutions established under the 1979 LRTAP Convention. Article 7 contemplates the establishment of a new body, an Implementation Committee, to oversee compliance.[93] In 1998, the parties to the 1994 Protocol decided that the structure, functions and procedures of the Implementation Committee should be those set out Decision 1997/2 of the Executive Body.[94] The Implementation Committee now oversees compliance with all of the Protocols to the LRTAP Convention.

1998 Aarhus Protocol on Heavy Metals

The 1998 Heavy Metals Protocol was adopted in Aarhus on 24 June 1998.[95] It targets three particularly harmful heavy metals – lead, cadmium and mercury – and requires parties to reduce their emissions of these metals below the levels in a selected reference year (between 1985 and 1995).[96] The Protocol aims to reduce

[87] Art. 2(5)(a) and (b); emissions limits are specified in Annex V.
[88] Art. 2(5)(c). [89] Art. 4(1). [90] Art. 4(2).
[91] Art. 5. [92] Arts. 3 and 6. [93] Chapter 5, p. 178 above.
[94] Decision 1998/6, The Application of the Compliance Procedure to the Oslo Protocol (ECE/EB.AIR/59, Annex II).
[95] Aarhus, 24 June 1998, not in force; thirty-six signatories and thirteen ratifications.
[96] Art. 3(1) and Annex I.

emissions of heavy metals from industrial sources, combustion processes and waste incineration. Parties are required to implement emission standards for these pollutants for stationary sources, based on the best available technologies suggested in the Protocol.[97] In addition, parties undertake to phase out the use of leaded petrol and to introduce measures designed to lower heavy metal emissions from other products.[98] A number of other product management measures are proposed for products containing mercury.[99]

Parties are to develop strategies, policies and programmes, without undue delay, to discharge their obligations under the Protocol. A range of measures are suggested for this purpose, including economic instruments, government/industry covenants and voluntary agreements, more efficient use of resources, use of less polluting sources, development of a less polluting transport system, phasing out certain polluting industrial processes and developing cleaner processes. Parties are free to adopt more stringent measures than those required by the Protocol.[100] As for the other Protocols, the Heavy Metals Protocol promotes technology exchange and other forms of co-operation between the parties.[101] Parties must report periodically to the Executive Body on measures taken to implement the Protocol, with compliance overseen by the Implementation Committee.[102]

1998 Aarhus Protocol on Persistent Organic Pollutants

The Protocol on Persistent Organic Pollutants (POPs) was adopted by the Executive Body at the same time as the Heavy Metals Protocol.[103] Its ultimate objective is to eliminate discharges, emissions and losses of POPs to the atmosphere. The Protocol focuses on a list of sixteen substances (including pesticides, industrial chemicals and contaminants) singled out according to agreed risk criteria. Parties to the Protocol undertake to eliminate the production and use of certain POPs listed in Annex I and to restrict the use of other substances listed in Annex II.[104] For a third group of POPs listed in Annex III, parties are required to reduce their emissions of these substances from the level of emissions in a given reference year (between 1985 and 1995).[105] For emissions of dioxins and furans, parties are required to apply emissions limits, based on best available technologies, for new and existing stationary sources, and must take effective measures to control emissions of POPs from mobile sources.[106]

The Protocol includes provisions dealing with the disposal of wastes containing or generated from listed substances.[107] Parties are to ensure the

[97] Art. 3(2) and Annex III. [98] Art. 3(3) and Annex VI. [99] Art. 3(4) and Annex VII.
[100] Art. 5. [101] Arts. 4 and 6. [102] Arts. 7 and 9.
[103] Aarhus, 24 June 1998, not yet in force; thirty-six signatories and thirteen ratifications.
[104] Art. 3(1). Parties may grant exemptions from these requirements for research purposes or in the event of a public health emergency: see Art. 4.
[105] Art. 3(5)(a). [106] Art. 3(5)(b) and Annexes IV and V. [107] Art. 3(1) and (3).

environmentally sound destruction and disposal of these wastes. For Annex I substances, domestic disposal should take place where possible, and any transboundary movement of these wastes should be in accordance with applicable subregional, regional and global regimes governing the transboundary movement of hazardous wastes, in particular the 1989 Basel Convention. Parties are to: develop strategies, policies and programmes to discharge their obligations under the Protocol; promote the provision of information to the general public, including individuals who are direct users of POPs; facilitate the exchange of technology and information; and engage in co-operative research, development and monitoring in relation to POPs.[108] Parties must report periodically to the Executive Body on measures taken to implement the Protocol, with compliance overseen by the Implementation Committee.[109]

1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone

The most recent Protocol to the LRTAP Convention is the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone, adopted by the Executive Body on 30 November 1999.[110] The Protocol's objective is to control and reduce anthropogenic emissions of four pollutants – sulphur, NO_x, ammonia and VOCs – which are likely to cause adverse effects on human health, natural ecosystems, materials and crops due to acidification, eutrophication or ground-level ozone.[111] Following full implementation of the Protocol, it is estimated that the area in Europe with excessive levels of acidification will shrink from 93 million hectares (measured in 1990) to 15 million hectares. Similarly excessive levels of eutrophication are expected to fall from 165 million hectares (in 1990) to 108 million hectares and the number of days with excessive ozone levels to be halved.

The Protocol builds on the previous sulphur, NO_x and VOC Protocols, employing a range of mechanisms to reduce atmospheric emissions of the four types of pollutants. On a long-term step-wise basis, the parties commit to ensuring that atmospheric depositions or concentrations of the pollutants do not exceed the critical loads of acidity, nutrient nitrogen and ozone specified in Annex I to the Protocol.[112] Annex II sets emissions ceilings for sulphur, NO_x, VOCs and ammonia which parties are required to attain by 2010. Required emissions reductions are differentiated between the parties on the basis that parties whose emissions have more severe environmental or health impacts and which are relatively inexpensive to reduce will be required to make the largest cuts. In addition, the Protocol sets tight limit values for

[108] Arts. 5–8. [109] Arts. 9 and 11.
[110] Gothenburg (Sweden), 30 November 1999 (not yet in force); thirty-one signatories and four ratifications.
[111] Art. 2. [112] *Ibid.*

specific emission sources, fuels and new mobile sources, and requires the best available technologies to be used to minimise emissions.[113] Guidance documents adopted together with the Protocol provide details of a wide range of abatement techniques and economic instruments for the reduction of emissions in relevant sectors, including the transport sector.[114]

The Protocol is the first agreement under the Convention to deal specifically with emissions of reduced nitrogen compounds (ammonia), which are particularly associated with farming activities. Parties will be required to: apply ammonia control measures including developing advisory codes of good agricultural practice to control ammonia emissions; take such steps as are feasible to limit ammonia emissions from the use of solid fertilisers based on urea; and implement control measures with respect to manure application and storage, and animal housing.[115]

Once again, parties are required: to develop strategies, policies and programmes to discharge their obligations under the Protocol; to promote the provision of information to the general public; to facilitate the exchange of technology and information; and to engage in co-operative research, development and monitoring.[116] Parties must report periodically to the Executive Body on measures taken to implement the Protocol, with compliance overseen by the Implementation Committee.[117]

1988/2001 EC Large Combustion Directive

The EC has adopted a significant body of secondary legislation aimed at limiting and reducing atmospheric emissions.[118] Of particular note was the 1988 EC Large Combustion Directive, which allocated anthropogenic emissions rights to each of the member states for sulphur dioxide, nitrogen oxides and dust particles from large combustion plants.[119] From 1994, the Directive also applied to six EFTA member countries under the 1992 EEA Agreement.[120] With effect from 27 November 2002, Directive 88/609/EEC was repealed by Directive 2001/80/EC, which is intended to 'recast' Directive 88/609 'in the interests of clarity'.[121]

[113] Art. 3(2)–(6).
[114] Decision 1999/1, The Guidance Documents for the Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (ECE/EB.AIR/68, Annex I).
[115] Art. 3(8) and Annex IX. [116] Arts. 4–6 and 8.
[117] Arts. 7 and 9. [118] Chapter 15, pp. 755–68 below.
[119] Council Directive 88/609/EEC of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants, as amended, OJ L336, 7 December 1988, 1. A 'large' combustion plant is one with a rated thermal input equal to or greater than 50 MW: Art. 1.
[120] Chapter 15, p. 747 below.
[121] Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants, OJ L309, 27 November 2001, 1.

Like its predecessor, the new Directive distinguishes between existing and new plants, but excludes a smaller category of plants.[122]

Existing plant emissions of sulphur dioxide and nitrogen oxides

In accordance with Directive 88/609, member states determined their total annual emissions and drew up programmes for the reduction of such emissions from existing plants. Directive 88/609 set emissions ceilings and percentage reductions on the basis of 1980 emissions levels, which each member state was required to meet by 1993, 1998 and 2003 for sulphur dioxide, and by 1993 and 1998 for nitrogen oxides.[123] These target figures were reviewed by the EC Commission after 1994,[124] which involved lengthy negotiations which raised many of the issues faced by the rest of the international community in applying the principle of 'common but differentiated responsibility' under the 1992 Climate Change Convention and its 1997 Kyoto Protocol. The targets took into account the different capabilities of states. For sulphur dioxide, four of the economically wealthier member states (Belgium, Germany, France and the Netherlands) had to reduce their emissions of sulphur dioxide from existing plants by 70 per cent of 1980 levels by 2003, while three of the economically poorer southern member states (Greece, Ireland and Portugal) were allowed to increase their emissions over the same period by 6 per cent, 25 per cent and 79 per cent respectively. The other five member states were to reduce emissions by between 37 per cent and 67 per cent by 2003. For nitrogen oxides, the requirements ranged from a reduction of 40 per cent of 1980 levels by 1998, to permitted increases of up to 178 per cent.

Directive 2001/80 retains the emission ceilings, percentage reductions and targets for existing plants set by the 1988 Directive.[125] For sulphur dioxide, seven states now have to reduce their emissions from existing plants by 70 per cent of 1980 levels by 2003, with Austria, Finland and Sweden added to this group. Sulphur dioxide emission reduction targets for 2003 for the other member states have not been altered. The targets in the 1988 Directive for nitrous oxides also remain unchanged.

Directive 2001/80 introduces a new requirement for member states to achieve 'significant emission reductions' from existing plants. This obligation may be met either by the member state taking appropriate measures to ensure that licences for the operation of existing plants contain conditions requiring

[122] Art. 2(7) (for example, gas turbines licensed after 27 November 2002). An 'existing plant' is one for which the original construction licence or original operating licence was granted before 1 July 1987, and a 'new plant' is one for which such licences were granted after 1 July 1987: Art. 2(9) and (10).

[123] Directive 88/609, Art. 3(1), (2) and (3), Annex I and Annex IX.C. See also the emissions reductions set by the 1992 EEA Agreement for the EFTA member countries; see chapter 15, p. 747 below; Annex XX, para. 19.

[124] Art. 3(4). [125] Directive 2001/80, Art. 3(2).

compliance with the same emission limit values as apply to new plants for which a licence application was lodged prior to 27 November 2002 and which were put into operation by 27 November 2003, or by ensuring that existing plants are subject to a national emission reduction plan.[126] If a member state chooses the latter option, it must design and implement a national emission reduction plan which will reduce the total annual emissions of nitrogen oxides, sulphur dioxide and dust from existing plants to the levels that would have been achieved by applying to the existing plants in operation in the year 2000 the emission limit values for new plants for which a licence application was lodged prior to 27 November 2002 and which were put into operation by 27 November 2003. The closure of a plant included in the national emissions reduction plan cannot result in an increase in the total annual emissions from the remaining plants covered by the plan. The national emissions reduction plans must comprise: objectives and related targets; measures and timetables for reaching the objectives and targets; and a monitoring mechanism. Member states are to communicate their national emission reduction plans to the EC Commission by no later than 27 November 2003.[127]

New plant emissions of sulphur dioxide, nitrogen oxides and dust

In respect of new plants, Directive 88/609 required member states to ensure that licences for their construction or operation included conditions giving effect to the emissions limit values fixed in Annexes III to VII to the Directive for sulphur dioxide, nitrogen oxides and dust.[128] The applicable emissions limit values depended upon the type of fuel used (solid, liquid or gaseous) and the output of the plant. Member states were free to impose more stringent requirements, including the addition of other pollutants.[129]

Directive 2001/80 distinguishes two categories of new plants. For new plants for which a full request for a licence was made prior to 27 November 2002, and which are put into operation no later than 27 November 2003, member states in licensing such plants are to impose conditions relating to compliance with the emissions limit values laid down in Part A of Annexes III to VII to the Directive.[130] Like the emissions limit values under the 1988 Directive, the values under the 2001 Directive depend upon the type of fuel used and the output of the plant. For all other new plants, member states must take appropriate measures to ensure that the relevant licences contain conditions requiring compliance with the more stringent emissions limit values laid down in Part B of Annexes III to VII.[131] Where a combustion plant is extended by at least 50MW, the more stringent emissions limit values apply to the new part of the plant and must be fixed in relation to the thermal capacity of the entire plant.[132] Once again, member states are free to impose more stringent requirements on new

[126] Art. 4(3). [127] Art. 4(6). [128] Directive 88/609, Art. 4(1).
[129] Art. 4(2) and (3). [130] Directive 2001/80, Art. 4(1). [131] Art. 4(2). [132] Art. 10.

plants, including the addition of other pollutants, additional requirements or adaptation of the plant to technical progress.[133] In the case of construction of a combustion plant which is likely to have significant effects on the environment in another member state, the authorising member state is under an obligation to ensure that all appropriate information and consultation takes place in accordance with Council Directive 85/337/EEC on environmental impact assessment.[134]

Like the previous Directive, Directive 2001/80 provides for derogations, the occurrence of malfunction or breakdown of pollution abatement equipment, the establishment of emissions limits for multi-firing plants using two or more fuels, and the use of emission stacks.[135] National authorities are responsible for ensuring that the monitoring of emissions is carried out by operators, and that the EC Commission receives regular reports on the implementation of the Directive.[136] By 31 December 2004 at the latest, the Commission must submit a report to the European Parliament and the Council assessing the need for further emissions reduction measures, taking into account factors such as the cost-effectiveness of further reductions, their technical and economic feasibility and the effects on the environment and the internal market.[137] The 1988 and 2001 Directives have had important consequences for the choice of fuel supply used by electricity generating utilities. In the United Kingdom, for example, the costs associated with implementing the Directives, and in particular the cost of fitting flue gas desulphurisation (FGD) equipment on coal-fired plants, has contributed to the move away from coal-fired power plants to natural-gas-fired plants, and a consequential decline in the UK coal industry.

1991 Canada–US Air Quality Agreement

E. G. Lee, 'International Law and the Canada–United States Acid Rain Dispute', in D. Magraw (ed.), *International Law and Pollution* (1991), 322.

The 1991 Agreement Between the United States of America and Canada on Air Quality (1991 Canada–US Air Quality Agreement)[138] is designed to control transboundary air pollution between the two countries and provide a framework for addressing shared concerns.[139] The Agreement followed disputes over responsibility for causing acid rain, an issue which dates back at least to the 1930s and the differences over the sulphur emissions from the Trail Smelter.[140] At the heart of the Agreement are air quality objectives to limit and reduce

[133] Art. 4(5). [134] Art. 11. [135] Arts. 5, 7, 8 and 9.
[136] Arts. 12, 13 and 15. [137] Art. 4(7).
[138] Ottawa, 13 March 1991, in force 13 March 1991, 30 ILM 676 (1991).
[139] Arts. II and III(1). 'Air pollution' is defined in similar terms to the definition in the 1979 LRTAP Agreement except for the exclusion of 'energy': Art. I(1).
[140] See below.

emissions of sulphur dioxide and nitrogen oxides and to prevent air quality deterioration and visibility protection.[141] The 1991 Agreement also requires compliance monitoring by continuous emissions monitoring systems or their equivalent for certain utilities and comparably effective methods of emissions estimation from other major stationary sources.[142] Since February 2000, the parties have been negotiating an Ozone Annex to the Agreement designed to reduce transboundary flows of ground-level ozone, one of the main contributors to smog.[143]

Sulphur dioxide

The United States is obliged to reduce its annual sulphur dioxide emissions by approximately 10 million tons from 1980 levels by the year 2000, in accordance with its own national legislation (1990 Clean Air Act), to achieve a permanent national emissions cap of 8.95 million tons of sulphur dioxide per year for electric utilities by 2010. It must also adopt new or revised standards as the Administrator of the Environmental Protection Agency deems appropriate, aimed at limiting sulphur dioxide emissions from industrial sources in the event that they may be expected to exceed 5.6 million tons per year.[144] For its part, Canada agrees to reduce sulphur dioxide emissions in its seven easternmost provinces to 2.3 million tonnes per year by 1994 and to establish a cap on emissions from those provinces of 2.3 million tonnes per year from 1995 to 31 December 1999, and a permanent national emissions cap of 3.2 million tonnes per year by 2000.[145]

Nitrogen oxides

The United States must reduce the total annual emissions of nitrogen oxides by approximately 2 million tons from 1980 emission levels by 2000. This is to be achieved through controls on stationary sources (establishing emissions standards for electric utility boilers) and mobile sources (emissions standards from old and new light duty trucks, light duty vehicles and heavy duty trucks).[146] Canada agrees as an interim requirement to reduce by the year 2000 annual national emissions from stationary sources by 100,000 tonnes below its forecast level of 970,000 tonnes for the year 2000, to develop by 1 January 1995 further national annual emissions reduction requirements from stationary sources to be achieved by 2000 and/or 2005, and to limit emissions from mobile sources by adopting specified emissions standards (for light, medium and heavy duty vehicles).[147]

[141] Art. IV(2) and Annex 1, Section 4. [142] Annex I, Section 3.
[143] For details of the parties' negotiations, see www.can-am.gc.ca/menu-e.asp?mid=1&cat=11#air/.
[144] Annex I, Section 1A. [145] Annex I, Section 1B. 1 ton – 0.91 tonnes (metric tons).
[146] Annex I, Section 2A. [147] Annex I, Section 2B.

Assessment, information and institutions

The 1991 Agreement requires assessment of proposed activities likely to cause significant transboundary air pollution, notification and consultation, and measures must be taken to avoid or mitigate the risks posed by actions likely to cause significant transboundary air pollution.[148] It also provides for research, the exchange of information, and other consultations.[149] A bilateral Air Quality Committee is established to prepare progress reports, and the International Joint Commission assists the parties in implementation, by receiving public comments and dealing with other requests from the parties.[150] The Agreement envisages a role for the public and interested organisations in assessing reports and implementing the Agreement.[151]

Aircraft emissions: ICAO Convention

Aircraft emissions are now known to be making a significant contribution to global atmospheric problems.[152] Annex 16 to the 1944 Convention on International Civil Aviation establishes rules on 'Environmental Protection Relating to Aircraft Noise[153] and Aircraft Engine Emissions' (1980 ICAO Aircraft Emissions Standards and Recommended Practices).[154] The Standards were adopted by the ICAO Council in 1980, following proposals to develop Standards and Recommended Practices to achieve 'maximum compatibility between the safe and orderly development of civil aviation and the quality of human environment'.[155]

The 1980 ICAO Aircraft Emissions Standards and Recommended Practices were adopted under Article 37 of the ICAO Convention, which requires contracting states

[148] Art. V. [149] Arts. VI, VII and XI and Annex 2.
[150] Arts. VIII and IX. [151] Art. XIV(3).
[152] For a recent assessment, see the *Special Report on Aviation and the Global Atmosphere* (1999) prepared at ICAO's request by the IPCC in collaboration with the Scientific Assessment Panel to the Montreal Protocol (available at www.grida.no/climate/ipcc/aviation/index.htm). See also ICAO Resolution A33-7 (2001), 'Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection', at Annex H.
[153] ICAO, International Standards and Recommended Practices, Environmental Protection, Annex 16 to the 1944 ICAO Convention, vol. I (1988, 2nd edn), as amended.
[154] ICAO, International Standards and Recommended Practices, Environmental Protection, Annex 16 to the 1944 ICAO Convention, vol. II (1980, 1st edn), as amended. A 'Consolidated Statement of Continuing Policies and Practices Related to Environmental Protection' is revised and updated by the ICAO Council every three years for adoption by the ICAO Assembly. The present version, Assembly Resolution A32-8, was adopted in October 1998.
[155] ICAO Assembly Resolution A18-11, para. 2.

> to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures and organisation . . . in all matters in which such uniformity will facilitate and improve air navigation.

Where a state finds it 'impracticable' to comply with an international standard, it must, under Article 38, immediately notify the ICAO of the differences between its own practices and those established by the international standard. For the Emission Standards, eleven of the 187 contracting states to the ICAO had notified differences. The Emissions Standards establish rules for vented fuel (Part II) and emission centrification (Part III), including emissions limits for smoke, hydrocarbons, carbon monoxide and oxides of nitrogens for subsonic and supersonic aircraft,[156] and standard techniques for measurement and evaluation, and compliance procedures.[157] In recent years, the ICAO has begun to address the impacts of the aviation industry on climate change.[158]

Ozone depletion

J. Temple Lang, 'The Ozone Layer Convention: A New Solution to the Question of Community Participation in "Mixed" International Agreements', 23 *Common Market Law Review* 157 (1986); J. Lammers, 'Efforts to Develop a Protocol on Chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer', 1 *Hague Yearbook of International Law* 255 (1988); J. Tripp, 'The UNEP Montreal Protocol: Industrialised and Developing Countries Sharing the Responsibility for Protecting the Stratospheric Ozone Layer', 20 *New York University Journal of International Law and Policy* 733 (1988); J. Kindt and S. Menefee, 'The Vexing Problem of Ozone Depletion in International Environmental Law and Policy', 24 *Texas International Law Journal* 261 (1989); C. Granda, 'The Montreal Protocol on Substances that Deplete the Ozone Layer', in L. Susskind and J. W. Breslin (eds.), *Nine Case Studies in International Environmental Negotiation* (1990); D. Caron, 'La Protection de la couche d'ozone stratosphérique et la structure de l'activité normative internationale en matière d'environnement', AFDI 704 (1990); D. Caron, 'Protection of Stratospheric Ozone Layer and the Structure of International Environmental Law-Making', 14 *Hastings International and Comparative Law Review* 755 (1991); Mintz, 'Progress Towards a Healthy Sky: An Assessment of the London Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer', 16 *Yale Journal of International Law* 571 (1991); P. Haas, 'Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone', 46 *International*

[156] Sections 2.2, 2.3, 3.2 and 3.3. [157] Appendix 6.

[158] See IPCC, *Special Report on Aviation and the Global Atmosphere* (1999); see also ICAO Assembly Resolution A33-7, resolving to promote scientific research aimed at addressing uncertainties and requesting the ICAO Council to continue to co-operate closely with the IPCC and other organizations involved in the definition of aviation's contribution to environmental problems in the atmosphere.

Organization 187 (1992); D. Brack, *International Trade and the Montreal Protocol* (1996); R. E. Benedick, *Ozone Diplomacy* (1998, 2nd edn); UNEP, *Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer* (2000, 5th edn); F. S. Rowland, 'Atmospheric Changes Caused by Human Activities: From Science to Regulation', 27 *Ecology Law Quarterly* 1261 (2001); O. Yoshida, *The International Legal Regime for the Protection of the Stratospheric Ozone Layer* (2001).
Website: www.unep.org/ozone/index.shtml

The ozone layer comprises a sheet of O_3 molecules (ozone) that are found in the earth. Ninety per cent of atmospheric O_3 is found in the stratosphere, with maximum concentrations occurring at altitudes of 25 kms over the equator and 15 kms over the poles. The ozone layer is thought to provide a shield against harmful exposure to ultraviolet radiation from the sun and control the temperature structure of the stratosphere. O_3 also acts as a greenhouse gas at lower altitude, is a respiratory irritant, and can adversely affect plant growth.[159] Since the 1960s, there have been losses in the ozone layer over the Antarctic during the southern hemisphere spring (September–October), and more recently a hole has appeared in the ozone layer above the Arctic. Since then, significant thinning has also been discovered in the northern hemisphere and ozone depletion has become progressively greater over the course of the 1990s. Serious levels of UVB radiation have been observed over Antarctica, Australia and mountainous regions of Europe, and damage to phytoplankton has been discovered in Antarctica.[160]

The depletion of the ozone layer is caused by the anthropogenic emission of certain inert gases, particularly chlorofluorocarbons (CFCs) and halons. When these gases reach the ozone layer, they are exposed to ultraviolet rays and break down, releasing free chlorine (from CFCs) and bromine (from halons), which break up the ozone molecules and deplete the ozone layer. Increased levels of ultraviolet rays are thought to cause harm to human health and the environment, including organisms in the marine environment. CFCs are used extensively as refrigerants, air conditioner coolants, aerosol spray-can ingredients and in the manufacture of styrofoam.

The protection of the ozone layer from these destructive elements is the subject of a complex legal regime comprising the 1985 Vienna Convention for the Protection of the Ozone Layer (the 1985 Vienna Convention),[161] and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer (the 1987

[159] UNEP, *Environmental Data Report* (1991), 9.

[160] Statement from the Co-Chair of the Ozone Scientific Assessment Panel and Chair of the Assessment Panels, Report of the Fourth Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.4/15, 25 November 1992, 5–6. For the latest assessment of ozone depletion, see WMO/UNEP, *Scientific Assessment of Ozone Dépletion* (November 1998).

[161] Vienna, 22 March 1985, in force 22 September 1988, 26 ILM 1529 (1987); 185 states are parties to the Convention.

Montreal Protocol).[162] Since 1990, there have been various adjustments to the production and consumption of controlled substances listed in the Annexes to the Protocol[163] and four amendments to the Protocol, adopted in London (1990),[164] Copenhagen (1992),[165] Montreal (1997)[166] and Beijing (1999).[167] Since the 1960s, monitoring functions have been carried out by states individually and jointly, as well as under the World Meteorological Organization (WMO) Global Ozone Observing System. In 2002, evidence began to emerge to suggest that the global regime was limiting the rate of increase in the degradation of the ozone layer, and that within five years the size of the hole in the ozone layer over the Antarctic might begin to decrease in magnitude, following a decrease in the levels of ozone-depleting gases in the stratosphere and of ozone-depleting chemicals in the troposphere.[168]

1985 Vienna Convention

The Vienna Convention was negotiated over five years under the auspices of UNEP. It was the first treaty to address a global atmospheric issue and is open to participation by all states. It has attracted widespread support from all industrialised nations and a very large number of developing countries. It established a framework for the adoption of measures 'to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer'.[169] The Vienna Convention does not set targets or timetables for action but requires four categories of 'appropriate measures' to be taken by parties in accordance with means at their disposal and their capabilities, and on the basis of relevant scientific and

[162] Montreal, 16 September 1987, in force 1 January 1989, 26 ILM 1550 (1987); 184 states are parties to the Protocol.

[163] Adjustments to the Protocol were adopted, in accordance with the procedure laid down in Art. 2(9), at the Second, Fourth, Seventh, Ninth and Eleventh Meetings of the Parties to the Protocol and came into force for all parties on 7 March 1991, 23 September 1993, 5 August 1996, 4 June 1998 and 28 July 2000, respectively.

[164] London, 29 June 1990, in force 10 August 1992, 30 ILM 537 (1991); 164 states are parties to the 1990 Amendments.

[165] Copenhagen, 25 November 1992, 14 June 1994, 32 ILM 874 (1993); 144 states are parties to the 1992 Amendments; see Report of the Fourth Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.4/15, 25 November 1992, Annexes I, II and III.

[166] Montreal, 25 September 1997, in force 10 November 1999; eighty-nine states are parties to the 1997 Amendments; Annex IV of the Report of the Ninth Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.9/12.

[167] Beijing, 17 December 1999, in force 25 February 2002; forty-five states have accepted the 1999 Amendments. Annex V of the Report of the Eleventh Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.11/10.

[168] UNEP Press Release, 16 September 2002.

[169] Art. 2(1); the 'ozone layer' is defined as 'the layer of atmospheric ozone above the planetary boundary layer': Art. 1(1).

technical considerations.[170] These obligations are: co-operation on systematic observations, research and information exchange; the adoption of appropriate legislative or administrative measures and co-operation on policies to control, limit, reduce or prevent activities that are likely to have adverse effects resulting from modifications to the ozone layer; and co-operation in the formulation of measures, procedures and standards to implement the Convention as well as with competent international bodies.[171] Parties are free to adopt additional domestic measures, in accordance with international law, and maintain in force compatible measures already taken.[172]

Article 3 and Annexes I and II elaborate upon the type of research and systematic observations which are to be carried out directly or through international bodies.[173] Article 4 and Annex II require co-operation in legal, scientific and technical fields, including the exchange of scientific, technical, socio-economic and legal information relevant to the Convention, subject to rules of confidentiality, and the development and transfer of technology and knowledge, taking into account the particular needs of developing countries.

The parties transmit information to the conference of the parties on their implementation measures. That body is entrusted with the implementation of the Convention, assisted by a Secretariat whose services are provided by UNEP.[174] The conference of the parties has other functions, including the adoption of protocols, additional annexes and amendments to protocols and annexes, and the right to take 'any additional action that may be required for the achievement of the purposes of the Convention'.[175] Annexes to the Convention or to any protocols are restricted to scientific, technical and administrative matters, and are to be considered an integral part of the Convention or of such protocols,[176] and only parties to the Convention may become parties to any protocol.[177]

The 1987 Montreal Protocol and the Adjustments and Amendments

Introduction

The first, and to date the only, Protocol to the Vienna Convention is the 1987 Montreal Protocol. It is a landmark international environmental agreement, providing a precedent for new regulatory techniques and institutional

[170] Art. 2(1), (2) and (4). [171] Art. 2(2)(a) to (d). [172] Art. 2(3).

[173] Annex I identifies three main areas of research need (the physics and chemistry of the atmosphere; health, biological and photodegradation effects; effects on climate) and systematic observations on designated matters. Annex I also identifies substances thought at the time to have the potential to modify the ozone layer: carbon substances (carbon monoxide, carbon dioxide, methane, non-methane hydrocarbon species); nitrogen substances (nitrous oxide, nitrogen oxides); chlorine substances (fully halogenated alkanes, partially halogenated alkanes); bromide substances; and hydrogen substances (hydrogen, water).

[174] Arts. 5 to 7. [175] Arts. 6(4), 8, 9 and 10. [176] Art. 10(1). [177] Art. 16(1).

arrangements, and the adoption and implementation of innovative financial mechanisms. With hindsight, the Montreal Protocol appears to be a relatively straightforward instrument, and the fact that its approach has subsequently been relied upon extensively in other international environmental negotiations belies the controversy and complexity surrounding it at the time of its negotiations. According to one commentator, most observers in and out of government believed at the time that an agreement on international regulation of CFCs would be impossible to reach. The issues were complex, involving interconnected scientific, economic, technological and political variables. The science was still speculative, resting on projections from evolving computer models of imperfectly understood stratospheric processes – models that yielded varying, sometimes contradictory, predictions of potential future ozone losses each time they were further refined. Moreover, existing measurements of the ozone layer showed no depletion, nor was there any evidence of the postulated harmful effects.[178]

The Montreal Protocol sets forth specific legal obligations, including limitations and reductions on the calculated levels of consumption and production of certain controlled ozone-depleting substances.[179] Its negotiation and conclusion, shortly after the 1985 Vienna Convention, were prompted by new scientific evidence indicating that emissions of certain substances were significantly depleting and modifying the ozone layer and would have potential climatic effects.[180] The absence of scientific evidence that actual harm was occurring required the international community to take 'precautionary measures to control equitably total global emissions' of substances that deplete the ozone layer.[181] Like the Vienna Convention, the Montreal Protocol and its amendments have attracted widespread support.[182] In 1990, the Second Meeting of the Parties to the Montreal Protocol adopted the first Adjustment and Amendments to the Montreal Protocol. Those Amendments were ratified by 164 states, including a significant number of developing countries. In 1992, the Fourth Meeting of the Parties to the Montreal Protocol adopted a second round of Adjustment and Amendments. The 1992 changes were adopted within four months of the entry into force of the 1990 Amendments and have been ratified by 144 states. Since 1992, there have been three further rounds of Adjustments in 1995, 1997 and 1999 and two Amendments have been adopted, the first at the Ninth Meeting of the Parties in 1997 (in force 10 November 1999, with eighty-nine ratifications)

[178] R. Benedick, *Ozone Diplomacy* (1991), xii, an insider's account of the negotiations of the Montreal Protocol (see also the second edition 1998).
[179] 1987 Montreal Protocol, Art. 3 provides for the method of calculating control levels.
[180] *Ibid.*, preambular paras. 3 and 4. [181] Preambular para. 6.
[182] On the procedure for the adoption of adjustments and amendments, see chapter 4, pp. 138–40 above.

and the second at the Eleventh Meeting of the Parties in 1999 (in force 25 February 2002, with forty-five ratifications).

The 1990 Amendments introduced important changes to the Montreal Protocol. The Preamble was amended to include a reference to the need to take into account the 'developmental needs of developing countries', the provision of 'additional financial resources and access to relevant technologies', and the 'transfer of alternative technologies'.[183] The definitions of 'controlled substances' and 'production' were amended,[184] and a definition of 'transitional substances' was introduced.[185] The amended definition of 'production' excludes 'recycled' and 'reused' amounts.[186] Article 2(5) was amended to establish new rules concerning transfers of calculated levels of production between parties and, as described below, changes were introduced to all the important operational provisions, particularly those requiring the reduction and, ultimately, the prohibition of the use of controlled substances which were subject to control measures relating to consumption, production and trade. New rules were also adopted relating to the financial arrangements and technology transfer.

The 1992 Adjustments: introduced changes to the timetable for phasing out substances under Articles 2A to 2E of the amended Protocol; listed three new controlled substances and further trade restrictions; adopted new reporting requirements; enlarged the Implementation Committee; and adopted an indicative list of measures to be taken against parties which were not in compliance; it also established the Multilateral Fund on a permanent basis.

The 1997 Montreal Amendment established a new timetable for phasing out the use of methyl bromide and adopted a new licensing system for controlling trade based on licences issued by the parties for each export and import of controlled substances. The licensing system will enable customs and police officials to track trade in CFCs and to detect unlicensed trade. The 1999 Amendment provides for new production controls on Group I, Annex C substances, lists bromochloromethane as a controlled substance and institutes new reporting obligations for quarantine and pre-shipment uses of methyl bromide.

[183] 1990 Amendments, sixth, seventh and ninth preambular paragraphs.

[184] *Ibid.*, Art. 1(4) and (5); see also Decision IV/12 of the Fourth Meeting of the Parties to the Montreal Protocol excluding 'insignificant quantities' from the definition: see Report of the Fourth Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.4/15, 25 November 1992.

[185] 1990 Amendments, Art. 1(9). 'Transitional substances' are those in Annex C to the Protocol.

[186] *Ibid.*, Art. 1(5), Decision IV/24 of the Meeting of the Parties adopted 'clarifications' of the terms 'recovery' ('collection and storage of controlled substances . . . during servicing or prior to disposal'), 'recycling' (by re-use of a recovered controlled substance following a basic cleaning process) and 'reclamation' ('re-processing' and upgrading of a recovered controlled substance): Report of the Fourth Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.4/15, 25 November 1992.

Controlled substances

Article 2 and Annex A of the 1987 Montreal Protocol established control measures which were relatively complex and sophisticated as compared to the existing international environmental rules. Annex A established two groups of 'controlled substances' and an estimate of the ozone-depleting potential of each substance in the two groups. Group I listed certain chlorine substances,[187] and Group II listed certain halon substances.[188] The 1987 Protocol allows the parties to make adjustments to the ozone-depleting potentials specified in Annex A, as well as further adjustments and reductions of production and consumption from 1986 levels.[189]

The 1990 Amendments added controlled substances in two new Annexes to the Protocol. Annex B added three new groups of controlled substances (Group I (additional CFCs), Group II (carbon tetrachloride) and Group III (methyl chloroform)), and Annex C added a list of transitional substances (HCFCs).[190] In 1991, the parties to the Montreal Protocol added an Annex D to the Protocol.[191] The 1992 Amendments added methyl bromide as a controlled substance in a new Annex E. The 1999 Amendments added bromochloromethane as a controlled substance in a new Group III in Annex C.

Control measures: consumption and production

Article 2 of the 1987 Montreal Protocol adopted limitation and reduction requirements on the consumption and production of all Annex A substances. By Article 6, as amended by the 1992 and 1999 Amendments, the parties are to assess with the assistance of panels of experts all the Article 2 control measures on the basis of available scientific, environmental, technical and economic information.[192] More stringent control measures in respect of those substances, including an accelerated timetable for phase-out, were imposed by the various Adjustments and Amendments to the Protocol.

[187] CFC-11, CFC-12, CFC-113, CFC-114 and CFC-115.

[188] Halon-1211, halon-1301 and halon-2402.

[189] 1987 Montreal Protocol, Art. 2(9). Such adjustments are subject to a simplified decision-making procedure whereby decisions binding on all parties may, as a last resort and consensus having failed, be taken by two-thirds of parties present and voting and representing 50 per cent of total consumption. By Art. 2(1), the parties may also decide to add or remove substances from Annex A and what control measures should apply to those substances, subject to a two-thirds majority vote of parties present and voting.

[190] The 1992 Amendment replaced Annex C with a new section.

[191] Report of the Third Meeting of the Parties to the Montreal Protocol, UNEP/OzL.Pro.3/11, 21 June 1991, Decision III/15.

[192] 1987 Montreal Protocol, Art. 6. Under the Protocol, the control measures are to be assessed at least every four years on the basis of available scientific, environmental, technical and economic information; by Art. 2(11) of the 1987 Montreal Protocol, parties remain free to take more stringent measures than those required by Art. 2.

CFCs Under the 1987 Montreal Protocol as adjusted and amended, each party must limit its calculated level of consumption of Annex A, Group I substances to 1986 levels within nineteen months of the entry into force of the Protocol.[193] Thereafter, annual consumption is to be reduced to 25 per cent of 1986 levels by 1 June 1994, with a complete phase-out by 1 January 1996.[194] Each party is also to reduce calculated levels of production of Annex A substances by the same amounts and by the same dates, except that for each amount the level may be increased by up to 10 per cent based on the 1986 level, provided that such increase is only to satisfy the 'basic domestic needs' of developing country parties operating under Article 5.[195] The 1999 limit of production may be increased, in the same circumstances, by an amount equal to the average annual production for basic domestic needs for the period 1995–7 unless the parties decide otherwise.[196]

The 1999 Amendments introduced new reductions for production for basic domestic needs by Article 5 parties. These parties are required to phase out production of Group I, Annex A CFCs by 1 January 2010, with intermediate reductions of 20 per cent by 2003, 50 per cent by 2005 and 85 per cent by 2007, based on their average annual production for basic domestic needs for the period 1995–7.[197]

Halons For the halons listed in Group II of Annex A, each party was required to freeze its calculated level of consumption at 1986 levels by 1 January 1992, with a complete phase-out by 1 January 1994.[198] Thereafter, production was to be limited to 1986 levels, with a 15 per cent permitted increase until 1 January 2002 to satisfy the 'basic domestic needs' of parties operating under Article 5.[199] Since 1 January 2002, developing country parties operating under Article 5 are required to phase out production for basic domestic needs by 1 January 2010, with a 50 per cent reduction by 1 January 2005, based on a 1995–7 baseline.[200]

Additional CFCs Under the 1990 Amendments, a new Article 2C required each party to ensure that its calculated levels of consumption and production of controlled substances in Annex B, Group I (additional CFCs) for the twelve-month period commencing 1 January 1993 and each twelve-month period thereafter did not exceed 80 per cent of consumption and production levels of those substances in 1989.[201] Annual consumption and production of these controlled substances was not to exceed 25 per cent of 1989 levels in the twelve-month period commencing 1 January 1994 and in each twelve-month period

[193] *Ibid.*, Art. 2A(3). [194] *Ibid.*, Art. 2A(3) and (4). [195] *Ibid.*, Art. 2A(3).
[196] *Ibid.*, Art. 2A(4). [197] *Ibid.*, Art. 2A(5)–(8). [198] *Ibid.*, Art. 2B(1) and (2).
[199] *Ibid.*, Art. 2(2). [200] *Ibid.*, Art. 2B(3) and (4). [201] 1990 Amendment, Art. 2C(1).

thereafter, and the consumption and production of these additional CFCs were totally prohibited as from 1 January 1996.[202]

Carbon tetrachloride Under the 1990 Amendments, each party's calculated annual levels of consumption and production of Annex B, Group II controlled substances (carbon tetrachloride) for the twelve-month period commencing 1 January 1995 and each twelve-month period thereafter must not exceed 15 per cent of 1989 levels for those substances,[203] and the production and consumption of carbon tetrachloride are totally prohibited as from 1 January 1996.[204]

Methylchloroform Under the 1990 Amendments, each party's calculated annual levels of consumption and production of Annex B, Group III controlled substances (methylchloroform) for the twelve-month period commencing 1 January 1993 and each twelve-month period thereafter was not to exceed its consumption and production levels of those substances in 1989.[205] Thereafter, consumption and production were to be reduced to 50 per cent of 1989 levels by 1 January 1994 and in each twelve-month period thereafter, with a total prohibition on the consumption and production of methylchloroform as from 1 January 1996.[206]

HCFCs, hydrobromofluorocarbons and methyl bromide The 1992 Amendments added three new Articles to the Montreal Protocol to phase out the use of the three controlled substances listed in Annex C of the Protocol. Article 2F was introduced to require parties to limit their annual consumption of Annex C, Group I substances (HCFCs) to no more than 3.1 per cent[207] of their level of consumption of Annex A, Group I substances in 1989 *and* their total level of consumption of Annex C, Group I substances in 1989.[208] Article 2F then

[202] *Ibid.*, Art. 2C(1), (2) and (3). In order to satisfy 'basic domestic needs' a party operating under Art. 5(1) may exceed that level of production by 15 per cent of its 1989 levels up to 1 January 2003. By 1 January 2003, production for basic domestic needs is to be reduced by 20 per cent, with a cut of 85 per cent by 1 January 2007 before a total phase-out by 1 January 2010; *ibid.*, Art. 2C(3)–(5).

[203] 1990 Amendments, Art. 2D(1).

[204] 1992 Amendments, Art. 2D(1) and (2). In order to satisfy 'basic domestic needs' a party operating under Art. 5(1) may exceed that level of production by 15 per cent of its 1998–2000 levels until 1 January 2005 but must achieve a phase-out by 2010; *ibid.*, Arts. 2D(2) and 5(8*bis*).

[205] 1990 Amendments, Art. 2E(1).

[206] *Ibid.*, Art. 2E(1)–(4). Parties operating under Art. 5(1) are required to freeze production for 'basic domestic needs' at 1998–2000 levels by 1 January 2003. Reductions in production must be achieved by 2005 (30 per cent) and 2010 (70 per cent) with a total phase-out by 1 January 2015; *ibid.*, Arts. 2E(3) and 5 (8*bis*).

[207] This level was changed to 2.8 per cent by the 1995 Amendments.

[208] 1992 Amendments, Art. 2F(1).

requires a gradual thirty-five-year phase-out of consumption of HCFCs to levels of 65 per cent (1 January 2004), 35 per cent (1 January 2010), 10 per cent (1 January 2015), 0.5 per cent (1 January 2020) and zero (1 January 2030).[209] Article 2F also commits parties to 'endeavour' to ensure that the use of HCFCs is limited to applications where alternatives are not available, that such use is not outside the areas of application currently met by substances in Annexes A, B and C (except in some cases for the protection of human life and/or human health), and that they are used in a manner that minimises ozone depletion.[210]

Amendments to Article 2F agreed in the 1999 Amendments commit the parties to new control measures for the production of HCFCs. Developed countries are required to limit their annual production of HCFCs to a level calculated as an average of (1) the sum in 1989 of HCFC consumption and 2.8 per cent of the level of consumption of Annex A, Group I substances *and* (2) the sum in 1989 of HCFC production and 2.8 per cent of the level of consumption of Annex A, Group I substances. Developing countries will be subject to a freeze on HCFC production starting in 2016 based on average production and consumption in 2015.

Article 2G introduced a prohibition on the consumption of Annex C, Group II substances (hydrobromofluorocarbons) after 1 January 1996, except for 'essential uses'.

Article 2H was introduced to limit the annual production and consumption of Annex E substances (methyl bromide) to 1991 levels from 1995. A new phase-out programme for methyl bromide was introduced by the 1997 Amendments. Parties are required gradually to reduce the production and consumption of methyl bromide from 1991 levels by 25 per cent (1 January 1999), 50 per cent (1 January 2001), 70 per cent (1 January 2003) and 100 per cent (1 January 2005). Developing county parties operating under Article 5 must freeze production of methyl bromide for basic domestic needs at 1995–8 levels by 1 January 2002, with a total phase-out by 2015.

Transfer of production The 1987 Montreal Protocol also provides for transfer of production and the rules regarding facilities under construction. For the purpose of industrial rationalisation, Article 2(5) sets out the conditions under which parties whose 1986 production level of Annex A, Group I substances was less than 25 kilotonnes could transfer to or receive from any other party production which exceeded the limits in Article 2(1), (3) and (4). The 1992 Amendments introduced a new Article 2(5)*bis* allowing any party not operating under Article 5(1) to transfer to another such party any portion of its calculated level of consumption set out in Article 2F provided that certain conditions are fulfilled. Article 2(6) allows a party not operating under Article 5 to complete facilities for production under construction or contracted for prior

[209] *Ibid.*, Art. 2F(2)–(6). [210] *Ibid.*, Art. 2F(7).

to 16 September 1987, provided that facilities are completed by 31 December 1990 and the party's level of consumption remains below 0.5 kilograms per capita.

By Article 2(8) of the 1987 Montreal Protocol, parties which are member states of a regional economic integration organisation (such as the EC) may 'jointly fulfil' their obligations provided that their total combined level of consumption does not exceed levels set by the Protocol, and that certain procedural obligations are fulfilled (the parties to any such agreement must inform the Secretariat and all member states of the regional organisation, and the organisation itself).

Control measures: trade in controlled substances

Article 4 of the 1987 Montreal Protocol established innovative trade provisions to achieve its environmental objectives. Although initially somewhat controversial, they are now widely recognised for their effectiveness in creating incentives for states to become party to the Protocol. These measures address: the trade in controlled substances by parties with states which are not parties to the Protocol; the trade in products containing controlled substances; and the trade in products produced with but not containing controlled substances. Article 4 represents the first occasion on which the international community adopted trade measures for environmental protection outside the field of flora and fauna, although the trade prohibition will not apply to a non-party which is found by the parties to be in full compliance with Articles 2, 2A to 2I, 4 and 7 of the Protocol.[211] Imports of controlled substances from non-parties are banned, and from 1 January 1993 developing country parties were prohibited from exporting to non-parties.[212] Article 4(3) provides for the ban on imports of certain products containing controlled substances into certain parties from non-party states. Parties are also required to determine the feasibility of banning or restricting imports of products produced with, but not containing, controlled substances, and if feasible adopt the necessary bans or restrictions.[213]

The 1987 Montreal Protocol also requires parties to discourage exports of technology for producing and using controlled substances,[214] and to refrain from providing new subsidies, aid, credits, guarantees or insurance for the export to non-party states of products, equipment, plants or technology which would facilitate the production of controlled substances.[215] Exceptions are allowed for products, equipment, plants or technology that improve containment, recovery, recycling or destruction of controlled substances, promote the development of alternative substances, or otherwise contribute to reductions of controlled substances.[216]

[211] 1987 Montreal Protocol, Art. 4(8). [212] *Ibid.*, Art. 4(2). [213] *Ibid.*, Art. 4(4).
[214] *Ibid.*, Art. 4(5). [215] *Ibid.*, Art. 4(6). [216] *Ibid.*, Art. 4(7).

The 1990 Amendments introduced significant changes to Article 4 of the Protocol. The import of controlled substances in Annex A from any state not party to the Protocol was banned from 1 January 1990, and those in Annex B from any state not party to the Protocol[217] within one year of the date of entry into force of amended Article 4.[218] The 1992 Amendments introduced a ban on the import of Group II, Annex C substances from non-parties within one year of the entry into force of the Amendments.[219] The 1997 Amendments introduced a ban on the import of Annex E substances from non-parties within one year of the entry into force of the Amendments.[220] Exports to non-parties of Annex A substances are banned from 1 January 1993, and of Annex B substances commencing one year after entry into force of the Amendments.[221] The 1992 Amendments introduced a ban on the export of Annex C, Group II substances to non-parties within one year of the entry into force of the Amendments.[222]

The 1997 Amendments introduced a ban on the export of Annex E substances to non-parties within one year of the entry into force of the Amendments.[223] New timetables were also established for bans of imports from non-parties of products containing controlled substances in Annexes A and B, and for determining the feasibility of banning or restricting imports from non-parties of products produced with, but not containing, controlled substances in Annexes A and B.[224] The 1992 Amendments introduced provisions for banning the import of products containing Annex C, Group II substances, and to determine the feasibility of banning the import of products produced with but not containing Annex C, Group II substances.[225] The 1997 Amendments required parties, by February 2000, to implement a system for licensing the import and export of new, used, recycled and reclaimed controlled substances.[226] Parties are also required, 'to the fullest practicable extent', to discourage exports to non-parties of technology for producing and utilising controlled substances.[227]

[217] Such a state includes 'a state or regional economic integration organization that has not agreed to be bound by the control measures in effect for that substance': *ibid.*, Art. 4(9) of the 1990 Amendments.

[218] 1990 Amendments, Art. 4(1) and (1*bis*). [219] 1992 Amendments, Art. 4(1*ter*).

[220] 1997 Amendments, Art. 4(1*qua*). As of 1 January 2004, parties will be required to ban the import of Group I, Annex C controlled substances from non-parties: Art. 4(1*quin*). Within one year of the entry into force of the 1999 Amendment, parties will be required to ban the import of bromochloromethane from non-parties: Art. 4(1*sex*).

[221] 1990 Amendments, Art. 4(2) and (2*bis*). [222] 1992 Amendments, Art. 4(2*ter*).

[223] 1997 Amendments, Art. 4(2*qua*). As of 1 January 2004, parties will be required to ban the export of Group I, Annex C controlled substances to non-parties: Art. 4(2*quin*). Within one year of the entry into force of the 1999 Amendments, parties will be required to ban the export of bromochloromethane to non-parties: Art. 4(2*sex*).

[224] 1990 Amendments, Art. 4(3), (3*bis*), (4) and (4*bis*).

[225] 1992 Amendments, Art. 4(3*ter*) and (4*ter*). [226] 1997 Amendments, Art. 4B.

[227] 1990 Amendments, Art. 4(5). The 1992 Amendment extended this provision only to Annexes A and B and Group II of Annex C substances: 1992 Amendments, Art. 4(5).

Developing countries

The 1987 Montreal Protocol included provisions to take account of the special needs of developing countries, including large users of CFCs such as India and China, who were unwilling to become parties to the Protocol because of the economic and developmental implications of the Protocol. Article 5(1) of the Protocol allowed developing country parties whose calculated level of consumption was less than 0.3 kilograms per capita a grace period of ten years beyond the dates set for phase-out in Article 2(1) to (4) of the Protocol. In addition, but without specifying how it was to be achieved, the parties agreed to facilitate access to 'environmentally safe alternative substances' and to provide developing countries with subsidies, aid, credits, guarantees or insurance programmes for alternative and substitute products.[228]

The original provisions of the Montreal Protocol were insufficiently attractive to encourage the participation of many developing countries, and further incentives were adopted by the 1990 Amendments. These developed the rules concerning the special situation of developing countries by replacing Article 5 in full and establishing, under a new Article 10, a mechanism to provide financial resources. The amended Article 5 created an incentive for developing countries to become parties to the Protocol before 1 January 1999 by fixing that date as the final point at which states would be able to benefit from the commencement of the ten-year period of delay for compliance with the control measures in Articles 2A to 2E as amended.[229] Significantly, Article 5(5) of the 1990 Amendments recognised that the capacity of developing country parties to fulfil their obligations and their implementation would depend upon 'the effective implementation of the financial co-operation as provided by Article 10 and transfer of technology as provided by Article 10A'. This marked the first time that an international environmental agreement linked implementation to the receipt of financial resources and the transfer of technology. The 1992 Amendments created the possibility that the period of grace would also apply to the 1992 Amendments substances after the 1995 review required under Article 5(8) of the 1990 Amendments.[230] The 1992 Amendments also introduced a new Article 5(1*bis*) requiring the parties to decide by 1 January 1996 on phase-out and/or consumption and production timetable for Annex C, Groups I and II, and Annex E substances for parties operating under Article 5(1). Other changes provided by the new Article 5 include limiting parties operating under Article 5(1) to those with annual levels of consumption of 0.2 kilograms per capita of Annex B substances and providing for the situation in which a party operating under Article 5(1) finds itself unable to obtain an adequate supply of controlled substances or unable to implement any or all of its obligations in

[228] 1987 Montreal Protocol, Art. 5(2) and (3).
[229] 1990 Amendments, Art. 5(1). [230] 1992 Amendments, Art. 5(1).

Articles 2A or 2E due to the inadequate implementation of the new provisions on financial co-operation and transfer of technology.[231] The really significant change, however, was the amendment to Article 10, which set a precedent followed in subsequent agreements addressing global environmental problems.

Technical, financial and other assistance

The original Article 10 of the Montreal Protocol contained rather innocuous and traditional environmental treaty provisions on technical assistance, particularly for developing countries, to facilitate participation in and implementation of the Protocol, including through the preparation of workplans. The 1990 Amendments introduced a radical and innovative change which has had profound consequences on the negotiation of subsequent global environmental treaties, particularly the Climate Change and Biodiversity Conventions. The innovation was to introduce financial incentives, almost of a compensatory nature, to entice hesitant developing countries to join the Montreal Protocol regime.

The new Article 10 established a 'Financial Mechanism' to provide financial and technical co-operation, including the transfer of technologies, to parties operating under Article 5(1) of the Protocol to enable their compliance with Articles 2A to 2E of the amended Protocol.[232] The mechanism, which is to meet 'all agreed incremental costs' of such parties, includes a Multilateral Fund to meet, on a grant or concessional basis, the agreed incremental costs; to finance certain clearing house functions related to, *inter alia*, identifying needs for and facilitating co-operation; and to finance the secretariat services of the Fund.[233] The Fund operates under the authority of the parties, who decide on its overall policies, and is operated by an Executive Committee which discharges its tasks and responsibilities with the co-operation of the World Bank, UNEP, UNDP and (more latterly) UNIDO.[234] The Multilateral Fund is financed by contributions from parties not operating under Article 5(1) on the basis of the UN scale of

[231] 1990 Amendments, Art. 5(2), (4) and (6).

[232] 1990 Amendments, Art. 10(1); for further details, see chapter 20, pp. 1031–2 below. The 1992 Amendments extend the application of the Financial Mechanism to control measures under Arts. 2F to 2H that are decided pursuant to Art. 5(1*bis*) of the 1992 Amendments. Since the establishment of the Multilateral Fund in 1990, the Executive Committee has approved the expenditure of more than US$1.2 billion, to support over 3,850 projects and activities in 124 developing countries (see www.unmfs.org/general.htm).

[233] 1990 Amendment, Art. 10(2) and (3); see Annex VIII of the Report of the Fourth Meeting of the Parties to the Montreal Protocol for an 'Indicative List of Categories of Incremental Cost', UNEP/OzL.Pro.4/15, 25 November 1992.

[234] 1990 Amendments, Art. 10(4) and (5); on financial resources, see chapter 20, pp. 1021–37 below.

assessments, in convertible currency, in kind, and/or in national currencies.[235] The Protocol as amended in 1990 also allows bilateral and regional co-operation in financing in certain specified circumstances.[236] Resources are to be disbursed with the concurrence of the beneficiary party.[237] Under Article 10A, introduced by the 1990 Amendments, each party agrees to take every practicable step to ensure that the best available environmentally safe substitutes and technologies are expeditiously transferred, under fair and most favourable conditions, to parties operating under Article 5(1).

Reporting

The principal technique for ensuring compliance with the Protocol and its amendments, apart from the non-compliance procedure and trade sanctions, are the reporting requirements, which are more detailed than most environmental treaties.[238] Article 7 requires all parties to report data on production, imports and exports of each controlled substance for 1986 and for the year during which it became a party and each year thereafter. Article 9 provides for research, development, public awareness and exchange of information. The 1990 Amendments introduced changes to Article 7 concerning the provision of data on production, imports and exports of controlled substances in Annexes A and B and Group 1 of Annex C, and separate data on amounts used for feedstocks, amounts destroyed by approved technologies, and imports and exports to parties and non-parties.[239]

Institutional arrangements

The Protocol is operated under the auspices of regular meetings of the parties whose functions include: reviewing implementation of the Protocol; deciding on any adjustments or reductions under Article 2(9) and on the addition or removal of substances from any Annex under Article 2(10); assessing the Article 2 control measures; and considering and adopting proposals for amendment of the Protocol or any Annex and for any new Annex.[240] Fourteen meetings of the parties have been held to date. At their first meeting, the parties approved procedures and mechanisms for determining non-compliance and the consequences

[235] 1990 Amendments, Art. 10(6). The Fund has been replenished four times: US$240 million (1991–3), US$455 million (1994–6), US$466 million (1997–9) and US$440 million (2000–2). As at 20 July 2001, the contributions made to the Multilateral Fund by some thirty-two industrialised countries amounted to US$1.3 billion.

[236] *Ibid.* [237] *Ibid.*, Art. 10(8).

[238] On the Implementation Committee and the Non-Compliance Procedure established by the Meeting of the Parties of the Montreal Protocol, see chapter 5, pp. 205–7 above.

[239] Art. 7(1), (2) and (3) of the 1990 Amended Montreal Protocol. See also Art. 7(2) and (3) as amended by 1992 Amendments; Art. 7(3*bis*) of the 1992 Amendments introduces a reporting requirement on imports and exports of certain substances that have been recycled.

[240] 1987 Montreal Protocol, Art. 11(1) and (3).

thereof.[241] The Protocol also establishes specific tasks for the Secretariat, which is provided by UNEP.[242]

Climate change

V. Nanda (ed.), *World Climate Change: The Role of International Law and Institutions* (1983); C. Tickell, *Climatic Change and World Affairs* (1986); M. Grubb, *The Greenhouse Effect: Negotiating Targets* (1989); R. Benedick, 'The Montreal Ozone Treaty: Implications for Global Warming', 5 *American University Journal of International Law and Policy* 217 (1990); D. Zaelke and J. Cameron, 'Global Warming and Climate Change: An Overview of International Legal Process', 5 *American University Journal of International Law and Policy* 248 (1990); C. Stone, 'The Global Warming Crisis, If There Is One, and the Law', 5 *American University Journal of International Law and Policy* 497 (1990); US National Academy of Sciences, *Policy Implications of Greenhouse Warming* (1991); R. Benedick, A. Chayes *et al.*, *Greenhouse Warming: Negotiating a Global Regime* (1991); D. Caron, 'When Law Makes Climate Change Worse: Rethinking the Law of Baselines in Light of a Rising Sea Level', 17 *Ecology Law Quarterly* 621 (1991); R. Churchill and D. Freestone (eds.), *International Law and Global Climate Change* (1991); T. Iwama (ed.), *Policies and Laws on Global Warming: International and Comparative Analysis* (1991); P. Roderick, 'A Charter for Global Warming', 1 RECIEL 158 (1992); P. Sands, 'The United Nations Framework Convention on Climate Change', 1 RECIEL 270 (1992); C. Stone, 'Beyond Rio: "Insuring" Against Global Warming', 86 AJIL 445 (1992); E. Barratt-Brown *et al.*, 'A Forum for Action on Global Warming: The UN Framework Convention on Climate Change', 4 *Colorado Journal of International Law and Policy* 103 (1993); D. Bodansky, 'The United Nations Framework Climate Change Convention: A Commentary', 18 *Yale Journal of International Law* 451 (1993); I. Mintzer and J. Leonard (eds.), *Negotiating Climate Change: The Inside Story of the Rio Convention* (1994); L. Boisson de Chazournes, 'De Kyoto à la Haye, en passant par Buenos Aires et Bonn: La régulation de l'effet de serre aux forceps', AFDI 709 (2000); Symposium on Climate Change, 11 RECIEL (2002)
Website: http://unfccc.int.

Introduction

The earth's climate is determined in large part by the presence in the atmosphere of naturally occurring greenhouse gases, including in particular water vapour, carbon dioxide (CO_2), methane (CH_4), CFCs, nitrous oxide (N_2O) and tropospheric ozone (O_3). These are transparent to incoming shortwave solar radiation but absorb and trap longwave radiation emitted by the earth's surface. Their presence exerts a warming influence on the earth. Scientific evidence

[241] *Ibid.*, Art. 8; see chapter 5, pp. 205–7 above. [242] *Ibid.*, Art.

suggests that continued increases in atmospheric concentrations of selected greenhouse gases due to human activities will lead to an enhanced 'greenhouse effect' and global climatic change.[243] Carbon dioxide from emissions from the combustion of fossil fuels, the production of cement, and agricultural and other land use (including deforestation) is widely considered to be the most significant contribution to the threat of climate change, but global emissions of CFC-11 and 12, methane and nitrous oxide also pose a significant threat. In 1988, UNEP and the WMO established the Intergovernmental Panel on Climate Change (IPCC) to provide the scientific guidance necessary to take further action. The first IPCC report, published in August 1990, predicted that, on a 'business-as-usual' emissions scenario, global mean temperatures could rise by an average rate of about 0.3°C per decade (with an uncertainty range of 0.2–0.5°C) during the next century.[244] This could lead to an increase in global mean temperature of about 2°C above that occurring in pre-industrial times by the year 2025, and about 4°C by 2100. Such a rate of increase would be expected to lead to increased global average of rainfall by a few per cent by 2030, to diminution of areas of sea ice and snow cover, and to a rise in global mean sea level of 20 cm by 2030 and 65 cm by the end of the next century.[245] In February 1992, the IPCC produced its second report, which concluded that findings of scientific research since 1990 did not affect the Working Group's understanding of the science of the greenhouse effect and either confirmed or did not justify altering the major conclusions of the 1990 report.[246] In its latest report, published in 2001, the IPCC predicted that anthropogenic warming is likely to lie in the range of 0.1–0.2°C per decade over the next few decades, leading to a likelihood of increased precipitation and a greater risk of extreme weather conditions such as floods and droughts.[247] The environmental, economic and social consequences of such rates of warming are described by the IPCC Working Group on Impacts.

The negotiation of a treaty to address climate change and its effects was formally set in motion by the UN General Assembly and the specialised agencies. In 1988 and 1989, the General Assembly determined that 'climate change is a common concern of mankind' and urged governments and intergovernmental

[243] See IPCC, WG I, 'Climate Change 2001: The Scientific Basis', *in Third Assessment Report: Climate Change 2001* (2001); see also Hadley Centre for Climate Change, *Climate Change: An Update of Recent Research* (2000). The 1992 Climate Change Convention defines 'greenhouse gases' as 'those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infra-red radiation': Art. 1(5).

[244] IPCC, *Climate Change: The IPCC Scientific Assessment* (1990).

[245] The 'business-as-usual' scenario assumed a continued reliance on coal and oil, modest improvements in energy efficiency, limited controls on emissions of carbon dioxide, continued deforestation, uncontrolled emissions of methane and nitrous oxide from agricultural sources, and a reduction of CFCs in line with the 1987 Montreal Protocol.

[246] IPCC, *1992 Supplement* (1992), Section II, para. 2.

[247] IPCC, WG I, 'Climate Change 2001: The Scientific Basis', *in Third Assessment Report: Climate Change 2001* (2001).

and non-governmental organisations to collaborate in a concerted effort to prepare, as a matter of urgency, a framework convention on climate change.[248] The political process leading to the negotiation of a legal instrument was given further impetus by the 1990 Ministerial Declaration of the Second World Climate Conference,[249] which called for negotiations on an effective framework convention on climate change containing appropriate commitments to begin without delay. In December 1990, the UN General Assembly established a single intergovernmental negotiating process under the auspices of the General Assembly, supported by UNEP and WMO, for the preparation by an Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (INC/FCCC).[250] The INC/FCCC held five sessions and the Convention was adopted at the close of the resumed fifth session in May 1992. The UN Framework Convention on Climate Change (1992 Climate Change Convention) was signed by 155 states and the EC in June 1992 at UNCED and comprises a package which contains elements for almost all the negotiating states but left none entirely satisfied.[251] It reflected a compromise between those states which were seeking specific targets and timetables for emissions reductions, and those which wanted only a 'bare-bone' skeleton Convention which could serve as the basis for future Protocols, like the 1985 Vienna Convention. In 1997, the Kyoto Protocol was adopted, establishing more detailed commitments for developed parties.

The Convention went beyond the scope of the 1985 Vienna Convention, which took nearly three times as long to negotiate among a smaller group of states. The word 'Framework' in the title is something of a misnomer, since the 1992 Convention established:

1. commitments to stabilise greenhouse gas concentrations in the atmosphere at a safe level, over the long term, and to limit emissions of greenhouse gases by developed countries in accordance with soft targets and timetables;
2. a financial mechanism and a commitment by certain developed country parties to provide financial resources for meeting certain incremental costs and adaptation measures;
3. two subsidiary bodies to the conference of the parties;
4. a number of important guiding 'Principles'; and
5. potentially innovative implementation and dispute settlement mechanisms.

The Convention was the first international environmental agreement to be negotiated by virtually the whole of the international community, with 143 states participating in the final session of the INC/FCCC, and is potentially unique in the scope of its direct and indirect consequences: it is difficult to

[248] UNGA Res. 43/53 (1988); UNGA Res. 44/207 (1989).
[249] UN Doc. A/45/696/Add.1, Annex III (1990). [250] UNGA Res. 45/221 (1990).
[251] New York, 9 May 1992, in force 24 March 1994, 31 ILM 849 (1992), Art. 23(1). The Convention attracted twenty-six ratifications within a year of its adoption, and by June 2001 186 states were parties.

identify any type of human activity which will, over time, fall outside its scope. Affecting the vital economic interests of almost all states, it attempted to adopt a comprehensive approach to integrating environmental considerations into economic development and defined, in legal terms, rights and obligations of different members of the international community in the quest for 'sustainable development' and the protection of the global climate.

The relationship between the Climate Change Convention and vital national economic, social and environmental interests was evident from the different interest groups of states which emerged during the negotiation. On the key issues, the 'Commitments' section, this was not simply a North–South negotiation, as was clear from the failure of both the OECD and the Group of 77 countries to reach common positions. Developed countries were far from united, with the United States alone in publicly opposing the adoption of specific targets and timetables and seeking to ensure a 'comprehensive' approach which dealt with all greenhouse gas emissions, not just carbon dioxide. The economic implications of the Convention played a significant role in defining country positions, with Germany and Japan at the forefront of those developed countries viewing the Convention also as an instrument for gaining longer term competitive advantage by requiring the further development, production, use and dissemination of innovative new technologies. The differing economic capacities of developed countries, and in particular the problems faced by the former socialist countries of central and eastern Europe, led to a novel distinction being drawn in the Convention: for the purposes of differentiating those specific commitments relating to sources and sinks,[252] and those relating to finance, a distinction was drawn between all developed country parties and developed parties (included in Annex I)[253] and those developed country parties and developed parties not 'undergoing the process of transition to a market economy' (listed in Annex II).[254] Developing countries were also divided. The oil producing countries, led by Saudi Arabia, strongly opposed any substantive obligations in the Convention, and plainly would not have been unhappy to see

[252] Under the Convention, a 'source' is 'any process or activity which releases a greenhouse gas, aerosol or precursor of a greenhouse gas into the atmosphere': Art. 1(9); a 'sink' is 'any process, activity or mechanisms which removes a greenhouse gas or a precursor of a greenhouse gas from the atmosphere': Art. 1(8).

[253] Annex I lists all the OECD countries and the EC (for which the term 'developed party' was used, apparently for the first time in international law), as listed in Annex II, plus eleven former socialist countries: Belarus, Bulgaria, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia and Ukraine. Albania, Yugoslavia and certain members of the Commonwealth of Independent States appear in neither Annex and must therefore be deemed to be developing countries within the meaning of the Convention.

[254] Annex II lists all OECD member countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States) and the EC. Decision 26 at the seventh conference of the parties (2001) removed Turkey from Annex II.

the negotiations fail altogether. The large industrialising developing countries, such as India and China, were understandably concerned to ensure that their economic development, including use of large coal reserves, should not in any way be limited. Developing countries with extensive forests, such as Brazil and Malaysia, were concerned to ensure that the primary emphasis of the Convention should be on limiting developed country emissions and not on protecting or enhancing developing countries' sinks (forests). And developing countries particularly vulnerable to the effects of climate change, such as the forty-two member Alliance of Small Island States (AOSIS), sought a Convention with strong and enforceable commitments and an emphasis on the adverse effects of climate change. The fragmentation of countries into special interest groups created alliances between unlikely partners. On specific commitments relating to emissions, the interests of the US, Saudi Arabia and China were broadly similar, as were those of the EC and EFTA countries and AOSIS and certain African countries suffering from drought and desertification at the other end of the spectrum. It is in the context of these complex economic and environmental interests that the emergence of a package Convention must be understood.

Preamble, definition, objective and principles

The Convention's Preamble reflects a wide range of interests. It includes matters jettisoned from the 'Principles', and expressly recognises, *inter alia*, 'the principle of sovereignty', that the largest share of historical and current global emissions has originated in developed countries, and includes (for the first time in a treaty) Principle 2 of the Rio Declaration (rather than Principle 21 of the Stockholm Declaration). The Preamble also refers to the concepts of 'per capita emissions' and 'energy efficiency', matters which did not receive sufficient support to be included in the operational part of the Convention. Of note in the definitions Article is the omission of the concept of 'net emissions' (sources minus sinks, but no agreement was possible on whether to include natural sinks such as oceans), and a footnote to the first title ('Definitions', Article 1) which states that: 'Titles of articles are included solely to assist the reader.'[255]

The ultimate objective of the Climate Change Convention is to stabilise greenhouse gas concentrations in the atmosphere 'at a level that would prevent dangerous anthropogenic interference with the climate system', emphasising that prevention of climate change is the primary objective.[256] However, the Convention implicitly recognises that some climate change is inevitable, since the objective is to be achieved within a timeframe sufficient to allow

[255] On the possible legal consequences of this footnote, see chapter 6, p. 233 above

[256] Art. 2. The 'climate system' is defined as 'the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions': Art. 1(3); 'climate change' is 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods': Art. 1(2).

'ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner'.[257] Moreover, the Convention includes numerous references to the 'effects' and 'adverse effects' of climate change (twenty-two times), and to 'vulnerability' and 'impacts' (seven times), suggesting that it also has the additional, but unstated, objective of establishing an instrument to address the adverse effects of climate change and ensure that countries, particularly those most vulnerable, are able to prepare adequately for adaptation to the adverse effects of climate change.[258]

Article 3 of the Convention sets out a number of 'Principles' to guide the parties in achieving the objective and implementing the provisions. The obligation of parties to protect the climate system is 'on the basis of equity' and 'in accordance with their common but differentiated responsibilities and respective capabilities', in accordance with which developed country parties should take the lead.[259] Parties should adopt measures and policies which are 'precautionary', 'cost-effective' and 'comprehensive', and which take into account different 'socio-economic contexts'.[260] Climate change policies should also be integrated with national development programmes, and measures to combat climate change 'should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.[261] Finally, throughout the 'Principles' section, and elsewhere in the Convention, reference is made to the need to ensure 'sustainable economic growth' in order to address the problems of climate change.

General commitments

To achieve the objectives of the Convention, all parties are committed under Article 4(1) to take certain measures, taking into account their common but differentiated responsibilities and priorities, objectives and circumstances. These general commitments include the development of national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol,[262] and the formulation and implementation of national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing emissions and removals of these gases and by facilitation of adequate adaptation to climate change.[263] All parties are required: to promote, and co-operate in the diffusion of, technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol;

[257] *Ibid.*

[258] 'Adverse effects of climate change' means 'changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare': Art. 1(1).

[259] Art. 3(1). [260] Art. 3(3). [261] Art. 3(5). [262] Art. 4(1)(a). [263] Art. 4(1)(b).

to promote sustainable management, conservation and enhancement of sinks and reservoirs of these greenhouse gases; and to co-operate in preparing for adaptation to the impacts of climate change.[264] All parties are also required to take climate change into account, to the extent feasible, in their social, economic and environmental policies; to promote and co-operate in research, systematic observation and development of data archives to the further understanding of climate change and response strategies; to promote and co-operate in full, open and prompt exchange of relevant information, and to promote and co-operate in education, training and public awareness.[265]

Reporting

The Convention establishes broad reporting requirements for the communication of certain information, with specific provision for financial resources to be made available to developed country parties. All parties are required to communicate, to the conference of the parties: information on implementation; a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol; a general description of steps taken or envisaged to implement the Convention; and any other relevant information including that relevant for calculating global emission trends.[266] The effective implementation by developing country parties of their communication commitments is linked to the effective implementation by developed country parties of their financial commitments, including the need for adequacy and predictability in the flow of funds.[267] Annex I parties are to include information relating to measures and policies to fulfil commitments under Article 4(2)(a) and (b), and a specific estimate of the effects those policies and measures would have on emissions and removals by the year 2000.[268] Annex II parties must include details of measures taken in accordance with Article 4(3), (4) and (5).[269]

Initial communications for each Annex I party were required within six months of the entry into force of the Convention for that party, and most have now reported three times. For all other parties, reports were to be made within three years of entry into force for that party, or upon the availability of financial resources under Article 4(3), and least-developed country parties could make their initial communications at their discretion, and the timetable for subsequent communications is set by the conference of the parties.[270] Article 12 also

[264] Art. 4(1)(c)–(e); a 'reservoir' is defined as 'a component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored': Art. 1(7).

[265] Art. 4(1)(f)–(i). [266] Arts. 4(1)(j) and 12(1). [267] Art. 4(3) and (7).

[268] Art. 12(2). [269] Art. 12(3).

[270] Art. 12(5). Decisions 9/CP.2 and 10/CP.2 of the second conference of the parties established guidelines, a schedule and process for consideration of communications from Annex I and non-Annex I parties (see Report of the Conference of the Parties on its Second Session, Geneva, 8–19 July 1996, FCCC/CP/1996/15/Add.1, 29 October 1996). The reporting

provides for joint communication by a group of parties, for the protection of confidential information, and for making communications public.[271]

Specific commitments: sources and sinks

At the heart of the Convention are the specific commitments relating to sources and sinks of greenhouse gases binding on all developed country parties and the EC under Article 4(2). The extent of these commitments is unclear as a result of the convoluted language agreed to by way of compromise between various OECD members, and the different interests in and between developed and developing countries. The relevant provisions of the opaque language of Article 4(2) provide:

> (a) Each [Annex I party] shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs. These policies and measures will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of this Convention, recognising that the return by the end of the present decade to earlier levels of anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol would contribute to such modification; and taking into account the differences in these parties' starting points and approaches, economic structures and resource bases, the need to maintain strong and sustainable economic growth, available technologies and other individual circumstances, as well as the need for equitable and appropriate contributions by each of these parties to the global effort regarding that objective. These parties may implement such policies and measures jointly with other parties and may assist other parties in contributing to the achievement of the Convention and, in particular, that of this sub-paragraph;
>
> (b) In order to promote progress to this end, each [Annex I party] shall communicate, within six months of the entry into force of the Convention for it and periodically thereafter, and in accordance with Article 12, detailed information on its policies and measures referred to in subparagraph (a) above, as well as on its resulting projected anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol for the period referred to in subparagraph (a), with the aim of returning individually or jointly to their 1990 levels of these anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol . . .

guidelines were substantially revised by the fifth conference of the parties (see Decisions 3/CP.5 and 4/CP.5, Report of the Conference of the Parties on its Fifth Session, Bonn, 25 October–5 November 1999, FCCC/CP/1999/6/Add.1, 17 January 2000). Most developing country parties have now reported at least once.

[271] Art. 12(8)–(10).

Even when read together, these two paragraphs do not reflect a clear commitment to stabilise carbon dioxide and other greenhouse gas emissions by the year 2000 at 1990 levels, as advocated by the EC and others during the negotiations. Article 4(2)(a) requires only the 'limitation' by each developed country party of its anthropogenic emissions of greenhouse gases, as opposed to stabilisation at a particular level or reduction. It also recognises, in an especially unattractive 117-word sentence, that the return to 'earlier levels' by the year 2000 'would' contribute to the modification of longer term trends in emissions consistent with the objective of the Convention. This is clearly something other than a provision requiring a mandatory return to a specified earlier level by a specified date. Also noteworthy is the absence of any express commitment to keep emissions no higher than 1990 levels after 2000 (although it is not readily apparent that increases or unchecked emissions after 2000 would be compatible with the Convention's object and purpose). Further, each party's contribution is dependent on a series of factors, including its economic structure, resource base, starting point, and approach, as well as the application of 'equity'. Article 4(2)(b) is perhaps a little less opaque. It requires information to be provided on projected anthropogenic emissions for the period up to 2000, and establishes only the 'aim' of returning to 1990 levels without providing a date by when such a return should be achieved. The most that can reasonably be said of these provisions is that they establish soft targets and timetables with many loopholes; the adequacy of Articles 4(2)(a) and (b) was reviewed at the first conference of the parties. The parties agreed 'to begin a process to enable [the conference of the parties] to take appropriate action for the period beyond 2000, including the strengthening of the commitments of the Parties included in Annex I to the Convention (Annex I Parties) in Article 4, paragraph 2(a) and (b), through the adoption of a protocol or another legal instrument'.[272] This process led to the adoption of a protocol to the Convention at the third conference of the parties in Kyoto in 1997. The Kyoto Protocol set quantified targets and a timetable for the reduction of greenhouse gas emissions by developed country parties.[273] The second review of adequacy mandated by Article 4(2)(d) remains subject to competing views as to whether the review extends to the commitments of developing countries or is limited to those of Annex I parties.

The Convention provides for 'joint implementation' by Annex I parties of their policies and measures, subject to further decisions to be taken by the conference of the parties regarding criteria for such 'joint implementation'.[274]

[272] In accordance with Art. 2(4)(d), a second review of the adequacy of Art. 4(2)(a) and (b) took place during the fourth conference of the parties at Buenos Aires in 1998. The parties failed to reach a decision on the review and subsequent consideration of the matter at the fifth and sixth conferences of the parties has similarly produced no agreed result.

[273] See the Decision 1/CP.3, Report of the Conference of the Parties on its Third Session, Kyoto, 1–11 December 1997, FCCC/CP/1997/7/Add.1.

[274] Art. 4(2)(a) and (d). At its first session, the conference of the parties launched a 'pilot phase of activities implemented jointly' (AIJ) (see Decision 5/CP.1, Report of the Conference of

This will provide the foundation for the efforts of those states which sought to ensure that emissions reductions should be carried out in the most 'cost-effective' way possible. The Convention additionally requires that 'a certain degree of flexibility' should be allowed to developed country parties 'undergoing the process of transition to a market economy'.[275] Parties are also to take into consideration in the implementation of commitments the situation of parties, particularly developing country parties, with economies vulnerable to the adverse effects of implementation of response measures.[276]

The calculation of emissions by sources and removal by sinks will take into account the best available scientific knowledge, pending agreement by the conference of the parties on common methodologies.[277] Each developed country party is also required to co-ordinate relevant economic and administrative instruments and identify and periodically review its own policies and practices which encourage activities that lead to greater levels of anthropogenic emissions.[278]

Commitments: financial resources and technology transfer

Annex II parties undertake specific financial commitments. They agree to provide 'new and additional' financial resources to meet the 'agreed full costs' incurred by developing country parties in fulfilling their commitment to communicate information relating to implementation (Article 12), and to provide such financial resources needed by developing country parties 'to meet the agreed full incremental costs of implementing measures' relating to their general commitments under Article 4(1) and which are agreed between the developing country party and the entity responsible for the financial mechanism.[279] Annex II parties also undertake to assist developing country parties that are 'particularly vulnerable to the adverse effects' of climate change in meeting the costs of adaptation to those adverse effects.[280] In what amounts to an implicit acceptance by developed country parties of responsibility for causing climate change, Article 4(4) may ultimately emerge as one of the more unusual, contentious, and perhaps costly, commitments in the Convention.

In the implementation of Article 4, the parties must give full consideration to the actions necessary to meet the specific needs and concerns of developing country parties arising from the adverse effects of climate change, and/or the

the Parties on its First Session, Berlin, 28 March–7 April 1995, FCCC/CP/1995/7/Add.1). Under the pilot phase, parties may implement projects that reduce greenhouse gas emissions, or enhance removals of greenhouse gases by 'sinks', in the territories of other parties, although no credits may accrue to any party for greenhouse gas emission reductions or removals.

[275] Art. 4(6). [276] Art. 4(10).

[277] Art. 4(2)(c). See also Decision 4/CP.1 on Methodological Issues, Report of the Conference of the Parties on its First Session, Berlin, 28 March–7 April 1995, FCCC/CP/1995/7/Add.1.

[278] Art. 4(2)(e). [279] Art. 4(3). [280] Art. 4(4).

impact of implementing response measures, including actions related to funding, insurance and the transfer of technology.[281] Certain categories of countries are identified, including small island countries, countries with low-lying coastal areas, countries with areas liable to drought and desertification, and countries whose economies are highly dependent on income generated from, or the consumption of, fossil fuels.

Annex II parties are required to take all practicable steps to promote, facilitate and finance the transfer of, or access to, environmentally sound technologies and know-how, and support the development of endogenous capacities and technologies of developing country parties.[282] In the short term, the financial mechanism is likely to devote a significant proportion of the available financial resources to technology transfer.

Institutional arrangements

The Climate Change Convention establishes a conference of the parties, a secretariat, two subsidiary bodies and a financial mechanism.[283] The conference of the parties is the supreme body of the Convention, entrusted with keeping the implementation of the Convention under regular review and making decisions to promote its effective implementation.[284] It met for the first time in 1995 and has subsequently met annually.[285] It has several functions, including:

- to examine periodically the obligations of the parties;
- to facilitate the co-ordination of measures;
- to promote and guide comparable methodologies for preparing inventories of greenhouse gas emissions;
- to assess the implementation of the Convention by all parties and the overall effect of measures; and
- to adopt regular reports on the implementation of the Convention.

A multidisciplinary Subsidiary Body for Scientific and Technological Advice was established to provide information on scientific and technological matters to the conference of the parties.[286] A Subsidiary Body for Implementation was established to assist the conference of the parties in the assessment and review of the implementation of the Convention.[287] Although some states wanted to limit participation, both subsidiary bodies are open to participation by all parties.

The Convention defines a financial mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology.[288] After specific commitments this was the most disputed aspect of the Convention. The mechanism functions under the guidance of, and is accountable to, the conference of the parties, which is responsible for its policies, programme priorities and eligibility criteria, and its operation was to

[281] Art. 4(8) and (9). [282] Art. 4(5). [283] Arts. 7 to 11.
[284] Art. 7(2). [285] Art. 7(4). [286] Art. 9(1). [287] Art. 10(1). [288] Art. 11(1).

be entrusted to one or more existing international entities.[289] The mechanism is required to have an equitable and balanced representation of all parties within a transparent system of governance. The Global Environment Facility (GEF) of the UNDP, UNEP and IBRD was initially entrusted with the operation of the financial mechanism on an interim basis, and, in 1996, the second conference of the parties adopted a memorandum of understanding with the GEF on their respective roles and responsibilities.[290] In 1998, the fourth conference of the parties entrusted the GEF with the operation of the financial mechanism on a long-term basis, subject to review every four years.[291]

Implementation and dispute settlement

Apart from the role of the conference of the parties and the Subsidiary Body for Implementation, the Convention provides for the possibility of establishing a 'multilateral consultative process' for the resolution of implementation questions, which will be available to parties on their request.[292] This whittles down two more ambitious original proposals. Additionally, a dispute settlement Article provides for possible compulsory recourse to arbitration or the International Court of Justice with the consent of the relevant parties to a dispute, as well as the possibility for the compulsory establishment of a conciliation commission, with the power to make a recommendatory award, at the request of one of the parties to a dispute twelve months after notification of the dispute.[293] The Convention provides for amendment, the adoption and amendment of Annexes, and the adoption of Protocols.[294] No reservations are permitted.[295] Prior to its entry into force, Article 21 of the Convention established interim arrangements concerning the designation of an interim secretariat, co-operation with the IPCC and other scientific bodies.[296]

The 1997 Kyoto Protocol

P. Davies, 'Global Warming and the Kyoto Protocol', 47 ICLQ 446 (1998); F. Yamin, 'The Kyoto Protocol', 7 RECIEL 113 (1998); D. French, '1997 Kyoto Protocol to the 1992 UN Framework on Climate Change', 10 JEL 227 (1998); M. Grubb, C. Vrolijk

[289] Art. 11(1)–(3).

[290] See Decision 13/CP.2, Memorandum of Understanding Between the Conference of the Parties and the Council of the Global Environment Facility, Report of the Conference of the Parties on its Second Session, Geneva, 8–19 July 1996, FCCC/CP/1996/15/Add.1.

[291] See Decision 3/CP.4, Report of the Conference of the Parties on its Fourth Session, Buenos Aires, 2–14 November 1998, FCCC/CP/1998/16/Add.1.

[292] Art. 13. [293] Art. 14. [294] Art. 24. [295] Art. 24.

[296] Art. 21(1) and (2). The Secretariat of the INC, established by UN General Assembly Resolution 45/212, acted as interim secretariat until the completion of the first session of the conference of the parties. UNGA Res. 47/195 of 22 December 1992 decided that the INC will continue to function in order to prepare for the first conference of the parties.

and D. Brack, *The Kyoto Protocol: A Guide and Assessment* (1999); S. Oberthur and H. Ott, *The Kyoto Protocol* (1999); F. Depledge, 'Tracing the Origins of the Kyoto Protocol: An Article by Article History', UN Doc. FCCC/TP/2000/2 (2000); K. Nowrot, 'Saving the International Legal Regime on Climate Change? The 2001 Conferences of Bonn and Marrakech', 44 *German Yearbook of International Law* 396 (2001).

The Kyoto Protocol to the Framework Convention on Climate Change was adopted by the third conference of the parties in December 1997.[297] Negotiations for a Protocol to the Convention commenced in 1995 after the first conference of the parties, meeting in Berlin, determined that the commitments provided for in Article 4(2)(a) and (b) of the Convention were 'not adequate' and decided to launch a process to strengthen the commitments of Annex I parties through the adoption of a protocol or another legal instrument.[298] The 'Berlin Mandate' was to

> [a]im, as the priority in the process of strengthening the commitments in Article 4.2(a) and (b) of the Convention, for developed country/other Parties included in Annex I, both to elaborate policies and measures, as well as to set quantified limitation and reduction objectives within specified timeframes, such as 2005, 2010 and 2020, for their anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.[299]

The process was not intended to introduce any new commitments for non-Annex I parties, but merely to 'reaffirm existing commitments in Article 4.1 and continue to advance the implementation of these commitments'.[300] Negotiations were to be conducted as a matter of urgency with a view to adopting the results at the third conference of the parties in 1997.[301] At the second conference of the parties at Geneva in 1996, a Ministerial Declaration was adopted by which Ministers urged their representatives to accelerate negotiations on a legally binding protocol or another legal instrument, and stated that:

> [the] outcome should fully encompass the remit of the Berlin Mandate, in particular:
>
> - commitments for Annex I Parties regarding:
>   - policies and measures including, as appropriate, regarding energy, transport, industry, agriculture, forestry, waste management, economic instruments, institutions and mechanisms;

[297] Kyoto, 10 December 1997, not yet in force; reprinted at 37 ILM 22 (1998).

[298] See Decision 1/CP.3, Report of the Conference of the Parties on its Third Session, Kyoto, 1–11 December 1997, FCCC/CP/1997/7/Add.1.

[299] Decision 1/CP.1, Report of the Conference of the Parties on its First Session, Berlin, 28 March–7 April 1995, FCCC/CP/1995/7/Add.1, para. 2(a).

[300] *Ibid.*, para. 2(b). [301] *Ibid.*, para. 6.

- quantified legally-binding objectives for emission limitations and significant overall reductions within specified timeframes, such as 2005, 2010, 2020, with respect to their anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol;

– commitments for all Parties on continuing to advance the implementation of existing commitments in Article 4.1.[302]

The Geneva Ministerial Declaration clarified the scope of the Berlin Mandate in the final push of preparatory meetings leading up to the third conference of the parties in 1997. The Kyoto Protocol was adopted at the third conference of the parties and opened for signature on 16 March 1998.

Given the economic and developmental implications, it is not surprising that the Kyoto Protocol negotiations were among the most difficult and complex ever conducted for a multilateral environmental agreement. Deep divisions between the parties emerged in relation to a range of key issues, such as emissions reduction targets, sinks, emissions trading, joint implementation and the treatment of developing countries. Although consensus was reached at Kyoto, subsequent negotiations on the detailed rules, guidelines and methodologies needed to implement the Protocol have proved equally contentious as the original negotiations for the Protocol. In early 2001, the future of the Protocol was thrown into doubt with the announcement by President George W. Bush that the United States (responsible for about a quarter of 1990 global greenhouse gas emissions) would not ratify the Protocol.[303] Nevertheless, at the resumed session of the sixth conference of the parties, held in Bonn in July 2001, the remaining states parties reached agreement on mechanisms for implementing commitments under the Protocol. The 'Bonn Agreements' were not drafted as a legal text, but, at a political level, reflected an important breakthrough on many of the critical negotiating issues, and a clear signal that the world community was prepared to go ahead with the Kyoto Protocol, even without United States support.[304] It remained for the political agreement in Bonn to be converted into a legal text, which was the task of the seventh conference of the parties held in November 2001. The parties were able to incorporate almost all of the deals made in Bonn into the legal text of the 'Marrakesh Accords', a series of decisions concerning the implementation of the Kyoto Protocol which pave the way for its entry into force.[305] With the announcement by Japan and Russia at

[302] Geneva Ministerial Declaration, Annex, Report of the Conference of the Parties on its Second Session, Geneva, 8–19 July 1996, FCCC/CP/1996/15/Add.1.

[303] See Transcript, Bush Press Conference at White House, 29 March 2001, available at http://usinfo.state.gov/topical/global/environ/climate/01032904.htm.

[304] 'The Bonn Agreements on the Implementation of the Buenos Aires Plan of Action', Decision 5/CP.6, Report of the Conference of the Parties on the Second Part of its Sixth Session, Bonn, 16–24 July 2001, FCCC/CP/2001/5, 36–49.

[305] See Report of the Conference of the Parties on its Seventh Session, Marrakesh, 29 October–10 November 2001, FCCC/CP/2001/13. The decisions of the seventh conference of the parties which make up the Accords are in four volumes: FCCC/CP/2001/13/Add.1–Add.4.

the WSSD in September 2002 that they would ratify the Protocol, its entry into force during 2003 or 2004 seemed likely.

Emissions reduction targets and timetable

The major achievement of the Kyoto Protocol was the commitment of Annex I parties to quantified emissions reduction targets and a timetable for their achievement. The basic obligation accepted by the Annex I parties is set out in Article 3(1). It provides that Annex I parties 'shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts'.[306] The 'assigned amounts' are calculated pursuant to each party's quantified emissions limitation and reduction commitment set out in Annex B. Annex I parties must implement their obligation under Article 3(1) 'with a view to reducing their overall emissions of [Annex A] gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012'. This is estimated to represent an actual reduction of about 30 per cent over 'business as usual' emissions levels.

By 2005, each Annex I party is required to 'have made demonstrable progress in achieving its commitments under [the] Protocol'.[307] The first commitment period commences in 2008 and continues until 2012. Annex I parties with economies in transition can use a base year other than 1990, calculated in accordance with Article 3(5). Commitments for subsequent periods will be established by amendments to Annex B adopted in accordance with the provisions of Article 21(7). The Meeting of the Parties to the Protocol is required to initiate reconsideration of the commitments in Annex B by 2005.[308] Banking of assigned amounts for future commitment periods is permitted as any Annex I party with emissions in a commitment period which are less than its assigned amount can request the difference be added to its assigned amount for subsequent commitment periods.[309]

The determination of emissions targets for the Annex I parties was a difficult issue. Annex B lists differentiated targets for individual countries and regional economic organisations. For example, the European Community and its member states agreed to an emissions limitation of 92 per cent of the 1990 base year, or an 8 per cent reduction in the first commitment period of 2008–12. The United States agreed to a 7 per cent reduction. Japan and Canada each accepted a 6 per cent reduction, while Australia and Iceland were permitted to make increases of respectively 8 per cent and 10 per cent. Russia, the largest emitter of the Eastern bloc countries, agreed to stabilise its emissions at 100 per cent of 1990 levels.

[306] The gases covered by the Protocol are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

[307] Art. 3(2). [308] Art. 3(9).

[309] Art. 13(3). However, borrowing assigned amounts from future commitment periods is not permitted.

Six gases are covered by the emissions reduction commitments of the Annex I parties: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.[310] The number of gases covered by the Protocol was also a controversial issue with strong disagreement during the negotiations as to whether only three (carbon dioxide, methane and nitrous oxide) or six (adding hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) gases should be covered. In the end, all six gases were listed in Annex A. However, Article 3(8) provides that any Annex I party may use 1995 as its base year for the latter three gases.

Policies and measures

Article 2 of the Protocol contains a list of policies and measures which parties may implement in order to achieve their quantified limitation and emissions reduction targets. During negotiations for the Protocol, the European Union pushed for the adoption of mandatory and co-ordinated 'policies and measures' but this was resisted by the United States, Canada, Australia and some other Annex I parties who sought a more flexible approach, with policies and measures to be determined principally by each individual party. This latter approach was largely adopted in Article 2, which provides that each Annex I party, in achieving its emissions limitation and reduction commitments under Article 3, shall implement policies and measures 'in accordance with its national circumstances'. A list of indicative measures follows, which includes enhancement of energy efficiency, the protection and enhancement of sinks, the promotion of sustainable forms of agriculture, increased research on and use of new and renewable forms of energy, measures to limit or reduce emissions in the transport sector and the limitation or reduction of methane emissions.[311] Parties are required to co-operate 'to enhance the individual and combined effectiveness of their policies and measures' through taking steps to share relevant experience and information, including developing ways of improving the compatibility, transparency and effectiveness of policies and measures.[312] Parties must pursue limitation and reduction of emissions from aviation and bunker fuels, which remain outside the scope of the Protocol, by working through the ICAO and IMO respectively.

Emissions trading, joint implementation and the CDM

By far the most innovative (and controversial) aspect of the Kyoto Protocol negotiations was the proposal to enable Annex I parties to meet their commitments under the Protocol by purchasing or acquiring credits representing greenhouse gas reductions in other countries. Emissions trading permits an Annex B party to 'buy' emissions reduction credits, in the form of assigned amounts units or AAUs, from another Annex B party where it would be more

[310] Annex A. [311] Art. 2(1)(a). [312] Art. 2(1)(b).

cost-effective for it to do so rather than to undertake the reduction domestically. The inclusion of emissions trading in the Protocol was strongly supported by the United States, which has domestic experience with similar schemes (although in more discrete areas such as sulphur dioxide emissions)[313] and advocated their adoption internationally as cost-effective means of achieving reductions of emissions in greenhouse gases. However, emissions trading was strongly opposed by many parties, particularly China and the Group of 77 developing countries.

An eleventh-hour compromise text was included in the Protocol as Article 17. This allows Annex B parties to 'participate in emissions trading for the purposes of fulfilling their commitments under Article 3', but provides that any such trading must be 'supplemental' to domestic actions taken to achieve emissions reductions. Article 17 left to the conference of the parties the task of defining 'relevant principles, modalities, rules and guidelines, in particular for verification, reporting and accountability for emissions trading.'[314]

A further economic incentive mechanism included in the Protocol is the possibility for joint implementation by Annex I parties of their emissions reduction commitments. Article 6 provides that, for the purpose of meeting its commitments under Article 3, any Annex I party may transfer to, or acquire from, any other Annex I party 'emission reduction credits resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy'.[315] An Annex I party may authorise private legal entities, under its responsibility, to participate in actions leading to the generation, transfer or acquisition of emissions reduction units (ERUs) from joint implementation.[316] However, any such joint implementation must result in a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur and should be supplemental to domestic actions.[317]

The Clean Development Mechanism (CDM) defined by Article 12 provides a further innovation, establishing a means for Annex I parties to gain emission reductions credits to assist them in achieving compliance with their quantified emissions limitation and reduction commitments under Article 3. As part of the CDM, Annex I parties can invest in emissions reductions projects in non-Annex I parties and use the certified emissions reductions (CERs) accruing from such project activities 'to contribute to compliance with part of their quantified emission limitation and reduction commitments under

[313] For example, its sulphur dioxide emissions trading scheme under Title IV of the Clean Air Act, 42 USC 7651.

[314] In December 2002, the EC adopted a regional emissions trading arrangement, designed to be implemented in accordance with the scheme to be established under the Kyoto Protocol. It will begin to operate in January 2005: chapter 4, p. 163 above.

[315] Art. 6(1). [316] Art. 6(3). [317] Art. 6(1)(b) and (d).

Article 3'.[318] Certified emissions reductions obtained between 2000 and 2005 can be used to assist in achieving compliance in the first commitment period.[319] A share of the proceeds from certified project activities must be used to cover administrative expenses 'as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation'.[320]

The CDM is subject to the authority and guidance of the Conference of the Parties serving as the Meeting of the Parties to the Protocol and is to be supervised by an Executive Board.[321] Emissions reductions resulting from project activities require certification by operational entities to be designated by the Conference of the Parties serving as the Meeting of the Parties to the Protocol on the basis of various factors, including that the reductions in emissions are additional to any that would occur in the absence of the certified project activity and that there are real, measurable and long-term benefits related to the mitigation of climate change.[322] As with joint implementation, participation in the CDM may involve private and/or public entities, subject to the guidance of the Executive Board.[323] Article 12 leaves the 'modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities' to be elaborated by the Meeting of the Parties to the Protocol.[324]

Sinks

The inclusion of carbon sinks within the Protocol remained controversial up to the final stages of the negotiations. Some countries, particularly the United States and Australia, were strongly in favour of allowing activities which resulted in carbon sequestration (e.g. afforestation, reafforestation and land-use changes) to count towards their quantified commitments. The inclusion of carbon sinks was strongly opposed by other countries, particularly the members of the European Union. The final text adopted in Article 3(3) allowed for commitments to be met by 'net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period'. A last-minute proposal to include additional sinks resulted in the inclusion of Article 3(4) which provides that the Conference of the Parties serving as the Meeting of the Parties to the Protocol shall at its first session or as soon as practicable thereafter 'decide upon modalities, rules and guidelines as to how, and which, additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and land-use change and forestry categories shall be added to, or

[318] Art. 12(3)(b). [319] Art. 12(10). [320] Art. 12(8). [321] Art. 12(4).
[322] Art. 12(5). [323] Art. 12(9). [324] Art. 12(7).

subtracted from, the assigned amounts for parties included in Annex I'. Any such decision would apply in the second and subsequent commitment periods, although a party may choose to have it apply for the first commitment period, provided that the 'additional human-induced activities' have taken place since 1990.

Developing countries

Article 10 deals with that part of the 'Berlin Mandate' which called for the advancement of the implementation of commitments by all parties, including developing country parties. The Preamble to Article 10 affirms that the provision is not 'introducing any new commitments for Parties not included in Annex I' but is merely reaffirming existing commitments under Article 4(1) of the Convention, and 'continuing to advance the implementation of these commitments in order to achieve sustainable development'. A number of measures are listed in Article 10 which cover areas such as the formulation of 'cost-effective national, and where appropriate regional programmes to improve the quality of local emission factors, activity data and/or models which reflect the socioeconomic conditions of each Party for the preparation and periodic updating of national inventories' of emissions of greenhouse gases and the formulation, implementation, publication and updating of 'national and, where appropiate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaption to climate change'. Other measures include the provision of information on programmes which contain measures addressing climate change and its adverse impacts, and the promotion of effective modalities relating to the transfer of environmentally sound technologies pertinent to climate change.

Reporting and compliance

Detailed reporting obligations for Annex I parties are established by Articles 5, 7 and 8 of the Protocol. These build upon the reporting and review procedures developed under the Convention, particularly the in-depth review process. Article 5(1) provides that each Annex I party is required to have in place, no later than 2007, a national system for the estimation of anthropogenic emissions by sources and removals by sinks of greenhouse gases. Guidelines for such national systems are to be decided upon by the Conference of the Parties serving as the Meeting of the Parties to the Protocol at its first session. Under Article 7(1), each Annex I party is required to incorporate in its annual inventory of anthropogenic emissions by sources and removals by sinks, 'the necessary supplementary information for the purposes of ensuring compliance with Article 3'. Annex I parties are also required to include supplementary information to demonstrate compliance with commitments under the Protocol.[325]

[325] Art. 7(2).

The information submitted under Article 7 by Annex I parties will be reviewed by 'expert review teams' in accordance with guidelines to be adopted by the Meeting of the Parties at its first session.[326] The review process is to provide 'a thorough and comprehensive technical assessment of all aspects of the implementation by a Party' of the Protocol.[327] The expert review teams report to the Meeting of the Parties on the implementation of commitments by the party, identifying any potential problems in, and factors influencing, the fulfilment of commitments.[328] The reports of the expert review teams are circulated to all parties to the Convention, and the Conference of the Parties will consider the information submitted under Article 7 and the expert review reports and 'take decisions on any matter required for the implementation of [the] Protocol'.[329]

Apart from the review of information submitted by parties, the Protocol contemplates a further mechanism for ensuring compliance with commitments under the Protocol. Article 18 provides that the Meeting of the Parties at its first session shall 'approve appropriate and effective procedures and mechanisms to determine and to address cases of non-compliance with the provisions of this Protocol, including through the development of an indicative list of consequences, taking into account the cause, type, degree and frequency of non-compliance'. However, any such procedures and mechanisms entailing 'binding consequences' would require an amendment to the Protocol.

Entry into force and amendments

In order to enter into force, the Protocol requires the ratification, acceptance, approval or accession of at least fifty-five parties to the Convention, which must include Annex I parties which accounted for at least 55 per cent of the total carbon dioxide emissions of Annex I parties in 1990. The refusal of the world's largest greenhouse gas emitter, the United States, to ratify the Protocol made the participation by other Annex I parties with significant emissions, such as Japan, the European Community and Russia, essential for the Protocol to come into force. Japan, the European Community and Canada recently ratified the Protocol, bringing the number of parties to 100. In September 2002, at the World Summit on Sustainable Development held in Johannesburg, Russia pledged that it would ratify the Protocol in the near future, making likely its entry into force in 2003 or 2004.

Amendments to the Protocol can be adopted by a three-fourths majority vote of the parties present and voting at the meeting at which it is proposed for adoption, followed by its ratification or acceptance by at least three-fourths of the parties to the Protocol.

[326] Art. 8(1). [327] Art. 8(3). [328] *Ibid.* [329] Art. 8(5) and (6).

Subsequent developments: the Marrakesh Accords

Following the adoption of the Protocol, negotiations continued on the subsidiary rules, guidelines and methodologies called for by the Protocol text. A number of issues reflected divisions between states. Some of these covered matters relating to the implementation of commitments under the Convention, particularly those relating to financing, capacity-building, adaptation and transfer of technology. Other matters related to the Protocol, such as carbon sinks, rules for emissions trading and penalties for non-compliance with commitments. These are addressed in the 'Marrakesh Accords' agreed at the seventh conference of the parties in November 2001.[330] The 218-page Marrakesh Accords translate the Bonn Agreements into a legal text of some complexity, suggesting 'more possibilities for hidden meanings, ambiguities and "agreements to disagree" than the almost 30 pages of the Kyoto Protocol'.[331]

The sections of the Marrakesh Accords dealing with Protocol issues will be presented to the first meeting of the Conference of the Parties serving as the Meeting of the Parties to the Protocol for adoption. A major component of the Marrakesh Accords relates to the rules for implementation of the Kyoto Protocol's 'flexibility mechanisms', the establishment of a compliance mechanism (potentially one of the most important aspects of the Marrakesh Accords[332]) and the elaboration of permissible land-use, land-use change and forestry (LULUCF) activities. Building on the Bonn Agreements, the Accords also consolidate matters under the Convention relating to funding arrangements[333] and capacity-building provisions for developing countries,[334] and provide guidelines for the preparation of National Adaptation Programmes for Action (NAPAs).[335] The Accords also provide guidelines on national systems for the estimation of anthropogenic sources of greenhouse gas emissions, the

[330] The Marrakesh Accords are reproduced in four volumes of the Report of the seventh conference of the parties, FCCC/CP/2001/13/Add.1–Add.4. A useful summary of the Kyoto Protocol provisions as supplemented by the Marrakesh Accords has been produced by the Climate Change Secretariat, *A Guide to the Climate Change Convention and its Kyoto Protocol* (2002), at http://unfccc.int/resource/guideconvkp-p.pdf.

[331] *Ibid.*

[332] Decision 24/CP.7; see chapter 4, p. 162 above.

[333] Three new funds are established, two under the UNFCCC and one under the Protocol. The new Convention funds are a 'special climate change' fund to finance activities, programmes and measures related to climate change and a fund for least developed countries: Marrakesh Accords, Decision 7/CP.7. Under the Protocol an 'adaptation fund' is established to finance concrete adaptation programmes and projects in developing countries. The fund will be financed by voluntary contributions (the EU, together with Canada, Iceland, New Zealand, Norway and Switzerland made a commitment at the Bonn meeting to contribute collectively 450 million euros annually by 2005) and 2 per cent of the proceeds generated by CDM projects: Decision 10/CP.7.

[334] *Ibid.*, Decision 2/CP.7. Decision 3/CP.7 deals with capacity-building for parties with economies in transition.

[335] *Ibid.*, Decision 28/CP.7.

preparation of information required for fulfilment of the reporting obligations under the Protocol, and performance of reviews by expert review teams under Article 8.[336]

In relation to the flexibility mechanisms as a whole, the Marrakesh Accords do not place a numerical cap on their use to fulfil emissions reduction commitments, as was urged by the EU, developing countries and many environmental NGOs; instead the Accords provide that the use of these mechanisms is to be 'supplemental to domestic action' and that domestic action must constitute a 'significant element' of the effort made by Annex I parties in meeting their commitments under Article 3(1) of the Protocol.[337] While there is thus no quantitative limit on *acquiring* credits to use towards fulfilling emissions reduction commitments, the parties did agree to adopt a safeguard against *overselling* of emission reduction credits by participating countries. All Annex I parties are required to keep a 'Commitment Period Reserve' (CPR) at all times which consists of either 90 per cent of their originally assigned AAUs, or five times the emissions of the most recently reviewed emissions inventory, whichever is the lower.[338]

Emissions reduction credits, in the form of AAUs, ERUs and CERs, gained through use of the flexibility mechanisms, as well as 'removal units' (RMUs) generated by sink activities, may be used to meet the emissions reduction commitments of Annex I parties under Article 3(1).[339] Transfers and acquisitions of credits may take place between national registries under the responsibility of the parties, and each national registry will maintain electronic accounts of a party's AAUs, ERUs, CERs and RMUs, as well as accounts for holdings of any legal entities authorised by the party to engage in the acquisition and transfer of credits.[340]

Eligibility to participate in the flexibility mechanisms is limited to Annex I parties which have ratified the Protocol and complied with their methodological and reporting requirements under Articles 5 and 7.[341] Japanese and Russian resistance prevented agreement on a strict link between acceptance of the arrangements for dealing with non-compliance under the Protocol (discussed below) and eligibility to participate in the Protocol's flexibility mechanisms.[342]

[336] *Ibid.*, Decisions 20/CP.7, 22/CP.7 and 23/CP.7.

[337] *Ibid.*, Decision 15/CP.7, para. 1.

[338] *Ibid.*, Decision 18/CP.7, Annex, para. 6. The commitment period reserve may consist of holdings of ERUs, CERs, AAUs and/or RMUs for the relevant commitment period which have not been acquired by an Annex I party.

[339] Marrakesh Accords, Decision 15/CP.7, para. 6.

[340] Decision 19/CP.7, paras. 17 and 19. The Climate Change Secretariat will establish a transaction log to verify transactions of credits as they are proposed and to halt any transactions where a discrepancy is detected: paras. 38–43.

[341] Decision 15/CP.7, para. 5.

[342] Decision 15/CP.7, para. 5 requires the enforcement branch of the compliance committee to provide oversight of eligibility to participate in the flexibility mechanisms. See also

The Marrakesh Accords adopt detailed modalities and guidelines for each of the flexibility mechanisms.[343] In relation to the Clean Development Mechanism (CDM), the Marrakesh Accords affirm that it is the host party's prerogative to confirm whether a CDM project activity assists it in achieving sustainable development, although Annex I parties must 'refrain from using certified emission reductions generated from nuclear facilities' to meet their commitments under Article 3(1).[344] Afforestation and reafforestation are the only eligible land-use and forestry projects allowed under the CDM in the first commitment period,[345] and for the first commitment period the total additions to a party's assigned amount resulting from such activities may not exceed 1 per cent of the base year emissions of the party multiplied by five.

The parties have agreed to a 'prompt start' for the CDM, so that project activities starting from 2000 may register to accrue CERs, to be certified by the newly established Executive Board elected at the seventh conference of the parties.[346] They have also agreed upon the composition and functioning of the Executive Board of the CDM.[347] Two initial tasks for the Executive Board include the development of a simplified procedure for small-scale projects under the CDM, and the accreditation of independent organisations, known as operational entities, which play a central role in the validation of proposed CDM project activities and the verification and certification of emission reductions.[348] To be validated by an operational entity, a project must result in emissions reductions which are 'additional' to any that would have occurred in the absence of the project.[349] The issue of a certification report by a designated

the decisions relating to each of the flexibility mechanisms: Decision 16/CP.7, Annex, para. 22(b) (joint implementation); Decision 17/CP.7, Annex, para. 32(b) (CDM); Decision 18/CP.7, Annex, para. 3(b) (emissions trading).

343 See Decision 16/CP.7 (joint implementation); Decision 17/CP.7 (CDM); and Decision 18/CP.7 (emissions trading).

344 Decision 17/CP.7, Preamble.

345 The Subsidiary Body for Scientific and Technical Advice has been requested by the conference of the parties to develop definitions and modalities for including afforestation and reafforestation project activities under the CDM with the aim of adopting a decision on this matter at the ninth conference of the parties: *ibid.*, paras. 7 and 10.

346 *Ibid.*, paras. 1 and 13.

347 *Ibid.*, Annex, paras. 7, 12 and 13.

348 *Ibid.*, Annex, para. 27. 'Validation' involves the independent evaluation of a project activity by a designated operational entity against the requirements of the CDM set out in Decision 17/CP.7 and other relevant decisions of the COP/MOP. A validated project then becomes 'registered' when it is formally accepted by the Executive Board as a CDM project activity. 'Verification' involves the periodic independent review and *ex post* determination by the designated operational entity of the monitored reductions in anthropogenic emissions by sources that have occurred as a result of the registered CDM project activity. 'Certification' is the written assurance by the operational entity that the project activity achieved the verified reductions within a specified period of time.

349 *Ibid.*, Annex, para. 43. Additionality is determined by reference to project-specific baselines and monitoring plans devised according to methodologies specified in the Marrakesh Accords.

operational entity is the basis for the Executive Board's issuing CERs equal to the verified amount of emissions reductions.[350] The Accords also provide that public funding for CDM project activities must not result in a diversion in official development assistance and is separate from and not counted towards the financial obligations of Annex I parties under the Protocol. The parties agree that 2 per cent of the certified emission reductions issued for CDM project activities would go towards assisting developing country parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.[351]

The Marrakesh Accords' guidelines for implementation of Article 6 (joint implementation) are less elaborate than those for the CDM. An Article 6 supervisory committee is established to supervise the verification of ERUs from joint implementation activities, and its composition and functioning are provided for.[352] A two-track procedure is established for verification of ERUs from joint implementation activities. Where a host party meets the eligibility requirements for participation in the flexibility mechanisms, it may itself certify ERUs generated by activities within its territory as being additional to reductions that would otherwise be made. If the host party does not meet the eligibility requirements it may still host joint implementation projects; however, any resulting ERUs have to be verified by the Article 6 supervisory committee under a procedure comparable to the CDM procedure.[353] Projects starting from 2000 may qualify as joint implementation activities, but the resulting ERUs may only be issued for a crediting period starting after 2008.[354]

At Marrakesh, the parties agreed on a number of new provisions regarding land-use, land-use change and forestry (LULUCF) activities eligible to be credited against the assigned amounts for Annex I parties in accordance with Article 3(4) of the Protocol. Various governing principles for the inclusion of LULUCF activities were articulated:

- the treatment of such activities is to be based on 'sound science';
- consistent methodologies are to be used for estimation and reporting of these activities;
- the mere presence of carbon stocks is to be excluded from accounting, as is increased removals due to faster growth caused by increasing concentrations of atmospheric carbon dioxide and indirect nitrogen deposition associated with climate change;

[350] *Ibid.*, Annex, para. 64. CERs are issued automatically by the Executive Board unless a party involved in the project activity or at least three members of the Executive Board request a review of the proposed issuance; any review of proposed issues of CERs is limited to matters of fraud, malfeasance or incompetence of the designated operational entity: para. 65.

[351] *Ibid.*, para. 15. [352] Decision 16/CP.7, para. 3; and Annex, paras. 4 and 15.

[353] Annex, paras. 23 and 24. [354] *Ibid.*, para. 5.

- any reversals of LULUCF removals are to be accounted for at the appropriate time; and
- the implementation of LULUCF activities must contribute to biodiversity conservation and sustainable use of natural resources.[355]

Forest management, cropland management, grazing land management and revegetation were designated as additional eligible LULUCF activities under Article 3(4) of the Protocol.[356] A party may choose to apply these activities during the first commitment period provided it makes its choice of eligible activities prior to the start of that period.[357] To include such activities, the party must be able to demonstrate that the activities occurred since 1990 and are human-induced.[358]

Removal by sinks generated a new category of emissions reduction credits known as removal units (RMUs). To be available for credit against an Annex I party's emissions reduction commitment under Article 3(1), RMUs must be verified by the expert review teams established by the Protocol. Use of RMUs to meet emission reduction targets during the first commitment period is subject to conditions. First, as a general rule, any emissions from eligible LULUCF activities must be offset by emissions cuts or removals elsewhere.[359] Secondly, if a party's afforestation, reafforestation and deforestation activities result in emissions which are greater than the amount of removals, the party can offset these emissions against removals from forest management activities up to a total of nine megatonnes of carbon (MtC) per year.[360] Thirdly, the extent to which removals from forest management activities can be accounted for beyond 9 MtC per year is subject to country-specific numerical caps.[361] Finally, emissions and removals from cropland management, grazing management and revegetation can only be used to help meet emissions targets on a net-net basis, i.e. the net change in carbon stocks from LULUCF emissions and removals during 1990, multiplied by five, will be subtracted from the net change in LULUCF carbon stocks during the first commitment period for land where such activities took place.[362]

[355] Decision 11/CP.7, para. 1.

[356] *Ibid.*, Annex, para. 6. Definitions are in Decision 11/CP.7, Annex, para. 1.

[357] *Ibid.*, Annex, para. 7.

[358] *Ibid.*, Annex, para. 8. Activities credited under Art. 3.4 cannot also be credited under Art. 3.3.

[359] *Ibid.*, Annex, para. 4.

[360] *Ibid.*, Annex, para. 10.

[361] *Ibid.*, para. 11 and Appendix. At Bonn, Russia agreed to a figure of 17.63 megatonnes of carbon (MtC) per year from forest management. However, it subsequently questioned the validity of this figure, asserting that carbon-absorbing activities from forest management accounted for 33 MtC annually. To prevent the Accords unravelling, Decision 12/CP.7 was agreed upon, authorising a figure of 33 MtC per year for credits from forest management for Russia.

[362] Decision 11/CP.7, para. 9.

Outer space

C. Christol, *The Modern Law of Outer Space* (1982); B. Schafer, 'Solid, Hazardous and Radioactive Wastes in Outer Space, Present Control and Suggested Changes', 19 *California Western International Law Journal* 1 (1988); K. H. Bockstiegel, *Environmental Aspects of Activities in Outer Space* (Proceedings of the 1988 Cologne Colloquium, 1990); H. Baker, *Space Debris: Legal and Policy Implications* (1989); L. D. Roberts, 'Addressing the Problem of Orbital Space Debris: Combining International Regulatory and Liability Regimes', 15 BCICLR 51 (1992); R. I. R. Abeyratme, 'The Use of Nuclear Power Sources in Outer Space and Its Effect on Environmental Protection', 25 *Journal of Space Law* 17 (1997); I. H. P. Diederiks-Verschoor, *An Introduction to Space Law* ((1999, 2nd edn); D. Tan, 'Towards a New Regime for the Protection of Outer Space as the "Province of All Mankind"', 25 *Yale Journal of International Law* 145 (2000); website: www.oosa.unvienna.org/index.html.

Environmental problems in outer space are of three types: orbital space debris; environmental damage caused on or to other planets as a result of human exploratory activity; and environmental damage caused on earth as a result of man-made objects falling from space. The international legal regime regulating environmental aspects of outer space includes three treaties and two sets of principles: the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies (1967 Outer Space Treaty);[363] the Convention on Registration of Objects Launched into Outer Space (1975 Space Registration Convention);[364] the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979 Moon Treaty);[365] and the Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992 Outer Space Principles).[366] The 1972 Space Liability Convention is considered in chapter 18 below.

Four of these agreements were adopted before environmental considerations had become an important international legal issue, and do not reflect some of the legal innovations which have occurred in the past decade. In the meantime, increased human activity in outer space has contributed to greater

[363] London, Moscow, Washington, 27 January 1967, in force 10 October 1967, 610 UNTS 205.

[364] 14 January 1975, in force 15 September 1976, 28 UST 695.

[365] New York, 5 December 1979, in force 11 July 1984, 18 ILM 1434 (1979).

[366] UNGA Res. 47/68, 32 ILM 917 (1993). See also the Declaration on International Co-operation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, UNGA Res. 51/122.

environmental threats. It has been estimated that space debris now comprises some 7,000 pieces of debris larger than ten centimetres; 17,500 pieces of between one and ten centimetres; and 3,500,000 pieces of less than one centimetre.[367] Space debris constitutes an environmental hazard as it increases the risk of collision and consequential damage; because of the high speed at which they travel, objects as small as one centimetre can penetrate the crew compartments of spacecraft, and debris one-half millimetre in size can kill an astronaut protected only by a spacesuit.[368]

1967 Outer Space Treaty

The 1967 Outer Space Treaty states that the exploration and use of outer space (including the moon and other celestial bodies) is to be carried out for the benefit and interests of all countries, and shall be 'the province of all mankind'.[369] Outer space is not subject to national claims of sovereignty and all activities are to be carried out in the interest of maintaining international peace and security.[370] The Treaty includes provisions with important implications for environmental protection. In particular, nuclear weapons and other weapons of mass destruction may not be placed in orbit around the earth, installed on celestial bodies, or stationed in outer space, and the moon and other celestial bodies may only be used for 'peaceful purposes'.[371]

Article IX sets out some fundamental obligations:[372] exploration and use of outer space is to be guided by the principle of co-operation and mutual assistance, and all activities are to be conducted 'with due regard to the corresponding interests' of all other parties to the Treaty. Moreover, studies and exploration of outer space must avoid 'the harmful contamination and adverse changes in the environment of the earth resulting from the introduction of extra-territorial matter'. Parties are also under an obligation to undertake 'appropriate international consultations' before proceeding with activities or experiments which may cause 'potentially harmful interference' with activities of other state parties. It is evident that the approach of Article IX is directed towards the protection of human beings, rather than the protection of the environment as an end in itself.

[367] Figures cited in L. D. Roberts, 'Addressing the Problem of Orbital Space Debris: Combining International Regulatory and Liability Regimes', 15 BCICLR 53 (1992); the sources of debris include fragments caused by explosion, hyper-velocity impact or deterioration of the surfaces of payloads, as well as inactive payloads, spent rocket thrusters and other material produced by spacecraft operations: *ibid.*, 54–5.

[368] *Ibid.*, 55. [369] Art. I. [370] Arts. II and III. [371] Art. IV.

[372] The 1967 Treaty also includes provisions on international responsibility and liability (Arts. VI and VIII): see chapter 18, pp. 896–8 below.

1979 Moon Treaty

The 1979 Moon Treaty, which applies to the moon and celestial bodies other than the earth, provides that the moon and its natural resources are the 'common heritage of mankind' and are to be used exclusively for peaceful purposes.[373] Exploration and use of the moon is the province of all mankind, and due regard is to be paid in activities relating to it, and to the interests of present and future generations.[374] Article 7 sets out provisions on the protection of the environment of celestial bodies going beyond that established in the 1967 Outer Space Treaty. In their exploration and use of the moon, the parties are required to:

> take measures to prevent the disruption of the existing balance of its environment whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States parties shall also take measures to avoid harmfully affecting the environment of the earth through the introduction of extra-territorial matter or otherwise.[375]

The 1979 Treaty does not prohibit the placement of radioactive materials on the moon but does require the UN Secretary General to be notified in advance of all such placements. The Treaty also provides for the possible designation of international scientific preserves.[376] The exploitation of the natural resources of the moon is not prohibited by the Treaty. Instead, the parties agree to establish an international regime to govern such exploitation when it is about to become feasible, and to include in such a regime provisions for the orderly and safe development and rational management of the moon's natural resources.[377] Although the provisions on the exploitation of the moon's natural resources do not expressly refer to the need to establish rules on environmental protection, they should be read as being subject to the environmental protection requirements established by Article 7. The 1979 Moon Treaty includes provisions on international responsibility and recognises the need to develop arrangements on liability.[378]

Outer Space Principles

The eleven Principles Relevant to the Use of Nuclear Power Sources in Outer Space, which were adopted by the UN General Assembly in December 1992, were prepared by the Committee on the Peaceful Uses of Outer Space.[379] In

[373] Arts. 1(1), 3(1) and 11(1). [374] Art. 4(1).
[375] Art. 7(1). Parties are also required to take all practicable measures to safeguard the life and health of persons on the moon: Art. 10(1).
[376] Art. 7(2) and (3). [377] Art. 11(5) and (7)(a) and (b).
[378] Art. 14. [379] UNGA Res. 47/68 (1992).

order to minimise the quantity of radioactive material in space, Principle 3 provides that the use of nuclear power sources in space is to be restricted to those missions which cannot be operated by non-nuclear energy sources in a reasonable way. To that end, the Principles establish general goals for radioactive protection and safety, including the requirement that hazards in foreseeable operational or accidental circumstances are kept within acceptable levels and that radioactive material does not cause a 'significant contamination' of outer space.[380] The use of nuclear reactors in space is limited to interplanetary missions, in sufficiently high orbits and to low-earth orbits if they are subsequently stored in sufficiently high orbits,[381] and only highly enriched uranium-235 may be used as fuel. Radio-isotope generators may only be used for interplanetary missions and other missions leaving earth's gravity.[382] The Principles also include rules on safety assessment, the notification of re-entry, consultation and assistance to states, and on responsibility and liability.[383]

UNCED

Chapter 9 of Agenda 21, on 'Protection of the Atmosphere', was among the most difficult subjects addressed at UNCED – evidence of the potential impacts of international environmental regulation on the fundamental economic interests of many states. A number of OPEC states, led by Saudi Arabia, Libya and Kuwait, opposed the Chapter in its entirety. The political sensitivity of Chapter 9 is clear from its introduction, which states that 'the recommendations contained in this chapter do not oblige any Government to take measures which exceed the provisions' of the 1985 Vienna Convention, the 1987 Montreal Protocol as amended, the 1992 Climate Change Convention, and any other international, including regional, instruments.[384] On the other hand, to achieve a balance and with an eye to possible future trade disputes over unilateral national atmospheric protection and energy standards, it is also stated that 'within the framework of this chapter, Governments are free to carry out additional measures which are consistent with those legal instruments'.[385] The Chapter establishes four programme areas which emphasise the priorities of the international community in the coming years: addressing uncertainties; promoting sustainable development; preventing stratospheric ozone depletion; and transboundary air pollution.

[380] Principle 3(1)(a). Acceptable levels are defined in Principle 3(1)(b) and (c), including recommendations of the ICRP, generally accepted international radiological protection guidelines and specified numerical values.

[381] Principle 3(2). [382] Principle 3(3).

[383] Principles 4 to 7; see chapter 18, pp. 896–8 below.

[384] Para. 9.2. [385] *Ibid.*

Addressing uncertainties: improving the scientific basis for decision-making

The basic objective of this programme area is to improve the understanding of the processes that influence and are influenced by the earth's atmosphere on a global, regional and local scale, to enhance international co-operation, and to improve understanding of the economic and social consequences of atmospheric changes and mitigation and response measures.[386] To those ends, the programme area proposes, *inter alia*, a more balanced geographical coverage of the Global Climate Observing System and its components, including Global Atmosphere Watch, co-operation in early detection systems, developing methodologies, and identifying threshold levels of atmospheric pollutants and greenhouse gas concentrations.[387]

Promoting sustainable development

This programme head contains sections on energy development efficiency and consumption, transportation, industrial development, and resource development and land use. With regard to the energy sector, the programme recognises that:

> the need to control atmospheric emissions of greenhouse and other gases and substances will increasingly need to be based on efficiency in energy production, transmission, distribution and consumption, and on growing reliance on environmentally sound energy systems, particularly new and renewable sources of energy.[388]

The objective of the programme area is:

> to reduce adverse effects on the atmosphere from the energy sector by promoting policies or programmes, as appropriate, to increase the contribution of environmentally safe and sound and cost-effective energy systems, particularly new and renewable ones, through less polluting and more efficient energy production, transmission, distribution and use. The objective should reflect the need for equity, adequate energy supplies and increasing energy consumption in developing countries as well as the needs of certain vulnerable countries.[389]

[386] Para. 9.7. [387] Para. 9.8.

[388] Para. 9.9. New and renewable sources of energy are defined as 'solar thermal, solar photovoltaic, wind, hydro, biomass, geothermal ocean, animal and human power, as referred to in the reports of the Committee on the Development and Utilisation of New and Renewable Sources of Energy', prepared specifically for UNCED: see A/CONF.151/PC/119 and A/AC.218/1992/5.

[389] Para. 9.11.

regional arrangements.[89] The 1991 Antarctic Environment Protocol has banned the open burning of wastes since the end of the 1998/9 season, and allows the burning of certain non-hazardous combustible wastes in incinerators which 'to the maximum extent practicable reduce harmful emissions'.[90] The EC's recent legislation on the limitation of air pollution from new and existing waste incineration plants provides a model which could be followed by other regions.[91]

The incineration of fossil fuels, with its by-product of waste gases, has been the subject of a number of treaties and acts of international institutions. Emissions of waste gases of sulphur dioxide,[92] nitrogen oxide,[93] volatile organic compounds,[94] and carbon dioxide and other greenhouse gases,[95] are regulated. Limits have also been placed on the generation of waste gases by combustion from motor vehicles and aircraft.[96]

Landfill and other land disposal and storage

There is no international regulation of standards for domestic landfill, other than the recent EC Council Directive 99/31/EC establishing minimum standards for the design and management of landfill waste.[97] This Directive, which was to be implemented by 16 July 2001, details stringent rules on the landfill of solid waste with the dual aims of improving the sound environmental management of landfills and reducing the amount of landfill waste.[98] The Directive incorporates the 'polluter-pays principle' requiring member states to ensure that all of the set-up and operating costs of landfills are covered by the price charged by operators.[99] Member states are also required to establish a national strategy providing for the reduction of the landfill of biodegradable waste.[100] The strategy must ensure that the amount of biodegradable municipal waste going to landfill is reduced progressively across fifteen years compared to a 1995 baseline. A reduction to 75 per cent of the 1995 baseline must be achieved within five years of implementation; 50 per cent within eight years; and 35 per cent within fifteen years.[101] Under the 1985 EC Environmental Impact Assessment Directive, all landfill of toxic and dangerous wastes must be subjected to an environmental impact assessment,[102] and the 1991 Espoo Convention requires landfill of toxic and dangerous wastes likely to cause a significant adverse transboundary impact to be subjected to environmental impact assessment and notified to potentially affected parties to ensure adequate and

[89] 1985 EC EIA Directive, Annex I, para. 9; 1991 Espoo Convention, Appendix 1, para. 10.
[90] Annex III, Art. 3.
[91] Chapter 15, pp. 764–6 below. [92] Chapter 8, p. 327 above.
[93] Chapter 8, pp. 328–9 above. [94] Chapter 8, pp. 329–32 above.
[95] Chapter 8, pp. 357–81 above. [96] Chapter 8, pp. 324 and 341–2 above.
[97] Council Directive 99/31/EC on the landfill of waste, OJ L182, 16 July 1999, 1.
[98] Art. 1. [99] Art. 10. [100] Art. 5(1). [101] Art. 5(2).
[102] Chapter 16, pp. 807–13 below; Art. 4(1) and Annex I, para. 9.

effective consultation.[103] The Antarctic area is subject to more detailed rules. Here, the disposal of radioactive waste has been prohibited since 1959.[104] The 1991 Environmental Protection Protocol prohibits disposal of wastes on to ice-free areas and establishes rules for the disposal of sewage, domestic and other liquid wastes and wastes generated at field camps, which should generally be removed by the generator.[105] Wastes to be removed from the Antarctic Treaty area should also be stored to prevent their dispersal into the atmosphere.[106] Elsewhere, the 1986 Noumea Convention is one of the few treaties to establish detailed rules on storage, requiring the storage of toxic and hazardous wastes to be subject to measures to prevent pollution, and prohibiting storage of radioactive wastes or matter.[107] When it comes into force, the 2001 POPs Convention will require states parties to take appropriate measures to dispose of wastes consisting of, containing or contaminated with POPs in such a way that the POP content is destroyed or irreversibly transformed.[108] Where destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, states parties must ensure that the wastes are disposed of in an environmentally sound manner, taking into account international rules, standards, guidelines and relevant global and regional regimes governing the management of hazardous wastes.[109] States parties are to ensure that POPs wastes are not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of POPs.[110]

Recycling and re-use

Political efforts to encourage recycling, recovery and re-use of materials and products have not yet led to international legal commitments. The OECD's International Energy Agency is committed to research and development on waste heat utilisation and municipal and industrial waste utilisation for energy conservation,[111] and the OECD has adopted recommendations on re-use and recycling of beverage containers and on recovery of waste

[103] Chapter 16, pp. 814–17 below; Arts. 2(2), 3(1) and 5, and Appendix 1, para. 10.
[104] Antarctic Treaty 1959, Art. V(1). [105] Annex III, Art. 4.
[106] Annex III, Art. 6. [107] Art. 11. [108] Art. 6(d)(ii).
[109] *Ibid.* The conference of the parties of the 2001 POPs Convention is required to co-operate closely with the appropriate bodies of the 1989 Basel Convention to: (a) establish levels of destruction and irreversible transformation necessary to remove the hazardous characteristics of POPs; (b) determine what they consider to be methods that constitute environmentally sound disposal; and (c) work to establish, as appropriate, the concentration levels of the chemicals which can be defined as 'low persistent organic pollutant content': Art. 6(2).
[110] Art. 6(d)(iii).
[111] 1974 Agreement on an International Energy Programme, Art. 42(c).

Protocol fund and supporting the Protocol's compliance mechanism; and addressing the illegal traffic in ozone-depleting substances.[401]

Conclusions

Despite its slow start, the rules of international law governing the protection of the atmosphere and outer space are now among the most detailed and complex in international environmental law. As described in this chapter, regional and global developments have taken place which establish significant limitations on the right of states to allow emissions of gases which cause urban and transboundary air pollution, depletion of the ozone layer, and increased atmospheric concentrations of greenhouse gases. In so doing, a broad range of regulatory techniques has been deployed, including the total phase-out of the production and consumption of certain ozone-depleting substances, the use of a 'target-and-timetable' approach, differentiated commitments for developed and developing countries, and innovative new instruments addressing the attainment of the objectives of the ozone depletion and climate change regimes. Supplementing these substantive commitments and techniques are a number of innovative institutional arrangements (to provide technical assistance and address non-compliance), as well as new procedural obligations, recognition of the primary responsibility of industrialised nations, and the establishment of financial arrangements to encourage the participation of developing countries in new global rules.

The new international rules governing the protection of the atmosphere are at the cutting edge of international environmental law. They have attracted interest from states, scientists, business and environmental organisations largely because of the significance of the threat they seek to address and the broad scope of the activities they embrace, including in particular the transport and energy sectors. These are far-reaching and relatively speedy developments. Nevertheless, major gaps remain to be addressed. First, in relation to urban and transboundary air pollution the rules are almost entirely applicable to developed countries in the OECD/ECE/EC context; as rapid industrialisation takes place in other regions, there is a need to develop rules to address these related problems, perhaps through the development of a regional approach modelled upon UNEP's Regional Seas Programme. This is even more the case today than in the mid-1990s when the first edition of this book appeared. Secondly, the recently adopted agreements such as the 1999 Amendments to the Montreal Protocol and the 1997 Kyoto Protocol to the Climate Change Convention need to be brought into force promptly, and the financial arrangements necessary to encourage the participation of, in particular, the largest developing countries, should be assured. Thirdly, greater attention needs to be given to the

[401] Para. 37.

enforcement of these agreements, including in respect of meeting reporting requirements and providing independent verification that targets and timetables have been and are being complied with. And, fourthly, international lawyers will need to address a new range of legal issues thrown up by the development of innovative international mechanisms and techniques to assist in compliance: tradeable permits, 'joint implementation' and the Clean Development Mechanism are among the new approaches which raise political, economic and legal questions which have not been fully addressed or understood and will challenge the skills of public international lawyers, who will increasingly have to intersect with the work of commercial and private sector lawyers involved in the practical implementation of these arrangements.

9

Oceans and seas

W. Douglas, 'Environmental Problems of the Oceans: The Need for International Controls', 1 *Environment Law* 149 (1971); L. Caflisch, 'International Law and Ocean Pollution: The Present and the Future', 8 RBDI 7 (1972); J. Schneider, 'Something Old, Something New: Some Thoughts on Grotius and the Marine Environment', 18 *Virginia Journal of International Law* 147 (1974); J. L. Hargrove (ed.), *Who Protects the Ocean?: Environment and the Development of the Law of the Sea* (1975); E. Mann Borgese and D. Krieger (eds.), *The Tides of Change: Peace, Pollution, and Potential of the Oceans* (1975); R. Johnson (ed.), *Marine Pollution* (1976); A. Kiss, 'La Pollution du milieu marin', 38 ZaöRV 902 (1978); G. J. Timagenis, *International Control of Marine Pollution* (1980); K. Hakapaa, *Marine Pollution in International Law* (1981); D. M. Johnston (ed.), *The Environmental Law of the Sea* (IUCN, Environmental Policy Paper No. 18, 1981); E. Gold, *Handbook on Marine Pollution* (1985); R. Soni, *Control of Marine Pollution in International Law* (1985); J. van Dyke, D. Zaelke and G. Hewison (eds.), *Freedom of the Seas in the 21st Century: Ocean Governance and Environmental Harmony* (1993); A. Couper and E. Gold (eds.), *The Marine Environment and Sustainable Development* (1993); K. Gjerde and D. Freestone, 'Particularly Sensitive Sea Areas', 9 IJMCL 431 (1994) (special issue); L. Lucchini and M. Voelckel, *Le Droit de la mer* (1996); H. Ringbom (ed.), *Competing Norms in the Law of Marine Environmental Protection* (1997); UN, *Oceans and Law of the Sea: Report of the Secretary General* (1998); R. Churchill and A. Lowe, *The Law of the Sea* (1999, 3rd edn); J.-P. Beurier, A. Kiss and S. Mahmoudi, *New Technologies and Law of the Marine Environment* (2000); M. Nordquist and J. Norton Moore, *Current Marine Environmental Issues and the International Tribunal for the Law of the Sea* (2001); S. Marr, *The Precautionary Principle in the Law of the Sea – Modern Decision-Making in International Law* (2003).

Introduction

General rules concerning the protection of the marine environment from pollution are well developed at the regional and global levels, largely as a result of the treaties and other international acts adopted by states since 1972.[1] More

[1] Marine living resources are addressed in chapter 11, pp. 558–600 below.

detailed and specific obligations govern dumping at sea and pollution from vessels, and the rules on enforcement are now also relatively well developed.[2] The general and specific rules have not, however, halted the continued degradation of the marine environment as a result of pollution from the principal sources, namely, land-based sources (including pollution through the atmosphere); dumping by vessels at sea; offshore vessels; and seabed activities.

In 1990, the Joint Group of Experts on the Scientific Aspects of the Marine Environment (GESAMP) reported that coastal pollution was increasing and more widespread globally than in 1982. Moreover, although the open ocean was relatively clean, the margins of the seas were affected by human activity, primarily from land-based activities including intensive human settlement of coastal zones.[3] GESAMP reported that 'if unchecked, these trends will lead to global deterioration in the quality and productivity of the marine environment'.[4] The major causes of concern include coastal development, destruction of habitats, eutrophication from nutrients and sewage, overfishing and changes in sediment flows due to hydrological changes. Urban, industrial and recreational developments have resulted in large-scale destruction of coastal habitats, especially wetlands, mangroves, salt marshes and seagrasses:[5] by way of example, Italy had lost more than 95 per cent of its historic wetlands by 1972;[6] the United States has lost over 50 per cent of its coastal wetlands;[7] and a group of thirty-one tropical developing countries in Africa, Central America and Asia are estimated to have lost more than 50 per cent of their mangroves since pre-agricultural times.[8] Overall it is estimated that nearly 30 per cent of the land area in the world's coastal ecosystems has been extensively altered or destroyed by growing demands for housing, industry and recreation.[9]

[2] See chapter 5, on enforcement generally.

[3] GESAMP Reports and Studies No. 39 (1990), jointly sponsored by IMO, FAO, UNESCO, WMO, WHO, IAEA, UNEP and the UN. Susbequent studies have found a similar pattern of pollution: see GESAMP, 'A Sea of Troubles', GESAMP Report No. 70 (2001).

[4] *Ibid.*, 1.

[5] The degradation continues despite the fact that by 1989 states had established 977 marine and coastal protected areas over more than 211 million hectares: World Resources Institute, *World Resources 1992–3*, 298–9, Table 20.1.

[6] IBRD and EIB, *The Environmental Programme for the Mediterranean: Preserving a Shared Heritage and Managing a Common Resource (1990)*, 23 in World Resources Institute, *World Resources 1992–3*, 177.

[7] R. W. Tiner, *Wetlands of the United States: Current Status and Recent Trends* (US Fish and Wildlife Service, 1984), 36, in World Resources Institute, *World Resources 1992–3*, 177.

[8] World Resources Institute, *World Resources 1990–1*, 306–7, Table 20.4. In many cases, extensive losses have occurred in the last fifty years. For example, much of the estimated 84 per cent of original mangroves lost to Thailand were lost since 1975. Panama lost 67 per cent of its mangroves during the 1990s: World Resources Institute, *World Resources 2000–2001*, 72.

[9] Lauretta Burke *et al.*, *Pilot Analysis of Global Ecosystems: Coastal Ecosystems* (2001), 3.

The situation has not generally improved in the past decade. In its most recent report, published in 2001, GESAMP has confirmed that the situation is not improving: coastal activity is increasing the amounts of nitrogen and phosphorous entering the marine environment of coastal areas by between 50 and 200 per cent;[10] other sources of pollution include microbial contamination of seafood and beaches from the discharge of untreated human sewage, the fouling of the seas by plastic litter, the progressive build-up of chlorinated hydrocarbons, and the accumulation of tar on beaches from oil spills; and longer term issues, such as climate change and ozone depletion, are identified.[11] Another phenomenon which may be a symptom of environmental change is 'coral bleaching', which takes place when coral dies and loses its colour due to the loss of symbiotic algae; it is caused by the water at the sea surface getting warmer.[12]

Development of standards of international law[13]

International rules for the protection of the marine environment are established under regional and global treaties, and other international acts, and the rules of customary law are reflected in these acts and non-binding soft law obligations. Early international efforts addressed discharges of oil, and can be traced back to the 1926 Preliminary Conference on Oil Pollution of Navigable Waters, held in Washington.[14] The first treaty to address oil pollution of the sea was the 1954 International Convention for the Prevention of Pollution of the Sea by Oil (1954 Oil Pollution Convention), based on a draft text from the 1926 Washington Conference.[15] The 1954 Oil Pollution Convention was followed by environmental protection provisions in the 1958 High Seas Fishing and Conservation Convention,[16] the 1958 Convention on the Continental Shelf,[17] and the 1958 Convention on the High Seas.[18]

In 1959, the IMCO (now IMO) Assembly assumed responsibility for the 1954 Oil Pollution Convention and many of the UN's functions in relation

[10] GESAMP, 'A Sea of Troubles', GESAMP Report No. 70 (2001), 15.

[11] *Ibid.*

[12] National Science Foundation, US EPA, NOAA, *Workshop on Coral Bleaching, Coral Reef Ecosystems and Global Change: Report of Proceedings* (1991), 1–7; cited in World Resources Institute, *World Resources 1992–3*, 178.

[13] As to the competence of states to prescribe and enforce rules for the protection of the marine environment, see chapter 1, pp. 13–14, and chapter 5, p. 175 above.

[14] Report of the Preliminary Conference on Oil Pollution of Navigable Waters, 1926 June 8–16 (US Government Printing Office, 1926).

[15] London, 12 May 1954, in force 26 July 1958, 327 UNTS 3, as amended in 1962, 1969 and 1971.

[16] Geneva, 29 April 1958, in force 20 March 1966; 559 UNTS 285.

[17] Geneva, 29 April 1958, in force 10 June 1964; 499 UNTS 311.

[18] Geneva, 29 April 1958, in force 30 September 1962; 450 UNTS 82.

to oil pollution.[19] Subsequent international efforts were often triggered by a major oil spill such as the accidents involving the *Torrey Canyon* in 1967, the *Amoco Cadiz* in 1978, the *Exxon Valdez* in 1989 and the *Prestige* in 2002. These and other incidents led to the adoption under IMO auspices of the 1969 Intervention Convention, the 1969 (now 1992) CLC, the 1971 (now 1992) Oil Pollution Fund Convention, and the various amendments to MARPOL 73/78 requiring double hulls on new oil tankers,[20] and, more recently, first indications that certain states could act unilaterally to limit rights of passage even within their EEZs.[21] Following the *Torrey Canyon* accident, the UN General Assembly gave increased attention to the protection of the marine environment,[22] and in 1969 it adopted a resolution 'Promoting Effective Measures for the Prevention and Control of Marine Pollution'.[23] This called on the UN to: prepare reports for the 1972 Stockholm Conference; review harmful substances and wastes which might affect human health and activities in the marine environment and coastal area, and national and international activities for prevention and control of marine pollution; and make suggestions for comprehensive action and improved international co-ordination. Marine pollution was an important issue at the Stockholm Conference, and Principle 8 of the 1972 Stockholm Declaration called on states to 'take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea'.[24] The Stockholm Conference did not adopt a proposed global convention on ocean dumping as the text had not been completed. The United States had introduced a text in 1971 at the IMO Intergovernmental Working Group on Marine Pollution,[25] but it was not until December 1972 that the global Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972 London Convention) was actually adopted.[26] This followed by several months the adoption of the regional Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (1972 Oslo Dumping Convention).[27]

[19] ECOSOC Res. 537A (XVIII) (1959). [20] See p. 440 below.

[21] In November 2002, France, Spain and Portugal indicated that they would undertake unilateral actions to prevent passage through their EEZs of certain old ships without double hulls, following the accident involving the Prestige, and France apparently excluded some such ships. The actions have been condemned by shipping bodies as contravening UNCLOS: see 'Shipping Bodies Condemn European Tanker Expulsions', 13 December 2002, www.planetark.org.

[22] See e.g. UNGA Res. 2414 (XXII) (1968). [23] UNGA Res. 2566 (XXIV) (1969).

[24] See generally P. S. Thacher, 'Assessment and Control of Marine Pollution: The Stockholm Recommendations and Their Efficacy', 8 *Stanford Journal of International Studies* 79 (1973).

[25] 10 ILM 1021 (1971).

[26] London, Mexico City, Moscow, Washington, 29 December 1972, in force 30 August 1975, 1046 UNTS 120; see pp. 416–23 below.

[27] Oslo, 15 February 1972, in force 7 April 1974, 932 UNTS 3; see pp. 423–5 below.

In 1973, the International Convention for the Prevention of Pollution from Ships (MARPOL 73) was adopted under IMO auspices,[28] and in 1976 UNEP established its Regional Seas Programme, which has led to over thirty regional treaties.[29] In 1982, the international community finally adopted the United Nations Convention on the Law of Sea (UNCLOS), addressing pollution of the marine environment comprehensively with a view to establishing rules and standards of global application. Further efforts have taken place within the framework of the treaty institutions and the IMO which, together with the IOC, GESAMP and UNEP, continue to play a leading role in efforts to develop international law for the protection of the marine environment. During 1992, a 'second generation' of regional environmental treaties was introduced with the adoption of the 1992 Convention on the Protection of the Baltic (1992 Baltic Sea Convention)[30] (to supersede the 1974 Baltic Convention) and the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (1992 OSPAR Convention) (to supersede the 1972 Oslo Dumping Convention and the 1974 Paris Convention). Both of the 1992 instruments adopt a more comprehensive approach by addressing marine pollution from all sources, and introduce new principles, substantive rules and institutional arrangements. The approach is now reflected in other regional instruments, identified below.

The treaty regime

Marine environment protection rules fit into two broad categories: global rules (of which the 1982 UNCLOS is the most comprehensive, and the 1972 London Convention and MARPOL 73/78 the most specific); and regional rules. The second category includes treaties under the UNEP Regional Seas Programme, and those which are *ad hoc* regional and sub-regional arrangements establishing special rules in Europe and the Antarctic.[31]

UNCLOS

D. P. O'Connell, *The International Law of the Sea* (ed. I. Shearer, 2 vols., 1982 and 1984); P. Allott, 'Power Sharing in the Law of the Sea', 77 AJIL 1 (1983); B. Boczek, 'Global and Regional Approaches to the Protection and Preservation of the Marine Environment', 16 *Case Western Reserve Journal of International Law* 39 (1984);

[28] P. 440 below. [29] Pp. 399–405 below.

[30] Helsinki, 9 April 1992, in force 17 January 2000; IMO Doc. LDC.2/Circ.303, 10 August 1992.

[31] See chapter 13 below; for a helpful assessment, see T. Treves, 'Regional Approaches to the Protection of the Marine Environment', in J. Norton Moore and M. Nordquist (eds.), *The Stockholm Declaration and Law of the Marine Environment* (2003).

K. Ramakrishna, 'Environmental Concerns and the New Law of the Sea', 16 *Journal of Maritime Law and Commerce* 1 (1985); A. E. Boyle, 'Marine Pollution under the Law of the Sea Convention', 79 AJIL 347 (1985); R. Platzoder, *Third United Nations Conference on the Law of the Sea: Documents* (15 vols., 1982–); J. Sebenius, *Negotiating the Law of the Sea* (1984); M. H. Nordquist, S. Rosenne, A. Yancov and N. Grandy (eds.), *United Nations Convention on the Law of the Sea 1982: A Commentary*, vol. IV, *Articles 192 to 278, Final Act, Annex VI* (1991); UN Office for Ocean Affairs and the Law of the Sea, *The Law of the Sea: Protection and Preservation of the Marine Environment: Repertory of International Agreements Relating to Section 5 and 6 of Part XII of the United Nations Convention on the Law of the Sea* (1990); O. Schachter, 'The Value of the 1982 UN Convention on the Law of the Sea: Preserving Our Freedoms and Protecting the Environment', 23 *Ocean Development and International Law* 55 (1992); R. Churchill and A. V. Lowe, *The Law of the Sea* (1999, 3rd edn); J. Charney, 'The Marine Environment and the 1982 UNCLOS', 28 *International Lawyer* 879 (1994).

The 1982 UNCLOS aims to establish 'a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilisation of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment'.[32] It is one of the most far-reaching and influential of global environmental agreements, and is now widely supported, with 142 parties. Although UNCLOS only entered into force in 1994, more than ten years after it was signed, it has influenced the development of regional rules for the protection of the marine environment, as well as broader international environmental law. Its provisions on the protection and preservation of the marine environment are considered by many states to reflect generally applicable principles or rules of customary law, as evidenced by the reference in the Preamble to the 1992 OSPAR Convention which recalls the relevant provisions of customary law reflected in Part XII of the UNCLOS. Agenda 21 endorsed the view that the provisions of UNCLOS on protection and preservation of the marine environment reflect international law.[33] The legal force of the principles established in UNCLOS as customary obligations is further supported by the widespread state practice pursuant to treaty and national rules which address particular sources of marine pollution as set out in Part XII.

UNCLOS requires states to pursue two main environmental objectives: to prevent, reduce and control marine pollution; and to conserve and manage marine living resources. For both objectives, UNCLOS establishes rules on

[32] Preamble.

[33] Agenda 21, paras. 17.1 and 17.22; this view was stated to be without prejudice to the position 'of any state with respect to signature, ratification or accession to the Convention' or the 'position of states which view the Convention as having a unified character': *ibid.*, at nn. 1 and 2.

information, scientific research, monitoring, environmental assessment, enforcement (including developing rules in relation to enforcement by coastal states and port states)[34] and liability.[35] Part XII of UNCLOS addresses the 'protection and preservation of the marine environment', although principles and rules on environmental protection and the conservation of marine living resources may also be found throughout the Convention: among the various provisions, UNCLOS authorises coastal states to adopt certain laws relating to innocent and transit passage through territorial seas, straits and archipelagic sea lanes for the preservation of the environment of the coastal state and the prevention, reduction and control of pollution,[36] and it provides for coastal state jurisdiction (in accordance with the Convention) with regard to protection and preservation of the marine environment of the EEZ.[37] Part XII comprises forty-six Articles, divided into eleven Sections, which elaborate upon the general provisions of Section 1, which includes the primary obligation of all states 'to protect and preserve the marine environment'.[38] Drawing upon the language of Principle 21 of the Stockholm Declaration, UNCLOS declares that 'states have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment'.[39]

This general obligation is further elaborated, and a distinction is drawn between the duty to protect the environment and the responsibility not to cause damage by pollution to other states and their environment. Under Article 194(1), the duty to protect the environment requires states to take all the measures consistent with UNCLOS which are necessary to prevent, reduce and control pollution of the marine environment from any source, using the best practicable means at their disposal and in accordance with their capabilities. This introduces the element of differentiated responsibility based upon

[34] Chapter 5, pp. 175–6 above, and the literature there cited.

[35] Chapter 18, pp. 923–4 below.

[36] Arts. 21(1)(f), 42(1)(b) and 54.

[37] Art. 56(1)(b)(iii); in exercising their rights, coastal states are to 'have due regard to the rights and duties of other States and shall act in a manner compatible with the provisions of the Convention': Art. 56(2). The rights of other states include freedoms of navigation in the EEZ (Art. 58(1)). Following the sinking of the *Prestige* involving an oil spill off the west coast of Spain on 19 November 2002, it was reported that Spain, France and Portugal were proposing to ask all single-hull tankers over fifteen years of age and laden with crude or fuel oil to sail outside their EEZs (see Lloydslist.com, 'Spain, France and Portugal Ban Single Hull Tankers', 3 December 2002), raising an issue as to whether this apparent exercise of jurisdiction in relation to the prevention of pollution was compatible with freedoms of navigation under the 1982 Convention (see Lloydslist.com, 'Spain Single Hull Ban Flies in Face of Law of the Sea', 4 December 2002, referring to Art. 211 of UNCLOS; and see pp. 440–4 below on MARPOL regulations concerning double hulls). On 13 December 2002, the EC Commission proposed an immediate ban on the transport of heavy grades of oil to or from EU ports by all single-hull tankers (and to speed up the phase-out of single-hull tankers): Press Release IP/02/1953, 20 December 2002.

[38] Art. 192.

[39] Art. 193.

economic and other resources available which subsequently emerged as a major theme at UNCED. Article 1(4) of UNCLOS defines pollution of the marine environment, on the basis of an earlier GESAMP definition, as:

> the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate use of the sea, impairment of quality for uses of sea water and reduction of amenities.[40]

The definition has since been relied upon in other agreements. It includes both acts which result in, and those which are 'likely to' result in, harmful effects.[41] UNCLOS thus distinguishes between 'pollution' and 'damage'. Under Article 194(2), states are required not to cause damage by pollution, being directed to:

> take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other states and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with the Convention.

Article 194(3) further elaborates the obligation to prevent pollution damage by addressing particular sources of pollution: from land-based activities; from seabed activities; from activities in the 'Area'; from dumping; from vessels; and from or through the atmosphere.[42] Article 194(5) requires special protection for rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life. States must not transfer damage or hazards, or transform one type of pollution into another, and must limit the use of technologies or the introduction of alien or new species which may cause significant and harmful changes to the marine environment.[43]

These general obligations serve as the basis for more detailed standards. They are supplemented by procedural obligations to give effect to the requirements of global and regional co-operation set forth in Article 197 and, in respect of semi-enclosed seas, Article 123. Techniques for implementing the substantive rules and standards include: notifying imminent or actual damage; developing pollution contingency plans and scientific research;[44] providing technical assistance, particularly to developing countries;[45] and the monitoring and carrying out of environmental assessments of certain activities.[46] UNCLOS also

[40] Art. 1(4); see generally M. Tomczak, 'The Definition of Marine Pollution: A Comparison of Definitions Used by International Conventions', 8 *Marine Policy* 311 (1984).
[41] See p. 406 below. [42] Arts. 194(3) and 207–12. [43] Arts. 195–6.
[44] Arts. 198–200. [45] Arts. 202 and 203.
[46] Arts. 204–6. On 'environmental impact assessment', see generally chapter 16 below.

establishes new rules on enforcement,[47] ice-covered areas,[48] responsibility and liability,[49] and sovereign immunity,[50] and provides for the relationship between UNCLOS and other conventions for the protection and preservation of the marine environment.[51]

The contribution of UNCLOS to the progressive development of international environmental law at the general level cannot be overstated. The freedom of states to pollute the marine environment is no longer unconstrained and the obligation to develop specific rules to give effect to the general obligations of UNCLOS is reinforced. By bringing together elements which had previously been scattered among different agreements, these general provisions of UNCLOS establish a framework for the further development of rules on substantive matters at the global and regional levels.

UNEP Regional Seas Programme[52]

L. M. Alexander, 'Regional Arrangements in the Oceans', 71 AJIL 84 (1977); C. Okidi, *Regional Control of Ocean Pollution: Legal and Institutional Problems and Prospects* (1978); J. De Yturriaga, 'Regional Conventions on the Protection of the Marine Environment', 162 RdC 319 (1979); D. Alhéritière, 'Marine Pollution Control Regulation: Regional Approaches', 6 *Marine Policy* 162 (1982); P. Hayward, 'Environmental Protection: Regional Approaches', 8 *Marine Policy* 106 (1984); A. Boyle, 'Regional Pollution Agreements and the Law of the Sea Convention', in W. E. Butler (ed.), *The Law of the Sea and International Shipping*, (1985) 315; P. Sand, *Marine Environment Law in the United Nations Environment Programme* (1988); P. Verlaan and A. Khan, 'Paying to Protect the Commons: Lessons from the Regional Seas Programme', 31 *Ocean and Coastal Management* 83 (1996); E. Franckx, 'Regional Marine Environment Protection Regimes in the Context of UNCLOS', 13 IJMCL 307 (1998).

UNCLOS was preceded by the emergence of the UNEP Regional Seas Programme, an ambitious attempt at developing treaties and soft rules and standards at the regional level, taking account of the different needs and capabilities of the various regions. The Regional Seas Programme followed the 1972 Stockholm Conference and the creation of UNEP. In 1974, the FAO General Fisheries Council for the Mediterranean had sponsored guidelines for a framework convention on the protection of the marine environment against pollution in the Mediterranean.[53] This led to the adoption in February 1975, under the

[47] Arts. 213–33; chapter 5, pp. 175–80 above. [48] Art. 234; see chapter 14, p. 712 below.
[49] Art. 235; chapter 18, pp. 923–4 below. [50] Art. 236.
[51] Art. 237; on the relationship between UNCLOS and other conventions, see chapter 3, pp. 136–8 above.
[52] www.unep.ch/seas/.
[53] Protection of the Marine Environment Against Pollution in the Mediterranean, FAO Fisheries Report No. 148 (1974), Annex I.

auspices of UNEP, of the Mediterranean Action Plan,[54] which has since become a model for other regions. The Plan comprised five basic components: environmental assessment, environmental management, institutional arrangements, financial arrangements, and regional legal instruments. It was followed by the 1976 Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution (1976 Barcelona Convention) and two Protocols: a Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft (1976 Barcelona Dumping Protocol), and a Protocol for Co-operation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency (1976 Barcelona Emergency Protocol). In November 1976, UNEP convened its first 'Task Force on Legal Instruments for Regional Seas';[55] and in 1978 the UNEP Governing Council endorsed a Regional Seas Programme,[56] which is now a part of the broader UNEP Programme Activity Centre for Oceans and Coastal Areas.

The UNEP Regional Seas Programme extends to fourteen regional areas:[57] of these, thirteen regions now have their own Action Plans,[58] and an Action Plan for the Upper South-West Atlantic is in development. Ten regions are the subject of binding international agreements: the Mediterranean, the Arabian Gulf, the Gulf of Guinea, the South-East Pacific, the Red Sea and Gulf of Aden, the Caribbean, the Indian Ocean and East Africa, the South Pacific, the Black Sea and the North-East Pacific. The UNEP Regional Seas Programme now comprises a total of thirty-two framework Conventions and Protocols; others are under negotiation.

Mediterranean

D. De Hoyos, 'The United Nations Environment Programme: the Mediterranean Conferences', 17 *Harvard International Law Journal* 639 (1976); B. Boxer, 'Mediterranean Pollution: Problem and Response', 10 *Ocean Development and International Law* 315 (1982); P. Haas, *Saving the Mediterranean: The Politics of International Environmental Co-operation* (1990); E. Raftopoulos, *The Barcelona Convention and its Protocols* (1993); A. Vallega, 'Geographical Coverage and Effectiveness of the UNEP Convention on the Mediterranean', 31 *Ocean and Coastal Management* 199

[54] UNEP/WG.2/5INF.3, reprinted in 14 ILM 481 (1975).

[55] See P. H. Sand, 'Drafting of Regional Legal Instruments for Marine Environment Protection: The Case of the Mediterranean', UNEP/Doc. TFLIRS /Inf.4 Nairobi (1976).

[56] UNEP Governing Council Decision 6/2 (1978) and Programme Doc. UNEP/GC.6/7 (1978), 139–66.

[57] The term 'region' has no precise meaning, and as used in the Regional Seas Programme has been applied to different types of region including those comprising stretches of coastal waters, archipelagos and semi-enclosed seas.

[58] Mediterranean (1975), Kuwaiti (1978), Wider Caribbean (1981), East Asian (1981), South-East Pacific (1981), Red Sea and Gulf of Aden (1982), South Pacific (1982), West and Central African (1982), Eastern African (1985), North-West Pacific (1994), South Asian (1995), Black Sea (1996) and North-East Pacific (2001).

(1996); S.-Y. Chung, 'Is the Mediterranean Regional Co-operation Model Applicable to Northeast Asia?', 11 *Georgetown International Environmental Law Review* 363 (1999); T. Scovazzi (ed.), *Marine Specially Protected Areas: The General Aspects of the Mediterranean Regional System* (1999); T. Scovazzi, 'The Transboundary Movement of Hazardous Waste in the Mediterranean Regional Context', 19 *UCLA Journal of Environmental Law and Policy* 231 (2001).

The Mediterranean region was the first Programme region and is now the most advanced. It comprises the 1976 Barcelona Convention[59] and six Protocols: the 1976 Barcelona Dumping Protocol,[60] the 1976 Barcelona Emergency Protocol,[61] the 1980 Athens Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources (1980 Athens LBS Protocol),[62] the 1982 Geneva Protocol Concerning Mediterranean Specially Protected Areas (1982 Geneva SPA Protocol),[63] the Protocol for the Protection of the Mediterranean Sea Against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (1994 Madrid Offshore Protocol),[64] and the Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (1996 Izmir Hazardous Wastes Protocol).[65] The meetings of the parties to these instruments have also adopted assessments and common measures since 1985 which further develop the treaty rules.[66] Secretariat functions are provided

[59] Barcelona, 16 February 1976, in force 12 February 1978, 15 ILM 290 (1976); twenty-one states and the EC are party. Revised in Barcelona, 9–10 June 1995 as the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (not yet in force).

[60] Barcelona, 16 February 1976, in force 12 February 1978, 15 ILM 300 (1976); twenty-one states and the EC are party. Revised in Barcelona, 9–10 June 1995 as the Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea.

[61] Barcelona, 16 February 1976, in force 12 February 1978, 15 ILM 306 (1976); twenty-one states and the EC are party.

[62] Athens, 17 May 1980, in force 17 June 1983, 19 ILM 869 (1980); twenty-one states and the EC are party. Amended in Syracusa, Italy, 6–7 March 1996 as the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources and Activities not in force.

[63] Geneva, 3 April 1982, in force 23 March 1986, IELMT 982:26; twenty-one states and the EC are party. Revised in Barcelona on 9–10 June 1995 as the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA and Biodiversity Protocol) not in force.

[64] Madrid, 14 October 1994, not yet in force. [65] Izmir, 1 October 1996, not yet in force.

[66] See Interim Environmental Quality Criteria Concerning Mercury Content of Seafood (1985); Interim Environmental Quality Criteria Concerning Microbial Concentrations of Bathing Waters (1985); Maximum Concentration of Mercury in Effluent Discharges (1987); Interim Environmental Quality Criteria Concerning Microbial Concentrations of Shellfish Waters (1987); Control of Pollution by Used Lubricating Oils (1989); Control of Pollution by Cadmium and Cadmium Compounds (1989); Control of Pollution by Organotin Compounds (1989); Control of Pollution by Organohalogen Compounds

by UNEP and are carried out by the Co-ordinating Unit for the Mediterranean Action Plan (MEDU-UNEP) in Athens.

Arabian Gulf

S. S. Saqat, 'The Kuwait Convention for Co-operation on the Protection from Pollution of the Marine Environment of the Arabian Gulf Area', 34 REDI 149 (1978); S. Amin, 'The Gulf States and the Control of Marine Pollution: Regional Arrangements and National Legislation', *Lloyd's Maritime and Commercial Law Quarterly* 104 (February 1982); M. A. Mekouar, 'La Convention de Jeddah du 14 février 1982 pour la protection de l'environnement de la Mer Rouge et du Golfe d'Aden', 8 RJE 81 (1983); S. Amin, *Marine Pollution in International and Middle Eastern Law* (1986).

The next Regional Seas Programme was developed in the Arabian Gulf region. It comprises a framework Convention, the 1978 Kuwait Regional Convention for Co-operation on Protection of the Marine Environment from Pollution (1978 Kuwait Convention),[67] and four Protocols: a 1978 Kuwait Protocol Concerning Co-operation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency (1978 Kuwait Emergency Protocol),[68] a 1989 Kuwait Protocol Concerning Marine Pollution Resulting from Exploration and Exploitation of the Continental Shelf (1989 Kuwait Exploration Protocol),[69] the 1990 Kuwait Protocol Concerning Pollution from Land-Based Sources (1990 Kuwait LBS Protocol),[70] and the 1998 Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes (1998 Hazardous Wastes Protocol).[71] During the early 1990s, the secretariat had to cope with the severe damage which resulted from the release of oil from Kuwaiti terminals in January 1991 by Iraqi forces in unlawful occupation. The estimated release, of about 950,000 cubic metres of oil, was nearly twice the previous record spill at Ixtoc in the Gulf of Mexico and twenty times the size of the spill from the *Exxon Valdez*.

Gulf of Guinea

D. Alhéritière, 'Convention Sur le Milieu Marin de l'Afrique de l'Ouest et du Centre', 7 *Environmental Policy and Law* 61 (1981)

(1989) (all reprinted in 'Common Measures Adopted by the Contracting Parties to the Convention for the Protection of the Mediterranean Sea Against Pollution' (MAP Technical Report Series No. 38, UNEP, 1990). See also Common Measures on Control of Pollution by Organophosphorus Compounds (1991); Pollution by Persistent Synthetic Materials (1991); Pollution by Radioactive Substances (1991); Pollution by Pathogenic Microorganisms (1991), reprinted in Report of the Seventh Meeting of the Contracting Parties to the 1976 Barcelona Convention.

[67] Kuwait, 24 April 1978, in force 1 July 1979, 1140 UNTS 133; eight states are party.

[68] Kuwait, 24 April 1978, in force 1 July 1979, 17 ILM 526 (1978); eight states are party.

[69] Kuwait, 29 March 1989, in force 17 February 1990; eight states are party.

[70] Kuwait, 20 February 1990, not in force.

[71] Kuwait, adopted in 1998, not yet in force.

The protection of the marine environment of the Gulf of Guinea is addressed by the 1981 Abidjan Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (1981 Abidjan Convention),[72] and one Protocol, the 1981 Abidjan Protocol Concerning Co-operation in Combating Pollution in Cases of Emergency (1981 Abidjan Emergency Protocol).[73]

South-East Pacific

E. Ferrero Costa, 'Pacific Resources and Ocean Law: A Latin American Perspective', 16 *Ecology Law Quarterly* 245 (1989).

The protection of the marine environment of the South-East Pacific is addressed by the 1981 Lima Convention for the Protection of the Marine Environment and Coastal Areas of the South-East Pacific (1981 Lima Convention)[74] and five Protocols: the 1981 Lima Agreement on Regional Co-operation in Combating Pollution of the South-East Pacific by Hydrocarbons or Other Harmful Substances in Cases of Emergency (1981 Lima Emergency Agreement)[75] (as supplemented by the 1983 Quito Supplementary Protocol to the 1981 Lima Agreement (1983 Quito Protocol)),[76] the 1983 Quito Protocol for the Protection of the South-East Pacific Against Pollution from Land-Based Sources (1983 Quito LBS Protocol),[77] the 1989 Paipa Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the South-East Pacific (1989 Paipa SPA Protocol),[78] the 1989 Paipa Protocol for the Protection of the South-East Pacific Against Radioactive Contamination (1989 Paipa Radioactive Contamination Protocol),[79] and the 1992 Protocol on the Programme for the Regional Study on the El Niño Phenomenon (ERFEN) in the South-East Pacific (1992 El Niño Protocol).[80]

Red Sea and Gulf of Aden

The Red Sea and Gulf of Aden are addressed by the 1982 Jeddah Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (1982 Jeddah Convention)[81] and a single Protocol, the 1982 Jeddah Protocol

[72] Abidjan, 23 March 1981, in force 5 August 1984, 20 ILM 746 (1981); ten states are party.
[73] Abidjan, 23 March 1981, in force 5 August 1984, 20 ILM 756 (1981); ten states are party. A Protocol on land-based sources of pollution is in the early stages of preparation.
[74] Lima, 12 November 1981, in force 19 May 1986; five states are party; IELMT 981:85.
[75] Lima, 12 November 1981, in force 14 July 1986; five states are party; IELMT 981:85.
[76] Quito, 22 July 1983, in force 20 May 1987; five states are party; IELMT 983:55.
[77] Quito, 22 July 1983, in force 23 September 1986, IELMT 983:54; five states are party.
[78] Paipa, 21 September 1989, in force 1994, IELMT 989:71.
[79] Paipa, 21 September 1989, in force 1995, IELMT 989:70.
[80] Adopted in 1992, not yet in force.
[81] Jeddah, 14 February 1982, in force 20 August 1985, 9 *Environmental Policy and Law* 56 (1982); six states and Patestine are party.

Concerning Regional Co-operation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency (1982 Jeddah Emergency Protocol).[82]

Caribbean

G. Bundschuh, 'Transfrontier Pollution: Convention for the Protection and Development of the Marine Environment of the Wider Caribbean: Agreement Involving Collective Response to Marine Pollution Incidents and Long Range Environmental Planning', 14 *Georgetown Journal of International and Comparative Law* 201 (1984); W. Anderson, *The Law of Caribbean Marine Pollution* (1997).

The protection of the Caribbean environment is the subject of the 1983 Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (1983 Cartagena Convention),[83] and three Protocols: the 1983 Cartagena Protocol Concerning Co-operation in Combating Oil Spills (1983 Cartagena Oil Spills Protocol),[84] the 1990 Kingston Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region (1990 Kingston SPA Protocol),[85] and the 1999 Protocol on the Prevention, Reduction and Control of Land-Based Sources and Activities (1999 LBS Protocol).[86]

Indian Ocean and East Africa

C. Okidi, 'Nairobi Convention: Conservation and Development Imperatives', 15 *Environmental Policy and Law* 43 (1985); M. Pathmarajah and N. Meith, 'A Regional Approach to Marine Environmental Problems in East Africa and the Indian Ocean', 5 *Ocean Yearbook* 162 (1985).

The protection of the marine environment of the Indian Ocean and East Africa is the object of the 1985 Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (1985 Nairobi Convention),[87] and two Protocols: the 1985 Nairobi Protocol Concerning Protected Areas and Wild Fauna and Flora (1985 Nairobi

[82] Jeddah, 14 February 1982, in force 20 August 1985, IELMT 982:14; six states and Palestine are party.

[83] Cartagena, 24 March 1983, in force 11 October 1986, 22 ILM 221 (1983); twenty-one states are party.

[84] Cartagena, 24 March 1983, in force 11 October 1986, 22 ILM 240 (1983); twenty-two states are party.

[85] Kingston, 18 January 1990, in force 18 June 2000, 1 *Yearbook of International Environmental Law* 441 (1990); nine states are party.

[86] Oranjestad, Aruba, 6 October 1999, Annex to Final Act of the Conference of Plenipotentiaries to Adopt the Protocol Concerning Pollution from Land-Based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, not yet in force.

[87] Nairobi, 21 June 1985, in force 1996, IELMT 985:46; four states are party.

Fauna and Flora Protocol),[88] and the 1985 Nairobi Protocol Concerning Co-operation in Combating Marine Pollution in Cases of Emergency (1985 Nairobi Emergency Protocol).[89]

South Pacific

B. Cicin-Sain and R. Knecht, 'The Emergence of a Regional Ocean Regime in the South Pacific', 16 *Ecology Law Quarterly* 171 (1989); S. Riesenfeld, 'Pacific Ocean Resources: The New Regionalism and the Global System', 16 *Ecology Law Quarterly* 355 (1989); L. Osmundsen, 'Paradise Preserved? The Contribution of the SPREP Convention to the Environmental Welfare of the South Pacific', 19 *Ecology Law Quarterly* 727 (1992).

The protection of the marine environment of the South Pacific under the UNEP Regional Seas Programme is the subject of the 1986 Noumea Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (1986 Noumea Convention),[90] and two Protocols: the 1986 Noumea Protocol concerning Co-operation in Combating Pollution Emergencies (1986 Noumea Pollution Emergencies Protocol),[91] and the 1986 Noumea Protocol for the Prevention of Pollution of the South Pacific Region by Dumping (1986 Noumea Dumping Protocol).[92]

Black Sea and North-East Pacific

In 1992 the six Black Sea states, with the assistance of UNEP, adopted a Convention on the Protection of the Black Sea Against Pollution, together with Protocols on land-based sources of marine pollution, emergency situations for oil pollution and other harmful substances, and dumping.[93] A further Protocol on transboundary movements of hazardous wastes will be negotiated.

Finally, in 2002, a Convention on the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific was adopted.[94]

[88] Nairobi, 21 June 1985, not in force, IELMT 985:47. See chapter 11 below.
[89] Nairobi, 21 June 1985, not in force, IELMT 985:48.
[90] Noumea, 25 November 1986, in force 18 August 1990, 26 ILM 38 (1987); twelve states are party. This Convention was relied upon by New Zealand in its 1995 application to the ICJ on the legality of French nuclear testing; see below.
[91] Noumea, 25 November 1986, in force 18 August 1990; IELMT 986:878; twelve states are party.
[92] Noumea, 25 November 1986, in force, 18 August 1990; IELMT 986:87A; eleven states are party.
[93] Bucharest, 21 April 1992, in force 15 January 1994; 32 ILM 1101 (1993); six states are party.
[94] Antigua (Guatemala), 18 February 2002, not yet in force.

The framework conventions

The nine regional seas framework conventions follow a similar approach for co-operation between parties. They include basic substantive and procedural obligations, institutional arrangements, and mechanisms for the adoption of protocols and annexes. Each convention defines its geographic scope of application, and provides for its relationship with other international conventions and rules of international law. Except for the 1983 Cartagena Convention, which includes no definition, each Convention defines 'pollution' similarly to Article 2(a) of the 1976 Barcelona Convention, according to which pollution is:

> the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results, or is likely to result, in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of seawater and reduction of amenities.[95]

General obligations Each framework convention includes general obligations to take, individually or jointly, appropriate measures to prevent, abate and combat pollution to protect and enhance the marine environment, and to formulate and adopt protocols on agreed measures, procedures and standards. These commitments are general in nature, and it is doubtful whether they could create enforceable obligations in specific situations except in the most egregious cases. The framework conventions establish further obligations to conserve biological diversity, to combat pollution from different sources, including dumping from ships and aircraft, from vessels, from exploration and exploitation of the territorial sea and/or continental shelf and/or seabed, from land-based sources, from transboundary movement of hazardous wastes and their disposal, and from the atmosphere, as well as to co-operate in dealing with pollution emergencies.[96] Other provisions to be found in some of the framework conventions include: action to prevent coastal erosion;[97] the sound

[95] 1976 Barcelona Convention, Art. 2(a) (as revised in 1995); 1978 Kuwait Convention, Art. I(a); 1981 Abidjan Convention, Art. 2(1) (adding 'coastal zones, and related inland waters' to the 'marine environment'); 1981 Lima Convention, Art. 2(a); 1982 Jeddah Convention, Art. 1(3); 1985 Nairobi Convention, Art. 2(b); 1986 Noumea Convention, Art. 2(f).

[96] 1976 Barcelona Convention (as revised in 1995), Arts. 4–11; 1978 Kuwait Convention, Arts. III to IX; 1981 Abidjan Convention, Arts. 4–9 and 12; 1981 Lima Convention, Arts. 3–6; 1982 Jeddah Convention, Arts. III to IX; 1983 Cartagena Convention, Arts. 3–11; 1985 Nairobi Convention, Arts. 3–12; 1986 Noumea Convention, Arts. 4–9 and 15.

[97] 1981 Abidjan Convention, Art. 10; 1981 Lima Convention, Art. 5; 1986 Noumea Convention, Art. 13.

environmental management of natural resources;[98] specially protected areas;[99] and prevention of environmental damage from engineering activities.[100] The 1986 Noumea Convention includes detailed obligations on the disposal of wastes, environmental assessment, storage of toxic and hazardous wastes, and contamination from nuclear tests.[101]

Procedural obligations Apart from the general commitments, the eight framework conventions establish procedural obligations to implement substantive obligations. Legal techniques which find support in the framework conventions include: monitoring; scientific and technological co-operation; technical assistance; exchange of information; public access to information and participation; environmental impact assessment; and reporting requirements.[102] Although the obligations are general, they provide a starting point for co-operation and the elaboration of more detailed commitments in subsequent protocols or other treaties.

Institutional arrangements Each framework convention also creates basic institutional structures for the administration of the Convention and Plan for each region. The importance of these arrangements should not be understated since they establish, often for the first time, regional institutions for environmental protection. The institutions usually comprise regular meetings of the parties and a secretariat. The meetings are charged with reviewing implementation and may usually adopt, review and amend Annexes to the Convention and Protocols, make recommendations, and undertake any additional action that may be required for the achievement of the purposes of the Convention and Protocols.[103] Secretariat functions are carried out by UNEP[104] or by regional intergovernmental organisations.[105] The 1978 Kuwait Convention establishes

[98] 1981 Abidjan Convention, Art. 4(1).

[99] 1981 Abidjan Convention, Art. 11; 1985 Nairobi Convention, Art. 10; 1986 Noumea Convention, Art. 14.

[100] 1985 Nairobi Convention, Art. 12.

[101] Arts. 10–12.

[102] 1976 Barcelona Convention (as revised in 1995), Arts. 12, 13 and 15; 1978 Kuwait Convention, Arts. X to XII and XXIII; 1981 Abidjan Convention, Arts. 13, 14 and 22; 1981 Lima Convention, Arts. 7–10 and 14; 1982 Jeddah Convention, Arts. X to XII and XXII; 1983 Cartagena Convention, Arts. 12, 13 and 22; 1985 Nairobi Convention, Arts. 13, 14 and 23; 1986 Noumea Convention, Arts. 16–19.

[103] 1976 Barcelona Convention (revised in 1995), Art. 17; 1981 Abidjan Convention, Arts. 16 and 17; 1981 Lima Convention, Arts. 12 and 13; 1983 Cartagena Convention, Arts. 15 and 16; 1985 Nairobi Convention, Arts. 16 and 17; 1986 Noumea Convention, Arts. 21 and 22.

[104] 1976 Barcelona Convention (revised in 1995), Art. 17; 1981 Abidjan Convention, Art. 16(1).

[105] 1981 Lima Convention, Art. 13 (Permanent Commission of the South Pacific); the 1986 Noumea Convention, Arts. 2(g) and 21 (the South Pacific Commission; in 1991 the

a Regional Organisation for the Protection of the Marine Environment (comprising a Council, a Secretariat and a Judicial Commission for the Settlement of Disputes),[106] and the 1982 Jeddah Convention establishes a Regional Organisation for the Conservation of the Red Sea and the Gulf of Aden Environment (comprising a Council, a General Secretariat, and a Committee for the Settlement of Disputes).[107]

Other regional arrangements

Other agreements outside the UNEP Regional Seas Programme establish regional rules for protection of the marine environment. Apart from treaties specifically addressing particular sources of pollution, the most developed arrangements address the North-East Atlantic and the North Sea,[108] the Baltic region,[109] the Arctic,[110] the Caspian Sea[111] and Scandinavia.[112] EC rules are considered in chapter 15,[113] and those for the Antarctic region in chapter 14.[114] A number of regional and global conventions addressing the protection of natural resources include provisions on the protection of the marine environment.[115] Significant obligations have also been adopted by regional intergovernmental conferences; although not formally binding as a matter of international law, such declarations or recommendations have influenced the subsequent development of international law by treaty or resolution of international organisation. Examples include measures for the protection of the North Sea environment adopted by four international conferences.[116]

secretariat functions were delegated on a temporary basis to the South Pacific Regional Environment Programme).

[106] Arts. XVI to XVIII. [107] Arts. XVI to XX.

[108] 1969 Bonn Agreement; 1983 Bonn Agreement; 1972 Oslo Dumping Convention; 1974 Paris LBS Convention; 1992 OSPAR Marine Environment Convention; Ministerial Declarations on the Protection of the North Sea (1984, 1987, 1990, 1995 and 2002).

[109] 1974 Baltic Convention; 1992 Baltic Convention.

[110] Chapter 14; G. Nelson and R. D. Needham, 'The Arctic as a Regional Sea', 12 *Environmental Conservation* 7 (1985); A. Roginko and M. LaMourie, 'Emerging Marine Environmental Protection Strategies for the Arctic', 16 *Marine Policy* 259 (1992).

[111] C. Romano, 'The Caspian and International Law: Like Oil and Water?', in W. Ascher and N. Mirovitskaya (eds.), *The Caspian Sea: A Quest for Environmental Security* (2000), 145.

[112] 1971 Agreement Between Denmark, Finland, Norway and Sweden Concerning Co-operation in Measures to Deal with Pollution of the Sea by Oil; see also 1976 Agreement Concerning Protection of the Waters of the Mediterranean Shores, Monaco, 10 May 1976, in force 1 January 1981.

[113] Chapter 15, pp. 781–3 below. [114] Chapter 14, p. 712 below.

[115] 1985 ASEAN Agreement, Arts. 11 and 13.

[116] First International Conference on the Protection of the North Sea; Declaration, Bremen, 1 November 1984; Second International Conference on the Protection of the North Sea; Ministerial Declaration, London, 24–5 November 1987; Third International Conference on the Protection of the North Sea; Final Declaration, The Hague, 8 March 1990; Fourth

by treaty in the South Pacific[68] and in Africa,[69] and states have prohibited the dumping of radioactive wastes at sea in the North-East Atlantic.[70] The 1972 London Convention now prohibits the dumping of all radioactive wastes or matter, following a 1985 non-binding moratorium.[71]

Additionally, the disposal of industrial waste at sea has been prohibited in the North Sea since 31 December 1989,[72] and the other waters of the former 1974 Oslo Convention area after 31 December 1995,[73] and in Africa.[74] Since December 1998, the disposal of sewage sludge has been prohibited in the North Sea[75] and in the former 1974 Oslo Convention area.[76] The disposal of dredged materials at sea is also now a matter of international concern and is likely to be the subject of international regulatory action.[77] Moreover, the disposal at sea of oily wastes from ships is also prohibited by numerous treaties.

Disposal into rivers and lakes by other land-based sources[78]

The disposal of wastes into rivers and lakes is prohibited or regulated by many bilateral and multilateral treaties. Such prohibition and regulation is either intended to protect the environmental quality of freshwater resources or to protect the quality of seas and oceans by limiting the transportation of waste pollutants by rivers and estuaries into the seas and oceans and other land-based

[68] 1985 Rarotonga Treaty, Art. 7; 1986 Noumea Convention, Art. 10(1).

[69] 1991 Bamako Convention, Art. 4(2), which also prohibits disposal in the seabed and subseabed. See also OAU Council of Ministers Resolution, Dumping of Nuclear and Industrial Waste in Africa, 23 May 1988, 28 ILM 567 (1989).

[70] Chapter 9, pp. 425–6 above. [71] Chapter 9, pp. 420–1 above.

[72] Ministerial Declaration of the Second International Conference on the Protection of the North Sea, 25 November 1987, para. 22(a); OSCOM Decision 89/1, June 1989. The UK agreed to end such dumping by the end of 1992 with an extension to 1993 'only if absolutely necessary on technical grounds and excluding new dumping licences': Third North Sea Ministerial Declaration, para. 18 (1990).

[73] OSCOM Decision 89/1 on the Reduction and Cessation of Dumping Industrial Wastes at Sea (1989). The Decision creates exceptions for inert materials of natural origin and industrial wastes for which it can be shown that there are no practical alternatives on land, and that the materials cause no harm in the marine environment: para. 1.

[74] OAU Council of Ministers Resolution, Dumping of Nuclear and Industrial Waste in Africa, 23 May 1988, 28 ILM 567 (1989).

[75] Third North Sea Ministerial Declaration, paras. 14 and 15 (1990). See also Brussels Agreement on the Implementation of a European Project on Pollution, on the Topic 'Sewage Sludge Processing', 23 November 1971, 12 ILM 9 (1973).

[76] OSPAR Convention, Art. 3(2)(c).

[77] Third North Sea Ministerial Declaration, paras. 19–22 (1990); see also the Dredged Material Assessment Framework adopted in 1995 under the London Convention (Res. LC52.18) and the 1998 OSPAR Guidelines for the Management of Dredged Material (Agreement 1998-20).

[78] Chapter 10, pp. 468–[illegible]

sources of pollution.[79] The EC has adopted specific legislation on the treatment and disposal of urban waste water and municipal waste.[80]

Incineration

The incineration of wastes is limited by treaty and acts of international institutions in several regions and, in the case of the EC, subject to conformity with stringent technical standards. Incineration of marine waste at sea has been banned in the North Sea since 31 December 1991,[81] and in the former 1974 Oslo Convention area by the same date.[82] The 1992 OSPAR Convention prohibits incineration at sea.[83] In November 1990, parties to the 1972 London Convention agreed to 're-evaluate incineration at sea of noxious liquid wastes as early in 1992 as possible with a view to proceeding towards the termination of this practice by 31 December 1994'.[84] The re-evaluation was to take into account the practical availability of safer and environmentally more acceptable land-based alternatives, and in the meantime parties were not to export such wastes intended for incineration at sea or allow their disposal in other ways harmful to the environment.[85] In fact the incineration at sea of such wastes ceased at the end of 1990 with the decommissioning of the last incineration vessel. The *de facto* situation was formally confirmed by amendments to the 1972 London Convention in February 1994 prohibiting the incineration of industrial wastes and sewage sludge at sea, and requiring special permits for the incineration of other types of wastes.[86] The 1996 Protocol to the 1972 London Convention prohibits the incineration of wastes at sea, though this agreement is yet to come into force. The 1991 Bamako Convention prohibits the incineration of hazardous waste at sea.[87]

Land-based incineration of waste is currently dealt with only by EC legislation,[88] although it is considered to be a sufficiently hazardous activity to warrant mandatory environmental impact assessment under the relevant

[79] Chapter 9, pp. 427–38 above.

[80] Chapter 15, pp. 776–8 below; see also UNEP Environmental Guidelines for Domestic Wastewater Management, 1988 UNEP EMG No. 14.

[81] See Third North Sea Ministerial Declaration, para. 23 (1990).

[82] See chapter 9, pp. 423–5 above; OSCOM Decision 90/2 on the Termination of Incineration at Sea, 23 June 1990, para. 1. The Decision repealed Decision 88/1 on the Termination of Incineration at Sea by 31 December 1994.

[83] Chapter 9, pp. 425–6 above.

[84] Res. LDC.39(13), Status of Incineration of Noxious Liquid Wastes at Sea, para. 1. See also Res. LDC.35(11) on the Status of Incineration of Noxious Liquid Wastes at Sea, and Res. LDC.33(11) on Revised Interim Technical Guidelines on Incineration of Wastes and Other Matter at Sea. See also 1972 London Convention, 1978 London Amendments on Incineration of Wastes and Other Matter at Sea, 12 October 1978, not yet in force.

[85] Para. 2. [86] Annex I, para. 10. [87] Art. 4(2).

[88] Directive 2000/76/EC on the incineration of waste, chapter 15, pp. 765–6 below.

environmental practice', including the use of 'clean technology'.[123] The Convention also requires parties to apply the precautionary and polluter-pays principles.[124]

The five OSPAR Convention Annexes adopt commitments on pollution from land-based sources, dumping or incineration, offshore sources, and other sources, on the assessment of the quality of the marine environment and on the protection and conservation of the ecosystems and biological diversity of the maritime area.[125] The Convention promotes scientific and technical research, settlement of disputes and, for the first time in an international treaty, rules on the right of access to environmental information.[126] A Commission (the OSPAR Commission) comprising a representative from each party is established to supervise the implementation of the Convention; review the condition of the maritime area and the effectiveness of measures adopted and priorities; and draw up programmes and measures, including economic instruments.[127] Unlike its predecessors, the OSPAR Commission may adopt legally binding decisions as well as non-binding recommendations: to establish flexibility these rules and recommendations may apply different timetables 'having regard to the differences between ecological and economic conditions' in the various regions and sub-regions covered by the Convention.[128] Apart from receiving reports from the parties, the Commission may, at the request of a party, consider transboundary pollution which is likely to prejudice the interests of a party and make recommendations to reach a solution.[129] It will also be required to assess compliance and call for steps to bring about full compliance, including measures to assist a party to carry out its obligations.[130] These new powers imply extended functions for the permanent secretariat.[131] Parties undertake and publish regular joint assessments of the quality of the marine environment, including the effectiveness of measures taken and planned on the basis of monitoring, modelling, remote sensing and progressive risk assessment strategies.[132] The role

[123] Art. 2(3)(b). 'Clean technology' is not defined; but see the 1991 Bamako Convention, at chapter 13, pp. 695–6 below.

[124] Art. 2(2)(a) and (b); chapter 6 above. [125] Arts. 3–7.

[126] Arts. 8, 9 and 32; chapter 17, p. 849 below; on the *Ireland* v. *United Kingdom*, OSPAR arbitral tribunal, award pending, see chapter 16, pp. 806–7 below.

[127] Art. 10.

[128] Arts. 10(3), 13 and 24. Decisions and recommendations are adopted by unanimous vote unless unanimity is not attainable, in which case a three-quarters majority vote of parties will suffice: Art. 13(2).

[129] Arts. 21(2) and 22. [130] Art. 23. [131] Art. 12.

[132] Art. 6 and Annex IV, Art. 2. 'Monitoring' is defined as 'the repeated measurement of: (a) the quality of the marine environment and each of its compartments, that is, water, sediments and biota; (b) activities or natural and anthropogenic inputs which may affect the quality of the marine environment; (c) the effects of such activities and inputs': Annex IV, Art. 1(1).

of the OSPAR Commission includes implementing collaborative monitoring programmes and carrying out assessments.[133]

The Ministerial Meeting which adopted the 1992 OSPAR Convention endorsed an Action Plan for the Paris and Oslo Commissions,[134] which included examples of 'best available techniques' and/or 'best environmental practice' for particular industrial activities,[135] and the reduction of pollutants from diffuse sources with specific targets and timetables.[136] The 1998 Ministerial Meeting of the OSPAR Commission adopted strategies to direct its future work in four main areas: protection and conservation of ecosystems and biological diversity; hazardous substances; radioactive substances; and eutrophication. The relationship between the 1982 UNCLOS and the 1992 OSPAR Convention is currently the subject of litigation between Ireland and the UK, in the *MOX* case.[137]

Baltic Sea

B. Johnson, 'The Baltic Conventions', 25 ICLQ 1 (1976); B. Boczek, 'International Protection of the Baltic Sea Environment Against Pollution: A Study in Marine Regionalism', 72 AJIL 782 (1978); M. Fitzmaurice, *The International Legal Aspects of the Environmental Protection of the Baltic Sea* (1992); M. Fitzmaurice, 'The 1992 Convention on the Baltic Sea Environment', 2 RECIEL 24 (1993); U. K. Jenisch, 'The Baltic Sea: The Legal Regime and Instruments for Co-operation', 11 IJMCL 47 (1996); R. Platzoder and P. Verlaan, *The Baltic Sea: New Developments in National Policies and International Co-operation* (1997); M. Fitzmaurice, 'The Helsinki Conventions 1974 and 1992', 13 IJMCL 379 (1998); J. Ebbesson, 'A Critical Assessment of the 1992 Baltic Sea Convention', 43 GYIL 38 (2000).

The geography and marine ecology of the Baltic Sea has contributed to the environmental degradation resulting from unchecked industrialisation. It is a relatively closed sea with only limited inflows of water past the Danish and Swedish coasts, further aggravated by the fact that much of it is covered by ice in the winter months. Although some of the Baltic Sea coastal states have stringent environmental standards (Denmark, Sweden, Finland and Germany), others have only recently begun to tighten their standards but are hampered by the limited availability of funds (Estonia, Latvia, Lithuania, Russia and Poland). Pollution from the wider catchment area, including the Czech Republic and

[133] Annex IV, Art. 3.

[134] See Final Declaration of the Ministerial Meeting of the Oslo and Paris Commissions, 22 September 1992, LDC 15/INF.11, Annex 2, 2 October 1992, Part III.

[135] Action Plan, Appendix A lists the following industries: energy production from fossil fuel, fertiliser production, foundries, mining, non-ferrous metal industry, pharmaceuticals, other organic chemicals, primary aluminium, primary iron and steel, pesticides and biocides, pulp and paper, refineries, secondary iron and steel, shipyards, surface treatment of metals, tanneries, textiles and waste incineration.

[136] Appendix B. [137] P. 436 below.

Slovakia, has exacerbated environmental problems. In this context, the original 1974 Convention failed to fulfil its aims. The objective of the 1974 Convention on the Protection of the Marine Environment of the Baltic Sea Area (1974 Baltic Convention), which has now been superseded by the 1992 Baltic Convention, was to 'prevent and abate pollution and to protect and enhance the marine environment of the Baltic Sea Area' while seeking to prevent an increase in pollution outside that area.[138] The 1974 Baltic Convention included general commitments to prevent pollution from land-based sources, ships, dumping and exploration and exploitation of the seabed and its subsoil.[139] Additionally, the parties undertook 'to counteract the introduction, waterborne or otherwise' into the Baltic Sea of hazardous substances specified in Annex I,[140] and to 'strictly limit pollution by noxious substances and materials in accordance with Annex II by requiring the discharge of significant quantities to be subject to a prior special permit.[141] The parties were also to control pollution from other harmful substances by attaining the Annex II goals and criteria for the prevention of land-based pollution, particularly from municipal sewage, industrial wastes, and discharge of cooling water from nuclear power plants.[142] Three further Annexes addressed substances carried on ships (Annex IV), exceptions to the general provision on dumping of waste and other matters (Annex V), and co-operation in combating marine pollution (Annex VI).

The administering body for the 1974 (and now the 1992) Convention is the Baltic Marine Environment Protection Commission (HELCOM), which has met annually (twenty-one times) since the 1974 Convention entered into force. HELCOM's functions include observing the implementation of the Convention, making recommendations on measures, including amendments to the Convention and its Annexes, and defining pollution control criteria and objectives for the reduction of pollution, and objectives concerning measures.[143] Decisions of the Commission, including recommendations, are taken by unanimity unless provided otherwise in the Convention.[144]

The inadequacies of the 1974 Convention, which did not prevent massive pollution of the Baltic Sea leading to more than 100,000 square kilometres being described as 'totally dead',[145] led to the adoption of a new Convention in

[138] www.helcom.fi; Helsinki, 22 March 1974, in force 3 May 1980; 13 ILM 546 (1974), Art. 3(1) and (2). For the text as amended by the amendments adopted by the Helsinki Commission in 1983, 1987, 1989 and 1990 see OJ C222, 18 August 1993, 15 (appended to the text of an EC Commission proposal for EC accession to the Convention).

[139] Arts. 6–10.

[140] Art. 5; HELCOM Recommendation 4/1 added one additional substance (PCTs) to Annex I, 18 February 1983.

[141] Art. 6(2) and (3). [142] Art. 6(6).

[143] 1992 Baltic Convention, Art. 20. [144] 1992 Baltic Convention, Art. 19(5).

[145] *Financial Times*, 14 July 1993, 14: dangerous concentrations include nitrogen and phosphorus, sewage effluents, toxic substances (PCBs, DDT, chlorine, mercury, lead and cadmium) and chemical weapons dumped after the Second World War.

1992. The 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area (1992 Baltic Sea Convention)[146] replaces the 1974 Convention and enlarges the Convention area by including internal waters. The 1992 Convention includes new definitions and provisions on: fundamental principles and obligations; notification and consultation; environmental impact assessment; nature conservation and biodiversity; reporting and exchange of information; and public information.

The 1992 Convention amends the six Annexes to the 1974 Convention and adds a new Annex VII on the prevention of pollution from offshore activities. Parties must, individually or jointly, take measures to 'prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance'.[147] They must apply the precautionary principle and the polluter-pays principle, promote the use of best environmental practice and best available technology, and use best endeavours to ensure that implementation of the Convention does not cause transboundary pollution in areas beyond the Baltic Sea or lead to other 'unacceptable environmental strains'.[148] The Convention applies to the water-body and the seabed, including each party's territorial sea and internal waters, but not to ships and aircraft used for the time being only on governmental, non-commercial service.[149]

These general commitments and principles are supplemented by specific obligations. The parties are required to prevent and eliminate pollution by harmful substances from all sources under Annex I, which sets out general principles, and identifies banned substances and pesticides.[150] Pollution from land-based sources is to be prevented and eliminated in accordance with Annex III,[151] and pollution from ships is subject to the measures required by Annex IV.[152] Incineration is prohibited, as is dumping, subject to exemptions for dredged material and safety.[153] The exploration and exploitation of the seabed and its subsoil are also regulated.[154]

Implementation of these commitments is assisted by a range of techniques. The Convention requires notification to the Commission, and consultations

[146] Helsinki, 9 April 1992, in force 17 January 2000; LDC.2/Circ.303, 10 August 1992; 10 states are party.

[147] Art. 3(1).

[148] Art. 3(2) to (4) and (6). Annex II establishes Criteria for the Use of Best Environmental Practice and Best Available Technology.

[149] Art. 4. [150] Art. 5; Annex I.

[151] Art. 6. Annex III contains three Regulations relating to: general provisions; specific requirements governing, *inter alia*, municipal water sewage, industrial plant water management, industrial waters; and principles for issuing permits.

[152] Art. 8. Annex IV contains Regulations on co-operation, assistance in investigations, and definitions, and requires parties to apply the provisions of the Annexes of MARPOL 73/78, subject to the Regulation on sewage.

[153] Arts. 10 and 11 and Annex V. [154] Art. 12 and Annex VI.

between parties, whenever an environmental impact assessment of a proposed activity that is likely to cause a significant adverse impact on the marine environment is required by international law or supra-national regulations.[155] The Convention contains provisions on pleasure craft, notification and consultation on pollution incidents, co-operation in combating marine pollution, reporting requirements, and public information on the condition of the Baltic Sea, measures taken or planned, permits issued, sampling results, and water quality objectives.[156] It requires the parties to 'conserve natural habitats and biological diversity and to protect ecological processes' to ensure the sustainable use of natural resources.[157]

Pollution by dumping

R. N. Duncan, 'The 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes at Sea', 5 *Journal of Maritime Law and Commerce* 299 (1974); J. A. Rogers, 'Ocean Dumping', 7 *Environmental Law* 1 (1976); K. W. Goering, 'Mediterranean Protocol on Land-Based Sources: Regional Response to a Pressing Transnational Problem', 13 *Cornell International Law Journal* 269 (1980); G. Winter, 'The Implementation of the Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft', 3 *Zeitschrift fur Umweltpolitik* 707 (1980); P. Bliss-Guest, 'The Protocol Against Pollution from Land-Based Sources: A Turning Point in the Rising Tide of Pollution', 17 *Stanford Journal of International Law* 261 (1981); C. E. Curtis, 'Legality of Seabed Disposal of High-Level Radioactive Waste under the London Dumping Convention', 14 *Ocean Development and International Law* 383 (1985); M. A. Zeppetello, 'National and International Regulation of Ocean Dumping: The Mandate to Terminate Marine Disposal of Contaminated Sewage Sludge', 12 *Ecology Law Quarterly* 619 (1985); L. Kramer, 'Le Déversement des déchêts en mers et le droit Communautaire', 318 *Revue de Marché Commun* 36 (1988); E. McCann, 'Terminating Ocean Dumping of Municipal Sewage Sludge: a Political Solution to an Environmental Problem', 9 *Temple Environmental Law and Technology Journal* 69 (1990); D. Susman, 'Regulation of Ocean Dumping by the European Economic Community', 18 *Ecology Law Quarterly* 559 (1991); E. Hey, 'Hard Law, Soft Law, Emerging International Law and Ocean Disposal Options for Nuclear Waste', 40 *Netherlands International Law Review* 405 (1993); R. J. Baird, 'Ocean Dumping – An Overview of the International and Domestic Regulatory System', 15 *Environmental and Planning Law Journal* 174 (June 1998); L. de la Fayette, 'The London Convention 1972: Preparing for the Future', 13 IJMCL 515 (1998); E. A. Kirk, 'OSPAR Decision 98/3 and the Dumping of Offshore Installations', 48 ICLQ 458 (1999).

Pollution by dumping, which accounts for approximately 10 per cent of pollution of the marine environment, is addressed by two international agreements

[155] Art. 7(1) and (2). [156] Arts. 9, 13, 14 and 16–18. [157] Art. 15.

of global application and at least six regional agreements. Of these instruments, the 1982 UNCLOS establishes broad principles, and detailed regulations are set out at the global level by the 1972 London Convention.

UNCLOS

UNCLOS requires states to adopt laws and regulations to prevent, reduce and control dumping, which laws may not be less effective than global rules and standards, and to establish global and regional rules, standards and recommended practices and procedures.[158] In general, dumping in accordance with such laws and regulations must not be carried out without the permission of the relevant state authority, and dumping within the territorial sea and the EEZ or on the continental shelf must not be carried out without the express prior approval of the coastal state after due consideration of the matter with states which may be adversely affected.[159]

1972 London Convention

The 1972 London Convention (known as the London Dumping Convention until 1992) is an instrument of global application to all marine waters other than internal waters, which has attracted the support of seventy-eight parties including forty-three developing countries.[160] The objective is to 'prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea', and to encourage the development of regional agreements.[161] Dumping is defined by Article III of the Convention as

1. any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; or
2. any deliberate disposal at sea of vessels, aircraft, platforms or other man-made structures at sea.

This does not include 'the disposal at sea of wastes or other matter incidental to, or derived from, the normal operations of' man-made structures and their equipment at sea, other than wastes or other matter transported by or to man-made structures at sea operating for the purpose of disposal of such matter or related to offshore activities arising from the exploitation, exploration or

[158] Art. 210(1), (4) and (6). 'Dumping' is defined similarly to the 1972 London Convention: Art. 1(1)(5).
[159] Art. 210(3) and (5). [160] www.londonconvention.org; Art. III(3).
[161] Arts. I and VIII. On regional agreements, see below.

processing of seabed mineral resources.[162] Under Article III, 'wastes or other matters' are broadly defined as 'material and substance of any kind, form or description'.

Central to the 1972 London Convention are the rules which prohibit or regulate the dumping of waste. Three categories of wastes are established, each of which is subject to specific obligations. The dumping of highly hazardous waste substances listed in Annex I (the 'black list') is prohibited, except in emergency situations and after consultation with countries likely to be affected, and with the IMO.[163] The prohibition does not apply to Annex I substances which are rapidly rendered harmless by physical, chemical or biological processes in the sea, provided that they do not make edible marine organisms unpalatable or endanger human health or that of domestic animals.[164] Nor does the prohibition apply to the dumping of trace contaminants.[165] The dumping of Annex II 'special care' substances and wastes (the 'grey list') requires a prior 'special' permit.[166] The dumping of all other wastes requires a prior 'general' permit.[167] Exceptions to the rules of the London Convention concerning dumping are provided for in relation to the safety of human life and vessels, and emergency situations where unacceptable risk is posed to human health and no other solution is possible.[168] The Convention does not apply to vessels and aircraft entitled to sovereign immunity under international law, although each party must ensure that they act consistently with the Convention.[169]

[162] Art. III(1)(a) and (b). Cf. the definitions in the 1972 Oslo Dumping Convention, p. 423 below; and the 1992 OSPAR Convention, p. 425 below. On the issues arising in relation to the disposal of the *Brent Spar* oil platform in 1995, see S. Mankabady, 'Decommissioning of Offshore Oil Installations', 28 *Journal of Maritime Law and Commerce* 603 (1997).

[163] Art. IV(1)(a). Annex I, as amended in 1978, 1980 and 1993, includes organohalogen compounds, mercury and its compounds, cadmium and its compounds, persistent plastics and other persistent synthetic materials, crude oil and its waste and petroleum products, high-level radioactive wastes or matter, and materials produced for biological and chemical warfare. See also Guidelines for Allocation of Substances to the Annexes to the London Convention, Resolution LDC.31(11) (LDC 11/14, Annex 3).

[164] Annex I, para. 8 (see Resolution LDC 24(10), Guidelines for the Implementation of Paragraphs 8 and 9 of Annex I to the London Dumping Convention (LDC 10/15, Annex 3)).

[165] Annex I, para. 10. See Regulations for the Control of the Incineration of Wastes and other Matter at Sea, Addendum to Annex I. Para. 10 and the Addendum were adopted as amendments by the third consultative meeting of the contracting parties in 1978.

[166] Art IV(1)(b). Annex II, as amended in 1978 and 1980, includes wastes containing significant amounts of hazardous substances (e.g. arsenic, lead, copper, fluorides, pesticides not covered by Annex I, etc.), large quantities of acids and alkalis, bulky wastes, radioactive wastes not in Annex I, and certain other non-toxic substances.

[167] Art. IV(1)(c).

[168] Art. V. See Interim Procedures and Criteria for Determining Emergency Situations (LDC V/12, Annex 5).

[169] Art. VII(4).

'Special' and 'general' permits are granted by national authorities, for matter intended for dumping which is loaded in its territory, or loaded by a vessel or aircraft registered in its territory, or flying its flag when the loading occurs in the territory of a non-party.[170] The grant of 'special' and 'general' permits must comply with Annex III, which requires criteria to be taken into account in deciding whether a permit should be granted (the characteristics and composition of the matter and of the dumping site and method of deposit, and other general considerations and conditions including possible effects on amenities, marine life and other uses of the sea, and the practical availability of alternative methods of treatment, disposal or elimination).[171] National authorities must keep detailed records of all matter permitted to be dumped, and monitor the condition of the seas, and parties must report this and other information to the IMO.[172] In theory, this should allow the international community to determine what is being dumped. In practice, reporting requirements are not fully complied with, and there is considerable evidence of large-scale unauthorised dumping by nationals of parties in violation of the London Convention.

The 1972 London Convention also requires collaboration between parties on training, research and monitoring and methods for disposal and treatment of waste, to develop procedures to assess liability and the settlement of disputes, and the promotion of measures to protect the marine environment against pollution from specific sources (such as hydrocarbons and radioactive pollutants).[173] The Convention is administered by consultative meetings of the parties, which are responsible for keeping under review the implementation of the Convention, amending it and the Annexes, ensuring the availability of relevant scientific and technical information, receiving the parties' reports, and developing and adopting procedures and criteria for determining exceptional and emergency situations.[174] Consultative Meetings are held annually in London at the IMO, and secretariat functions are provided by the IMO, which was designated in 1975 as the competent organisation.[175] Amendments to the Convention are adopted by a two-thirds majority of those parties present, and they enter into force for parties accepting them sixty days after two-thirds of them have done so.[176] Amendments to Annexes are also adopted by two-thirds majority of those present, and enter into force for all parties except those which

[170] Art. VI(1)(a) and (b) and (2).

[171] Art. VI(3) and Annex III, as amended in 1989. Resolution LDC 32(11), Amendments to the Guidelines for the Application of Annex III (LDC 11/14, Annex 4).

[172] Art. VI(1)(c) and (d). On notification of permits, see Procedure for the notification of permits issued for the dumping of wastes and other matter at sea (LDC 12/16, Annex 2).

[173] Arts. IX, X, XI and XII.

[174] Art. XIV. See Resolution LDC 10(v), Procedures for Preparation and Consideration of Amendments to Annexes to the London Dumping Convention (LDC V/12, Annex 3).

[175] Art. XIV(2).

[176] Art. XV(1)(a). The only amendments so far adopted are the 1978 Amendments on Dispute Settlement, which have not yet entered into force; Resolution LDC 6(III).

declare they are unable to accept an amendment within 100 days of the approval of the amendment.[177] Other resolutions adopted by the Consultative Meetings are not formally binding.

Twenty-three Consultative Meetings of the parties have been held so far, adopting resolutions on a wide range of matters. Consultative Meetings agreed to a moratorium on the dumping of radioactive wastes at sea,[178] and to limit, regulate or prohibit *inter alia*:

- the export of wastes for disposal at sea;[179]
- the disposal of persistent plastics and other persistent synthetic materials;[180]
- the disposal of dredged materials;[181]
- waste incineration at sea;[182]
- the disposal of radioactive wastes into the seabed;[183]
- the disposal at sea of industrial wastes;[184] and
- the application of the precautionary principle.[185]

The Consultative Meetings have established several subsidiary bodies, including a Scientific Group on Dumping and an Ad Hoc Legal Group of Experts, which discussed issues including: the relationship between the London Convention and the Antarctic Treaty regime; the control of dumping by ships flying the flag of a party in the waters of a non-party; the development of a liability regime; and a further interpretation of the definition of dumping.[186] The parties to the London Convention established a Steering Group to identify future directions under the Convention, and at the fourteenth and fifteenth meetings the parties discussed the possible amendment of the London Convention to incorporate new trends and thinking, including the formal incorporation of several past resolutions. Areas identified as subjects for amendment included the extension of the Convention to include the sub-seabed and internal waters, a ban on the

[177] Art. XV(2).

[178] Resolution LDC 21(9) (1985); the parties agreed to a suspension of all dumping at sea of radioactive waste until the completion of studies and assessments required by the resolution (see also the earlier Resolution LDC 14(7) (1983)). Following completion of these studies, the parties agreed in 1993 to amend Annexes I and II to the Convention to ban the dumping of all radioactive wastes (Res. LDC 51(16)). The prohibition entered into force on 20 February 1994.

[179] Res. LDC 29(10) (1986). [180] Res. LDC 22(9) (1985).

[181] Res. LDC 23(10) (1986). The eighteenth consultative meeting adopted a 'Dredged Material Assessment Framework' by Res. LC 52(18) (1995).

[182] Res. LDC 5(111) (1981), Addendum to Annex I to the LDC. IMO, Revised Interim Technical Guidelines on the Control of Incineration of Wastes and Other Matter at Sea, Res. LDC 33(11) (1988); and Res. LDC 35(11) (1988). In early 1991, incineration at sea operations came to a halt, ahead of the agreed global deadline of 31 December 1992.

[183] Res. LDC 41(13) (1990).

[184] Res. LDC 43(13) (1990); under the resolution, the parties agree to cease dumping industrial waste by 31 December 1995 at the latest.

[185] Res. LDC 44(14) (1991).

[186] 2 *Yearbook of International Environmental Law* 148–9 (1991), LDC 14/INF.34.

dumping of radioactive and industrial wastes, and the formal adoption of the precautionary principle.

In 1993, the parties commenced a detailed review of the London Convention, leading initially to the adoption of a number of amendments to Annexes I and II. These amendments incorporated previous resolutions concerning prohibitions on dumping industrial wastes, radioactive wastes and other radioactive matter, as well as the prohibition on incineration at sea of industrial wastes and of sewage sludge. In 1996, this review was completed with the adoption of the 1996 Protocol to the London Convention,[187] which is expected to enter into force in late 2003 and will then replace the London Convention. Two issues were particularly controversial in negotiations for the 1996 Protocol: the dumping of radioactive waste at sea, and the sub-seabed disposal of radioactive wastes.

Radioactive waste dumping[188]

As adopted in 1972, the London Convention included high-level radioactive wastes (HLW) in Annex I, but intermediate-level radioactive wastes (ILW) and low-level radioactive wastes (LLW) were listed in Annex II and therefore could be dumped at sea by 'special' permit. Its subsequent transformation is illustrative of law-making in the international environmental field. In 1983, three proposals were put forward at the seventh Consultative Meeting. Nauru and Kiribati proposed an amendment to the London Convention to include all radioactive wastes in Annex I. Five Nordic countries put forward an alternative proposal whereby the dumping of all radioactive wastes at sea would be phased out by 1990. Spain proposed an immediate moratorium on all radioactive waste dumping at sea. Resolution 14(7) adopted the Spanish proposal by nineteen votes in favour, with six against and five abstentions. Two years later, in 1985, the Consultative Meeting adopted Resolution 21(9), which provided for an indefinite moratorium to 'permit time for . . . a broader basis for an informed judgment on proposals' and to allow additional studies to be made of the wider political, legal, economic and social aspects of radioactive waste dumping at sea. That resolution was adopted by twenty-six votes in favour, with five against and seven abstentions, and since 1985 no state has formally permitted the dumping of radioactive wastes at sea, although unlawful dumping may have occurred. Following the 1985 moratorium, the parties to the London Convention established an Intergovernmental Panel of Experts on Radioactive Wastes (IGPRAD) to address some of these issues, and IGPRAD produced its final report in November 1993.[189] IGPRAD identified seven options which were presented to the consultative parties at their sixteenth meeting:

[187] London, 7 November 1996, not yet in force; 36 ILM 1 (1997).

[188] See C. Curtis, 'The London Convention and Radioactive Waste Dumping at Sea: A Global Treaty Regime in Transition' conference paper delivered at Woods Hole Oceanographic Institute, Massachusetts, US, 7–9 June 1993.

[189] Res. LDC 28(10), Studies and Assessments Pursuant to Resolution LDC 21(9).

1. to lift the moratorium and allow the disposal at sea of LLW under IAEA and London Convention rules;
2. to lift the moratorium and allow the disposal at sea in accordance with amended and strengthened international rules;
3. to link action on radioactive waste to the phase-out of industrial waste dumping by 1995 as provided for by Resolution 43(13);
4. to continue a limited or indefinite moratorium;
5. to develop a new consultative procedure to govern the disposal at sea of radioactive wastes;
6. to amend the London Convention to prohibit disposal of all radioactive wastes; and
7. to prohibit the disposal of radioactive waste by amending the London Convention, while allowing certain countries to opt out of the prohibition after an agreed period of time has passed (following the approach of the 1991 Antarctic Environment Protocol and the 1992 OSPAR Convention).[190]

In the meantime, Agenda 21 called on all states to encourage

> the London Convention to expedite work to complete studies on replacing the current voluntary moratorium on disposal of low-level radioactive wastes at sea by a ban, taking into account the precautionary approach . . .[191]

In November 1993, the sixteenth Consultative Meeting adopted amendments to Annex I prohibiting the disposal of all radioactive wastes at sea.[192]

Sub-seabed disposal of radioactive wastes

In 1983, the issue of sub-seabed disposal of radioactive wastes was raised for the first time at a consultative meeting. This form of disposal, which remains under consideration by several states, would allow HLW to be injected under the seabed from a platform or vessel to a great enough depth to stop radioactive material from being released into the marine environment. The relevant issue is whether such disposal is covered by the London Convention. A special legal experts meeting was unable to reach consensus on the point, although the eighth Consultative Meeting, in 1984, apparently agreed that the London Convention was the appropriate international forum to address the matter, and that:

> No such disposal should take place unless and until it is proven to be technically feasible and environmentally acceptable, including a determination that such waste can be effectively isolated from the marine environment,

[190] See pp. 425–6 below, and chapter 14, pp. 721–6 below. [191] Agenda 21, para. 22.5(b).
[192] Res. LDC 51(16) Concerning Disposal at Sea of Radioactive Wastes and other Radioactive Matter. The amendment was adopted with thirty-seven votes in favour, none against, and seven abstentions, and entered into force in 1994 (not for the Russian Federation, which on 18 February 1994 submitted a declaration of non-acceptance of these amendments).

> and a regulatory mechanism is elaborated in accordance with the provisions of the London Convention to govern disposal into the seabed of such radioactive wastes.[193]

A minority of parties remain opposed to sub-seabed disposal being interpreted as a form of 'disposal at sea'. In 1990, the thirteenth Consultative Meeting adopted a resolution which stated that sub-seabed disposal of LLW into repositories accessed from the sea would be covered by the 1983–5 moratorium.[194] Agenda 21 called on states to:

> [n]ot promote or allow the storage or disposal of high-level, intermediate-level or low-level radioactive wastes near the marine environment unless they determine that the scientific evidence, consistent with the applicable internationally agreed principles and guidelines, shows that such storage or disposal poses no unacceptable risk to people and the marine environment or does not interfere with other legitimate uses of the sea, making, in the process of consideration, appropriate use of the concept of the precautionary principle.[195]

1996 Protocol

Upon its entry into force, the 1996 Protocol will replace the 1972 London Convention. Twenty-six ratifications or other expressions of consent by states are required before the Protocol will enter into force; and at least fifteen of these must come from contracting parties to the London Convention.[196] At present, fifteen states have ratified the Protocol. The objective of the 1996 Protocol is to 'protect and preserve the marine environment from all sources of pollution' and, to this end, contracting parties are required to take effective measures to prevent, reduce and where practicable eliminate marine pollution caused by dumping or incineration at sea.[197] In respect of internal waters, each contracting party has a discretion either to apply the provisions of

[193] *Report of the 8th Consultative Meeting of the LC* (1984), 31, cited in Curtis, *The London Convention.*

[194] Res. LDC 41(13), adopted with twenty-nine votes in favour, four against and four abstentions.

[195] Agenda 21, para. 22.5(c). In April 1997, the United Kingdom Government rejected an application by a UK company (NIREX) for permission to construct a 'rock characterisation facility' to explore the feasibility of establishing a long-term storage facility for radioactive waste in proximity to, and possibly under, the Irish Sea (Letter from the Director of Infrastructure and Planning, Government Office for North West, UK, to UK Nirex, 17 March 1997). In reaching his decision, the United Kingdom Secretary of State for the Environment noted and agreed with the planning inspector's conclusions, which had noted, *inter alia*, para. 22.5(c) of Agenda 21, and stated that he was 'acutely aware of the Government's obligations to other states which are set out in various international obligations in respect of the sea and the environment more generally'.

[196] 1996 Protocol, Art. 25(1).

[197] *Ibid.*, Art. 2.

the Protocol or to adopt 'other effective permitting and regulatory measures to control the deliberate disposal of wastes or other matter' where such disposal would be 'dumping' or 'incineration at sea' within the meaning of the Protocol.[198]

The purpose of the Protocol is similar to that of the Convention, but the Protocol is more restrictive: application of a 'precautionary approach' to environmental protection from dumping of wastes or other matter is included as a general obligation;[199] a 'reverse list' approach is adopted whereby contracting parties are required to prohibit the dumping of 'any wastes or other matter' with the exception of those listed in Annex 1, which require a permit;[200] incineration of wastes at sea is prohibited;[201] and the export of wastes or other matter to other countries for dumping or incineration at sea is banned.[202] The Protocol includes extended technical co-operation and assistance provisions,[203] as well as a commitment to develop procedures for assessing and promoting compliance with the Protocol within two years of its entry into force.[204] Article 26 of the Protocol makes provision for a transitional period to allow new contracting parties to phase in compliance with the Protocol over a period of five years, provided certain conditions are met.

1972 Oslo Convention

The first regional agreement to regulate and prohibit dumping at sea, predating by several months the London Convention, was the 1972 Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (1972 Oslo Dumping Convention).[205] The Oslo Convention applied to the north-east Atlantic Ocean, including the North Sea, but not the Baltic and Mediterranean Seas.[206] As amended, the definition of 'dumping' was broader than UNCLOS and the 1972 London Convention and included:

> any deliberate disposal into the sea, including through the medium of incineration at sea, of substances and materials by or from ships or aircraft other than:
> (a) any discharge or incineration incidental to or derived from the normal operation of ships and aircraft and their equipment;
> (b) the placing of substances and materials for a purpose other than mere disposal thereof, if not contrary to the aim of the Convention.[207]

[198] *Ibid.*, Art. 7(2). [199] *Ibid.*, Art. 3(1). [200] *Ibid.*, Art. 4(1) and (2).
[201] *Ibid.*, Art. 5. [202] *Ibid.*, Art. 6. [203] *Ibid.*, Art. 13. [204] *Ibid.*, Art. 11.
[205] Oslo, 15 February 1972, in force 7 April 1974, 932 UNTS 3; amended by Protocol of 2 March 1983, in force 1 September 1989; the Oslo Dumping Convention was replaced by the 1992 OSPAR Convention upon the latter's entry into force in 1998.
[206] Art. 2.
[207] Art. 19(1), as amended. 'Incineration' was defined as 'any deliberate combustion of substances and materials at sea for the purpose of their thermal destruction': Art. 19(2).

A 1983 amendment introduced incineration into the definition. Subject to certain exceptions, the dumping of Annex I substances was prohibited, and the dumping of waste containing substances and materials listed in Annex II was required to be authorised by national authorities with a specific permit in accordance with the provisions of Annexes II and III. No substance or material could be dumped without the approval of national authorities, which approval had to apply the conditions set out in Annex III.[208] Annex IV, adopted in 1983, established Rules of Incineration at Sea: the incineration of substances for which 'practical alternative land-based methods of treatment, disposal or elimination are available' was prohibited, and guidance was provided as to which substances and materials could be the subject of an incineration permit.[209] Annex IV also required approval of incineration systems, permits and operational requirements, the recording of data, and a prohibition on the disposal of wastes from the facility except by means of the incinerator during naval operation.[210] The Annex required a prior consultation procedure and established criteria for the selection of incineration sites.[211] Annex III included permit conditions which were required to take into account the waste's characteristics and the dumping site and method of deposit, interference with legitimate uses of the sea, and the practical availability of alternative means of disposal and elimination. National authorities were required to ascertain the waste's composition in accordance with Annex III before permits or approval were granted, and to keep and transmit to the Commission established under the Convention detailed records relating to permits or approvals.[212] Other measures provided for scientific and technical co-operation, monitoring, and additional measures for specific pollutants.[213]

The Convention was administered by a Commission (OSCOM), which exercised overall supervision over its implementation, received and considered reports from parties, and kept under review the Annexes. The Commission could also recommend amendments, additions or deletions, which were adopted by unanimous vote and entered into force after unanimous approval by the parties.[214] OSCOM met annually between 1974 and 1998 and adopted a large

[208] Arts. 5, 6 and 7. Exceptions under Arts. 8 and 9 included cases of *force majeure* threatening the safety of human life or of a ship or aircraft, where substances occur as trace contaminants not added for the purposes of dumping, and emergencies. Arts. 5, 6 and 7 did not apply to disposal by incineration at sea, which was generally prohibited and could only be allowed with a specific permit granted by national authorities in accordance with Annexes III and IV: Art. 8(3). See OSCOM Decision 85/1 (1985) concerning Annexes I and II to the Convention.

[209] Annex IV, Rule 2(1) and (4). Permissible substances were organohalogen compounds, pesticides and certain of their by-products, substances and materials not listed in Annexes I and II which could be incinerated without damage to the marine environment, and certain wastes containing these substances.

[210] Annex IV, Rules 3–7. [211] Annex IV, Rules 8 and 9. [212] Arts. 10 and 11.

[213] Arts. 12. 13 and 14. [214] Arts. 16, 17 and 18(2).

number of resolutions and recommendations. Of particular note are those relating to the export of wastes for disposal at sea[215] and establishing guidelines for the disposal of offshore installation.[216] In 1989, OSCOM agreed to cease dumping of industrial wastes in the North Sea by 31 December 1989 and in other Convention waters by 31 December 1995, except for inert materials of natural origin and industrial wastes for which there were 'no practical alternatives on land' and where 'the materials cause no harm in the marine environment'.[217] In 1990, the parties agreed to phase out the dumping of sewage sludge by the end of 1998,[218] and to terminate all incineration at sea by 31 December 1991.[219]

1992 OSPAR Convention

The 1972 Oslo Convention was replaced by the 1992 OSPAR Convention, which came into force on 25 March 1998. The 1992 OSPAR Convention incorporates many of the earlier treaty's resolutions and decisions into treaty obligations. Under Annex II to the 1992 Convention, the parties must prevent and eliminate pollution by dumping or incineration of wastes or other matter,[220] and pollution from the abandonment of vessels or aircraft as a result of accidents.[221] The OSPAR Convention adopts an expanded definition of dumping as:

(i) any deliberate disposal in the maritime area of wastes or other matter
  (1) from vessels or aircraft;
  (2) from offshore installations;
(ii) any deliberate disposal in the maritime area of
  (1) vessels or aircraft;
  (2) offshore installations and offshore pipelines.[222]

The 1992 OSPAR Convention reverses the traditional approach to defining waste: 'wastes or other matter' includes everything except human remains, offshore installations, offshore pipelines and unprocessed fish and offal discarded from vessels.[223]

[215] OSCOM Recommendation 88/1 (1988).
[216] OSCOM, Guidelines for the Disposal of Offshore Installations at Sea, The Hague, 12 June 1991.
[217] OSCOM Decision 89/1 (1989); and Report on Justification for the Issue of Permits for the Dumping of Industrial Wastes at Sea (OSCOM, 1989).
[218] OSCOM Decision 90/1 (1990). [219] OSCOM Decision 90/2 (1990).
[220] Art. 4 and Annex II. [221] Annex II, Art. 8.
[222] Art. 1(f). See also the exclusions from the definition, including disposal under MARPOL 73/78 or other applicable international law, placement of matter for a purpose other than mere disposal, and for the purposes of Annex III the 'leaving wholly or partly in place of a disused offshore installation or disused offshore pipeline, provided that any such operation takes place in accordance with any relevant provision of the Convention and with other relevant international law': Art. 1(g).
[223] Art. 1(o).

Annex II prohibits the incineration and dumping of all wastes or other matter, except for those expressly excluded by the Annex.[224] The Annex permits, subject to authorisation or regulation, the dumping of dredged material, certain inert material of natural origin, sewage sludge (until 31 December 1998), fish waste from industrial fish processing operations, and vessels or aircraft (until 31 December 2004).[225] However, authorisation will not be granted for the dumping of vessels or aircraft containing substances which result or are likely to result in harm or interference with other legitimate uses of the sea.[226] The OSPAR Convention further prohibits the 'placement' of matter in the maritime area for a purpose other than that for which it was originally designed without authorisation or regulation.[227]

Annex II also prohibits the dumping of low- and intermediate-level radioactive substances, including wastes.[228] However, the United Kingdom and France, desiring to retain the option of dumping these radioactive substances, negotiated an exception to the rule which left the way open for them to resume dumping after 1 January 2008.[229] However, before 2008, the OSPAR Commission could decide unanimously not to continue the exception granted to the United Kingdom and France.[230] On 9 February 1999, the OSPAR Commission adopted Decision 98/2 on Dumping of Radioactive Waste, as a result of which the exceptions granted to the United Kingdom and France have ceased to have effect.

UNEP Regional Seas Protocols

Three UNEP Regional Seas Protocols require parties to prevent dumping from ships and aircraft: the 1976 Barcelona Dumping Protocol, the 1986 Noumea Dumping Protocol, and the 1989 Paipa Dumping Protocol, each of which applies to the same geographic area as defined by their respective framework Conventions.[231] They use the same definitions as the 1972 London Convention[232] and similarly provide for three categories of substances: except in emergency

[224] Annex II, Arts. 2 and 3(1). The Annex does not apply to the deliberate disposal of wastes or other matter from offshore installations or the disposal of offshore installations and offshore pipelines: Art. 1. Art. 7 provides further exceptions on the grounds of, *inter alia*, *force majeure*, stress and safety. Art. 10(3) provides that the Annex does not 'abridge the sovereign immunity to which certain vessels are entitled under international law'.

[225] Annex II, Arts. 3(2) and 4(1). Authorisations and regulation must be in accordance with the criteria, guidelines and procedures adopted by the Commission under Art. 6 of Annex II: *ibid.*, Art. 4(1)(b).

[226] Annex II, Art. 4(2). [227] Annex II, Art. 5.

[228] Annex II, Art. 3(3)(a). [229] Annex II, Art. 3(3)(b). [230] Art. 3(3)(c).

[231] 1976 Barcelona Convention, Art. 2; 1986 Noumea Dumping Convention, Art. 2; 1989 Paipa Dumping Convention, Art. 1.

[232] 1976 Barcelona Convention, Art. 3(2), (3) and (4); 1986 Noumea Convention, Art. 2(b) and (c).

or exceptional cases those listed in Annex I cannot be dumped; Annex II substances can only be dumped after a 'special' permit has been granted by the competent national authorities; and the dumping of all other wastes requires a prior 'general' permit from the competent national authorities.[233] The Protocols require the reporting of incidents or conditions giving rise to suspicions that dumping is taking place.[234] Special and general permits must be issued for wastes loaded in the territory of the party or by a ship or aircraft registered in its territory or flying its flag when the loading occurs in the territory of a non-party, after taking account of the factors set out in Annex III.[235] Meetings of the parties to the Protocols ensure review of the implementation of the Protocols, the review and amendment of the Annexes, and the consideration of the records of permits issued.[236] Amendments to the Annexes to the Protocols require a three-fourths majority vote of the parties.[237]

Other regional agreements

Prohibitions on dumping have also been adopted by the EC[238] and in relation to the Antarctic region.[239] The 1985 Rarotonga South Pacific Nuclear Free Zone Treaty prohibits the dumping of radioactive waste and radioactive matter at sea anywhere within the South Pacific Nuclear Free Zone.[240]

Pollution from land-based sources including through the atmosphere

R. Busby, 'The Convention for the Prevention of Marine Pollution from Land-Based Sources: An Effective Method for Arbitrating International Effluent Pollution Disputes', 5 *California Western International Law Journal* 350 (1975); S. Burchi, 'International Legal Aspects of Pollution of the Sea from Rivers', 3 *Italian Yearbook of International Law* 115 (1977); J. E. Hickey, 'Custom and Land-Based Pollution of the High Seas', 15 *San Diego Law Review* 409 (1978); B. Kwiatowska, 'Marine Pollution from Land-Based Sources: Current Problems and Prospects', 14 *Ocean Development and International Law* 315 (1984); P. S. Passman, 'Japanese

[233] 1976 Barcelona Protocol, Arts. 4, 5, 6, 8 and 9; 1986 Noumea Dumping Protocol, Arts. 4, 5, 6, 9 and 10 (radioactive waste dumping is prohibited by the 1986 Noumea Convention).

[234] 1976 Barcelona Protocol, Art. 12; 1986 Noumea Dumping Protocol, Art. 14.

[235] 1976 Barcelona Protocol, Arts. 7 and 10(2); 1986 Noumea Dumping Protocol, Arts. 7 and 11(2) (in addition, Art. 8 and Annex IV provide for specific criteria for the allocation of substances to the Annexes).

[236] 1976 Barcelona Protocol, Art. 14; 1986 Noumea Dumping Protocol, Art. 16.

[237] 1976 Barcelona Protocol, Art. 14(3); 1986 Noumea Dumping Protocol, Art. 16(3).

[238] Chapter 15, pp. 768–78 below.

[239] Chapter 14, p. 725 below.

[240] Rarotonga, 6 August 1985, in force 11 December 1986, 24 ILM 1142 (1985), twelve states are party.

Hazardous Waste Policy: Signalling the Need for Global and Regional Measures to Control Land-Based Sources of Pollution', 26 *Virginia Journal of International Law* 921 (1986); P. Szell, 'The Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources', 37 *International Digest of Health Legislation* 391 (1986); D. Baur and S. Iudicello, 'Stemming the Tide of Marine Debris Pollution: Putting Domestic and International Control Authorities to Work', 17 *Ecology Law Quarterly* 71 (1990); R. M. M'Gonigle, '"Developing Sustainability" and the Emerging Norms of International Environmental Law: The Case of Land-Based Marine Pollution', 128 *Canadian Yearbook of International Law* 169 (1990); M. Berman, 'Protection of the Marine Environment from Land-Based Activities', in UNEP, *UNEP's New Way Forward: Environmental Law and Sustainable Development* (1995); A. Nollkaemper, 'Balancing the Protection of Marine Ecosystems with Economic Benefits from Land-Based Activities', 27 *Ocean Development and International Law* 153 (1996); D. A. Ring, 'Sustainability Dynamics: Land-Based Marine Pollution and Development Priorities in the Island States of the Commonwealth Caribbean', 22 *Columbia Journal of Environmental Law* 65 (1997); M. Pallemaerts, 'The North Sea and Baltic Sea Land-Based Sources Regimes: Reducing Toxics or Rehashing Rhetoric?', 13 IJMCL 421 (1998); T. Mensah, 'The International Legal Regime for the Protection and Preservation of the Marine Environment from Land Based Sources', in A. Boyle and D. Freestone (eds.), *International Law and Sustainable Development* (1999), 297.

Pollution of the marine environment from land-based sources is the principal source of ocean pollution, which arises from two general sources. First, it arises from substances and energy entering the marine environment by run-off from land, rivers, pipelines and other outfall structures, which accounts for some 44 per cent of all marine pollution.[241] Secondly, it arises from or through the atmosphere, generated principally from land-based activities but also from ships and aircraft, which accounts for some 33 per cent of marine pollution. The importance of land-based sources is emphasised in Agenda 21.[242] Rules are to be found in the 1982 UNCLOS (establishing one of the causes of action for Ireland's claim against the United Kingdom in respect of the MOX plant),[243] the 1974 Paris Convention and the 1992 OSPAR Convention; three UNEP Regional Seas Protocols;[244] the 1974 and 1992 Baltic Conventions; numerous non-binding international instruments; and EC Directives.[245] The 1995 Global Programme of Action for the Protection of the Marine Environment from Land-Based

[241] On the relationship between watercourse laws and the protection of oceans, see A. E. Boyle, 'The Law of the Sea and International Watercourses: An Emerging Cycle', 14 *Marine Policy* 151 (1990).

[242] See p. 456 below. [243] See p. 455 below.

[244] Two further Protocols dealing with land-based sources of pollution have been concluded for the Caribbean (1999) and Black Sea regions but are not yet in force.

[245] Chapter 15, pp. 768–78 below.

Activities (GPA) also provides for the development of national measures, and facilitates a comprehensive, multi-sectoral approach to the issue of pollution from land-based sources. Other treaties and international agreements to limit atmospheric pollution, as identified in chapter 8 above, also indirectly protect the marine environment.

UNCLOS

Article 207 of UNCLOS requires states to 'prevent, reduce and control pollution of the marine environment from land-based sources, including rivers, estuaries, pipelines and outfall structures'. States must take into account: internationally agreed rules, standards and recommended practices and procedures; characteristic regional features; the economic capacity of developing countries and their need for economic development; and the need 'to minimise, to the fullest extent possible, the release of toxic, harmful or noxious substances, especially those which are persistent, into the marine environment'.[246] In the context of the wide support for these principles in regional and global agreements and instruments, as set out below, the principles of Article 207 now reflect rules of customary international law. It should be recalled that these provisions are general in character, their detailed obligations being informed by the content of applicable and relevant international rules, whether global or regional.

1995 Global Programme of Action (GPA)

The GPA, and an accompanying Declaration,[247] were adopted by 108 states and the EC at a conference held in Washington from 23 October to 3 November 1995. The GPA drew upon relevant provisions of Chapters 17, 33 and 34 of Agenda 21 and the Rio Declaration on Environment and Development, as well

[246] Art. 207(1), (4) and (5).

[247] Washington, DC, 1 November 1995. In the Declaration, participating states declared their commitment to protect and preserve the marine environment from the impacts of land-based activities – specifically those resulting from sewage, persistent organic pollutants, radioactive substances, heavy metals, oils, nutrients, sediment mobilisation, litter, and physical alteration and destruction of habitat. The states pledged to undertake various activities to further this common goal including: the development or review of national action programmes; taking forward action to implement national programmes; co-operating to build capacities and mobilise resources for the development and implementation of such programmes; taking immediate preventive and remedial action, wherever possible; promoting access to cleaner technologies, knowledge and expertise; co-operating on a regional basis to co-ordinate efforts for maximum efficiency and to facilitate action at the national level; encouraging and/or making available external financing; giving priority to the treatment and management of waste water and industrial effluents; and acting to develop a global, legally binding instrument dealing with persistent organic pollutants.

as the 1985 Montreal Guidelines on the Protection of the Environment Against Pollution from Land-Based Sources (1985 Montreal LBS Guidelines).[248]

The GPA, which is administered by a UNEP-led GPA Co-ordination Office, provides the framework for the realisation of the commitments agreed to by states in the Washington Declaration. It aims at 'preventing the degradation of the marine environment from land-based activities by facilitating the realization of the duty of States to preserve and protect the marine environment', and is designed to assist states 'in taking actions individually or jointly within their respective policies, priorities and resources, which will lead to the prevention, reduction, control and/or elimination of the degradation of the marine environment, as well as to its recovery from the impacts of land-based activities'.[249] The GPA recommends actions at the state, regional and international level to address the problem of marine pollution from land-based activities. At the national level, these recommendations relate to the identification and assessment of problems, the establishment of priorities for action, setting management objectives for priority problems, identifying, evaluating and selecting strategies and measures to achieve objectives and developing criteria to assess the effectiveness of strategies and measures.[250] At the regional level, states are encouraged to strengthen, and where necessary create, regional co-operative arrangements and joint actions to support effective national action, strategies and programmes.[251] Internationally, the GPA seeks to develop institutional arrangements, and facilitate capacity-building and the mobilisation of financial resources.[252] The GPA also calls upon the Executive Director of UNEP, in close partnership with other international organisations, to prepare a proposal setting forth a specific plan for addressing the global nature of the problems related to the inadequate management and treatment of waste water. The GPA also records agreement on the need for international action to develop a global, legally binding instrument dealing with persistent organic pollutants.[253] The final chapter of the GPA provides specific guidance to states and regional organisations concerning recommended objectives and actions for addressing particular sources of land-based pollution, namely, sewage, persistent organic pollutants, radioactive substances, heavy metals, oils (hydrocarbons), nutrients, sediment, litter, and habitat destruction and alteration.[254]

1974 Paris Convention

The first treaty to establish detailed rules on land-based sources of marine pollution was the 1974 Paris Convention, agreed on to protect the marine

[248] 24 May 1985, UNEP/GC/DEC/13/1811.
[249] 5 December 1995, UNEP(OCA)/LBA/IG.2/7, 7.
[250] *Ibid.*, Chapter II. [251] *Ibid.*, Chapter III.
[252] *Ibid.*, Chapter IV. [253] *Ibid.*, paras. 86 and 88. [254] *Ibid.*, Chapter V.

environment of the North East Atlantic by supplementing the 1972 Oslo Convention.[255] The Convention has now been replaced by the 1992 OSPAR Convention. The Paris Convention defined marine pollution from land-based sources as pollution of the maritime area:

1. through watercourses;
2. from the coast, including introduction through underwater or other pipelines; and
3. from man-made structures placed under the jurisdiction of a contracting party within the limits of the area to which the Convention applies.[256]

The 1986 amendment added to this definition a fourth source: emissions 'into the atmosphere from land or from man-made structures as defined in [paragraph 3] above'.[257] Parties were required to adopt programmes and measures to eliminate pollution of the maritime area from land-based sources by substances listed in Part I of Annex A,[258] and to limit strictly pollution by substances listed in Part II of Annex A, which were to be discharged only after approval by national authorities.[259] These programmes and measures were to 'take into account the latest technical developments', within time limits, and to allow for measures to reduce unlisted substances if scientific evidence 'established that a serious hazard may be created in the maritime area by that substance and if urgent action is necessary'.[260]

The parties were also required to 'adopt measures to forestall and, as appropriate, eliminate pollution of the maritime area' by radioactive substances listed in Part III of Annex A, taking into account the recommendations of international organisations and agencies and their monitoring procedures.[261] These relatively specific commitments were supplemented by general obligations: to

[255] Paris, 4 June 1974, in force 5 October 1976; Preamble; amended 26 March 1986 to allow the EC to become a party; OJ L24, 27 January 1987, 49.

[256] Art. 3(c). The Paris Convention covered the North-East Atlantic excluding the Baltic Sea and the Mediterranean Sea: Art. 2.

[257] 1986 Amendment, Art. I.

[258] Art. 4(1)(a) and 4(2)(a). Part I substances were included because they are not readily degradable or naturally rendered harmless, and are dangerous to the food chain, the marine ecosystem or legitimate uses of the sea, and necessitate urgent action. Listed substances included organohalogen compounds and substances, mercury and mercury compounds, cadmium and cadmium compounds, certain persistent synthetic materials, and persistent oils and hydrocarbons: Annex A, Part I.

[259] Art. 4(1)(b) and 4(2)(b); substances listed in Part II were those which had similar characteristics to those listed in Part I but which were less noxious or more readily rendered harmless by natural processes, and included certain organic compounds of phosphorus, silicon and tin, elemental phosphorus, non-persistent oils and hydrocarbons, arsenic, chromium, copper, lead, nickel and zinc, and other substances agreed by PARCOM to have a deleterious effect on the taste or smell of marine products for human consumption: Annex A, Part II.

[260] Art. 4(3) and (4). [261] Art. 5.

reduce existing pollution from land-based sources and forestall new pollution from such sources; to avoid increasing pollution elsewhere through implementation of the Convention; to allow parties to take more stringent measures; to consult, establish scientific research programmes and exchange information; to establish a permanent monitoring system; and to co-operate to prevent incidents leading to pollution from land-based sources.[262]

The Paris Convention was administered by PARCOM, comprising representatives of each party, which met annually to supervise implementation; examine the feasibility of, and draw up, programmes and measures under Article 4; and make recommendations to amend the substances listed in Annex A.[263] PARCOM was competent to adopt certain *binding* programmes, measures and decisions by unanimity. Where unanimity was unattainable, any decision had to be adopted by three-quarters majority vote of its members, in which case the programme, measure or decision was only binding for those members voting for it or subsequently deciding expressly to accept the programme or measure, which they were free to do at any time.[264] PARCOM's recommendations for amendments to Annex A, adopted by a three-quarters majority vote of its members, entered into force for all parties unless one of them notified the depositary government in writing within 200 days of its adoption that it could not approve an amendment.[265]

Between 1978 and 1998, PARCOM met annually and adopted a large number of recommendations and decisions, some of which were very detailed and specific. In 1988, the parties agreed not to construct new nuclear reprocessing installations, or substantially to increase the capacity of existing installations, unless they could ascertain, following an environmental impact assessment, that such facilities did not cause radioactive pollution.[266] The parties also agreed to keep the recommendations of international organisations and apply 'best available technology' to minimise and eliminate pollution from radioactive discharges into the marine environment.[267] Other PARCOM recommendations addressed: the principle of precautionary action;[268] the use of best available technology;[269] and the phasing-out and destruction of all identifiable polychlorinated biphenyls (PCBs) by 1995 and the end of 1999 at the latest for Iceland and for North Sea parties, and by 2005 and by the end of 2010 at the latest for the other parties.[270] In 1991, PARCOM agreed that the disposal of

[262] Arts. 6–11, 13 and 17. [263] Arts. 15 and 16. [264] Art. 18(3). [265] Art. 18(4).
[266] PARCOM Recommendation 88/4 (1988).
[267] PARCOM Recommendation 88/5 (1988); and PARCOM Recommendation 90/2 (1990) on Reporting on Progress in Applying the Best Available Technology on Radioactive Discharges from All Nuclear Industries. PARCOM Recommendation 91/4 (1991) consolidated Recommendations 88/5 and 90/3 into a single Recommendation and establishes guidelines.
[268] PARCOM Recommendation 89/1 (1989).
[269] PARCOM Recommendation 89/2 (1989); PARCOM Recommendation 90/1 (1990).
[270] PARCOM Decision 90/4 (1990).

radioactive wastes in repositories constructed in bedrock under the seabed and accessed from land 'constituted a potential land-based source of marine pollution' and that PARCOM had competence to consider such developments.[271]

In 1987, PARCOM decided that the Convention did not need to be amended to provide expressly for environmental impact assessment, and that PARCOM had the authority to agree to measures on environmental impact assessment regarding projects involving the discharge of substances, but that the legal basis for agreeing on legally binding decisions regarding assessments for projects with impacts of a physical nature was unclear. PARCOM concluded that it should consider the implementation of the 1985 EC Directive on Environmental Impact Assessment, but that there was no need at the present time to formally include environmental impact assessments in the framework of the Paris Convention.[272] Nevertheless, the subject of environmental impact assessment, and related issues, continued to be controversial. PARCOM Recommendation 93/5, adopted at the fifteenth joint meeting of the Oslo and Paris Commissions in June 1993, illustrated the extent to which international organisations now address specific issues such as the authorisation of individual plants. PARCOM Recommendation 93/5 was adopted in the context of the proposed authorisation by the United Kingdom of a spent nuclear fuel reprocessing facility (THORP) on the north-west coast of England at Sellafield. No environmental impact assessment had been carried out because the plant had been subject to a planning enquiry in 1977 and subsequent authorisation before the adoption of the EC Environmental Impact Assessment Directive.[273] Concerned about the apparent unwillingness of the United Kingdom to require an environmental assessment, certain countries, including neighbouring Ireland and non-neighbouring Denmark, raised the matter at PARCOM. Recommendation 93/5 was adopted with the support of nine parties, representing the necessary three-quarters majority, since only three parties (Belgium, France and the United Kingdom) entered reservations against it. The parties to PARCOM agreed:

1. to adopt further measures, including the application of best available techniques for the reduction or elimination of inputs of radioactive substances to the maritime area;
2. that a new or revised discharge authorisation for radioactive discharges from nuclear reprocessing installations should only be issued by national authorities if special consideration is given to:

[271] PARCOM Recommendation 91/5 (1991). The Recommendation rejected the idea that such disposal constituted 'dumping'; cf. the discussion concerning seabed disposal under the 1972 London Convention, at pp. 416–21 above.

[272] Paris Commission, *Procedures and Decisions Manual*, D3/87, Environmental Impact Assessment; reprinted in D. Freestone and T. Ijlstra (eds.), *The North Sea: Basic Legal Documents on Regional Environmental Co-operation (1991)*, 148; on the EC Directive and environmental impact assessment in general, see chapter 16 below.

[273] Chapter 16, pp. 807–11 below.

(a) information on the need for spent fuel reprocessing and on other options;
(b) a full environmental impact assessment;
(c) the demonstration that the planned discharges are based upon the use of the best available techniques and observe the precautionary principle; and
(d) a consultation with the Paris Commission on the basis of (a), (b) and (c) above.

Recommendation 93/5 is not binding, although this does not preclude the possibility that it might reflect existing obligations under the Paris Convention. The United Kingdom gave precise reasons for not supporting the Recommendation:

> the United Kingdom reservation made was because the first limb of the recommendation made no progress beyond the commitment in the 1992 action plan, while the second limb both was too vague to provide a proper basis for a PARCOM recommendation and, insofar as it provided for a role for the Paris Commission in the decision process, was inappropriate.[274]

These reasons themselves raised further questions, both of a substantive nature (was PARCOM precluded from adopting recommendations on matters previously dealt with in a similar manner?) and of an institutional nature (was PARCOM precluded from participating in decision-making processes of this type?).

1992 OSPAR Convention

Under the terms of the 1992 OSPAR Convention, the parties are required to prevent and eliminate pollution from land-based sources, including accidents.[275] The definition of 'land-based sources' includes point and diffuse sources on land from which substances or energy reach the maritime area by water, through the air or from the coast; moreover, it specifically includes:

> sources associated with any deliberate disposal under the sea-bed made accessible from land by tunnel, pipeline or other means and sources associated with man-made structures placed, in the maritime area under the jurisdiction of a contracting party, other than for the purpose of offshore activities.[276]

Programmes and measures require the use of best available techniques for point sources and best environmental practice for point and diffuse sources, using the

[274] Minister for the Environment and Countryside, *Hansard*, 30 June 1993, Written Answers, col. 524. On the 1992 Action Plan, see above.
[275] Art. 3; and Annex I, Art. 1(3). [276] Art. 1(e); cf. pp. 421–2 above.

criteria in Appendix 2 to the Convention.[277] The adoption of such programmes and measures is mandatory for certain substances,[278] and measures for radioactive substances, including waste, must take account of the recommendations of other international organisations.[279] Under Annex I, all discharges into the maritime area, and releases into water or air which reach and may affect the maritime area, must be authorised or regulated and be subject to a system of regular monitoring to assess compliance.[280]

The parties to the OSPAR Convention subsequently agreed to more stringent commitments, particularly in relation to the disposal of radioactive wastes. By a 1998 Ministerial Declaration, the parties agreed:

> to prevent pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances, with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances.[281]

They further agreed to ensure that:

> discharges, emissions and losses of radioactive substances are reduced by the year 2020 to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

At the same meeting, the contracting parties adopted a strategy for the purposes of directing the future work of the OSPAR Commission with regard to radioactive substances, to put into effect the requirements of the 1998 OSPAR

[277] Annex I, Art. 1(1) and (2). The criteria listed in Appendix 2 include persistency, toxicity, bioaccumulation, radioactivity, the effect of concentrations, the risk of eutrophication, transboundary significance, the risk of undesirable change in the marine ecosystem and irreversibility or durability of effects, interference with legitimate uses of the sea, effects on the taste and/or smell of products for human consumption from the sea, or effects on smell, colour, transparency or other characteristics of the water in the marine environment, distribution patterns, and non-fulfilment of environmental quality objectives: Appendix 2, para. 1.

[278] Substances which shall be the subject of programmes include heavy metals, organohalogen compounds, organic compounds of phosphorus and silicon, biocides, oils, nitrogen and phosphorus compounds, radioactive substances including wastes, and persistent synthetic materials: Appendix 2, para. 3.

[279] Annex I, Art. 1(4).

[280] Annex I, Art. 2. The OSPAR Commission is required to draw up plans to reduce and phase out certain hazardous substances and to reduce inputs of nutrients from urban, municipal, industrial, agricultural and other sources: Art. 3.

[281] In achieving this objective, the following issues would, *inter alia*, be taken into account: legitimate uses of the sea; technical feasibility; and radiological impacts on man and biota.

Ministerial Declaration.[282] In 2000, the OSPAR Commission adopted a Decision requiring parties to review (as a matter of priority) current authorisations for discharges or releases of radioactive substances from nuclear reprocessing facilities, with a view to implementing the non-reprocessing option (for example, dry storage) for spent nuclear fuel management at appropriate facilities, and taking preventive measures to minimise the risk of pollution by accidents.[283] These commitments are the subject of litigation in the *MOX* case between Ireland and the UK.[284]

UNEP Regional Seas Protocols

Four UNEP Regional Seas Protocols address land-based pollution: the 1980 Athens LBS Protocol, the 1983 Quito LBS Protocol, the 1990 Kuwait LBS Protocol and the 1992 Black Sea LBS Protocol.[285] The four Protocols follow the same general approach and structure as the 1974 Paris Convention, obliging parties to eliminate pollution through the development of programmes and measures, including common emission standards and standards for use.[286]

Parties must prohibit the discharge of 'black list' substances listed in Annex I, based on their high level of toxicity, persistence and bioaccumulation, and strictly limit the less noxious substances listed in Annex II ('grey list' substances). The discharge of grey list substances must be authorised, taking account of the characteristics and composition of waste, the discharge site and the receiving marine environment, the availability of waste technologies, and the potential impairment of marine ecosystems and sea-water uses.[287]

[282] Strategies were also adopted on hazardous substances, to combat eutrophication, on the protection and conservation of the ecosystems and biological diversity of the maritime area, and on environmental goals and management mechanisms for offshore activities.

[283] Decision 2000/1 on Substantial Reductions and Elimination of Discharges, Emissions and Losses of Radioactive Substances, with Special Emphasis on Nuclear Reprocessing, in force 16 January 2001 (France and the United Kingdom abstained from the vote); see also OSPAR Decision 2001/1 on the Review of Authorisations for Discharges or Releases of Radioactive Substances from Nuclear Reprocessing Activities.

[284] Chapter 17, p. 807 below.

[285] A further LBS Protocol (1999) has been concluded under the 1983 Cartagena Convention, but is yet to come into force.

[286] 1980 Athens LBS Protocol, Arts. 5 and 6; 1983 Quito LBS Protocol, Arts. IV and V (the obligation being slightly less onerous by requiring parties, respectively, to 'endeavour to prevent, reduce, control and eliminate' and to 'endeavour progressively to reduce').

[287] 1980 Athens LBS Protocol, Art. 6(3) and Annex III; 1983 Quito LBS Protocol, Arts. IV and V and Annex III.

Each Protocol adopts a similar definition of land-based pollution,[288] and provides for: co-operation on guidelines and standards; the systematic assessment of pollution levels and evaluation of the effectiveness of measures; the exchange of scientific and other information and co-ordination of research; technical assistance for developing countries; co-operation where watercourses flow through the territories of two or more countries; and consultations where land-based pollution originating in the territory of one party is prejudicing the interests of another.[289] Reviewing the implementation of the Protocols, revision and amendments of Annexes, and other functions are performed by meetings of the parties to the Protocols.[290] Under the 1980 Athens LBS Protocol, decisions on programmes and measures are adopted by two-thirds majority vote, and parties unable to accept a programme or measure must inform the meeting of the parties about the action they intend to take.[291] The 1983 Quito LBS Protocol, however, merely grants the parties the power to 'examine' the need to amend or revise the Protocol and its Annexes and formulate programmes and measures.[292]

Atmospheric pollution

A significant proportion of pollution from or through the atmosphere generally originates from land-based sources. Under Article 212 of UNCLOS, all states must 'prevent, reduce and control pollution of the marine environment, from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels or aircraft of their registry'. The 1992 OSPAR Convention, the 1992 Baltic Convention, the 1980 Athens LBS Protocol, the 1983 Quito LBS Protocol and the 1990 Kuwait LBS Protocol include pollution through the atmosphere as a land-based source.[293] In 1991, the parties to the 1980 Athens LBS Protocol adopted a new Annex IV to the Protocol which defines the application of the Protocol to land-based sources of pollution transported through the atmosphere, including the compilation of data on sources, on effects and on the effectiveness of existing measures.[294] None of these provisions establishes its own programmes or standards; instead, they incorporate by reference 'internationally agreed rules, standards and recommended practices

[288] 1980 Athens LBS Protocol, Art. 4(1) (includes direct and indirect land-based sources, atmospheric sources, and fixed man-made offshore structures other than for exploration and exploitation of the seabed); 1983 Quito LBS Protocol, Art. II (not including fixed man-made offshore structures).

[289] 1980 Athens LBS Protocol, Arts. 7–13; 1983 Quito LBS Protocol, Arts. VI to XII.

[290] 1980 Athens LBS Protocol, Art. 14.

[291] 1980 Athens LBS Protocol, Art. 15. [292] Art. XV.

[293] 1992 OSPAR Convention, Art. 1(e); 1992 Baltic Convention, Art. 2(2); 1980 Athens LBS Protocol, Art. 4(1)(b); 1983 Quito LBS Protocol, Art. II(c).

[294] 2 *Yearbook of International Environmental Law* 128 at 136 (1991).

and procedures'.[295] Prior to UNCLOS, the only international instrument of significance was the 1963 Test Ban Treaty, which has protected the marine environment from atmospheric nuclear tests.[296]

Pollution from vessels

Y. Dinstein, 'Oil Pollution from Ships and Freedom of the High Seas', 3 *Journal of Maritime Law and Commerce* 363 (1971–2); A. W. Anderson, 'National and International Efforts to Prevent Traumatic Vessel Source Pollution', 30 *University of Miami Law Review* 985 (1976); R. M. M'Gonigle and M. W. Zacher, *Pollution, Politics and International Law: Tankers at Sea* (1979); P. S. Dempsey and L. L. Hellings, 'Oil Pollution by Vessels – An Environmental Tragedy: The Legal Regime of Flags of Convenience, Multilateral Conventions and Coastal States', 10 *Denver Journal of International Law and Policy* 37 (1980); J. Kindt, 'Vessel Source Pollution and the Law of the Sea', 17 *Vanderbilf Journal of Transnational Law* 287 (1984); D. W. Abecassis and R. L. Jarashow, *Oil Pollution from Ships* (1985, 2nd edn); P. Hagen, 'The International Community Confronts Plastics Pollution from Ships: MARPOL Annex V and the Problem that Won't Go Away', 5 *American University Journal of International Law and Policy* 425 (1990); D. Bodansky, 'Protecting the Marine Environment from Vessel-Source Pollution: UNCLOS III and Beyond', 18 *Ecology Law Quarterly* 719 (1991); T. Alcock, 'Ecology Tankers and the Oil Pollution Act of 1990: A History of Efforts to Require Double Hulls on Oil Tankers', 19 *Ecology Law Quarterly* 97 (1992); Y. Sasamura, 'Prevention and Control of Marine Pollution from Ships,' 25 *Proceedings of the Law of the Sea Institute* 306 (1993); R. Mitchell, *International Oil Pollution at Sea* (1994); W. Chao, *Pollution from the Carriage of Oil by Sea: Liability and Compensation* (1996); G. F. Little, 'The Hazardous and Noxious Substances Convention: A New Horizon in the Regulation of Marine Pollution', *Lloyd's Maritime and Commercial Law Quarterly* 554 (November 1998); C. de la Rue and C. Anderson, *Shipping and the Environment* (1998); G. Gauci, 'Protection of the Marine Environment Through the International Ship-Source Oil Pollution Compensation Regimes', 8 RECIEL 29 (1999).

Pollution from vessels is caused by operational discharges from ships, such as cleaning of tanks or de-ballasting, or from discharges following accidents. This source is estimated to account for about 12 per cent of the total, but has a high public profile due to the visibility and obvious environmental consequences of incidents, particularly involving oil spills, in the past twenty-five years, and most recently the oil spill following the *Prestige* accident.[297] The prevention

[295] 1982 UNCLOS, Art. 212(1); on regional and global rules, see pp. 395–9 above.
[296] See chapter 12, pp. 649–51 below. [297] See n. 21 above.

of pollution from vessels is an objective addressed mainly by UNCLOS and MARPOL 73/78.

UNCLOS

Under Article 211 of UNCLOS, states must establish international rules and standards to prevent, reduce and control pollution of the marine environment from vessels, and adopt routing systems to minimise the threat of accidents which might cause such pollution. They must also adopt national laws for vessels flying their flag or of their registry which 'at least have the same effect as that of generally accepted international rules and standards'.[298] This commits all states to ensuring that their national law complies with, at a minimum, standards generally accepted under international law. Without prejudice to the right of innocent passage, states can establish, individually or as part of co-operative arrangements, special rules for the prevention, reduction and control of vessel pollution as a condition for entry into ports or internal waters of foreign vessels, provided they are given 'due publicity' and are communicated to international organisations.[299] States may also adopt laws to combat vessel pollution from passage of foreign vessels in their territorial seas, including those exercising the right of innocent passage.[300] With respect to their EEZ, states may for the purposes of enforcement adopt laws and regulations which conform to and give effect to generally accepted international rules and standards.[301] Additionally, for a defined area of the EEZ, states may, with the agreement of the competent international organisation, adopt 'special mandatory measures for the prevention of pollution from vessels' which implement international rules, standards or navigational practices made applicable by that organisation for special areas; this right is limited to a defined area of the EEZ as 'required for recognised technical reasons in relation to its oceanographical and ecological conditions, as well as its utilisation or the protection of its resources and the particular character of its traffic'.[302] Additional laws and regulations for the same area relating to discharges or navigational practices (but not design, construction, manning or equipment standards other than generally accepted international rules and standards) may be adopted by states with the agreement of a competent international organisation.[303]

[298] Art. 211(1) and (2).

[299] Art. 211(3); see e.g. EC Council Directive 95/21/EC establishing a system of port state control based on uniform inspection and detention procedures, OJ L157, 7 July 1995, 1; and amendments by Council Directive 2001/106/EC, OJ L19, 22 January 2002, 17.

[300] Art. 211(4). [301] Art. 211(5).

[302] Art. 211(6)(a); see generally IMO, Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas, Res. A.720(17), 6 November 1991.

[303] Art. 211(6)(c).

MARPOL 73/78

The main international convention regulating pollution from vessels is MARPOL 73/78, which was first adopted at the International Conference on Marine Pollution convened by the IMO in 1973 to replace the 1954 Oil Pollution Convention. MARPOL 1973, the original treaty,[304] was modified by the 1978 Protocol (MARPOL 1978).[305] The modified convention is known as the International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 relating thereto, and is usually referred to as MARPOL 73/78. The detailed rules on pollution from ships are set out in six Annexes to the Convention. Further clarifications to various provisions of MARPOL 73/78 have been adopted by the IMO Marine Environment Protection Committee (MEPC) in the form of resolutions setting out unified and authoritative interpretations or amendments to the Convention. MARPOL 73/78 has attracted widespread support, although the Annexes have received less support and two have not yet entered into force.

MARPOL 73/78 establishes specific international regulations to implement the objective of completely eliminating intentional pollution of the marine environment by oil and other harmful substances and minimising accidental discharges. Needless to say, that objective has not yet been accomplished, even though the substantive obligations are among the most precise and comprehensive in any international environmental agreement. The parties agree to give effect to the provisions of the Convention which includes, unless expressly provided otherwise, the Protocols and Annexes.[306] MARPOL 73/78 establishes a framework for the adoption of the regulations in the Annexes, and sets out basic definitions. 'Harmful substances' include:

> any substance which, if introduced into the sea, is likely to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.[307]

[304] International Convention for the Prevention of Pollution from Ships, London, 2 November 1973, 12 ILM 1319 at 1434 (1973); 125 states are parties to MARPOL 73/78 or its Annexes I and II; 107 states are parties to Annex III; 91 states are parties to Annex IV; 112 states are parties to Annex V.

[305] Protocol Relating to the 1973 International Convention for the Prevention of Pollution from Ships, London, 17 February 1978, in force 2 October 1983, 17 ILM 546 (1978). Before MARPOL 1973 entered into force, it was recognised that the provisions of Annex II would be difficult for even the most economically advanced states to comply with. MARPOL 1978 was therefore negotiated and adopted to establish a new instrument which provided that the new convention comprised the 1978 Protocol and its Annex *and* MARPOL 1973 as amended by MARPOL 1978, and that the provisions of MARPOL 1973 and MARPOL 1978 should be 'read and interpreted together as one single instrument': MARPOL 1978, Art. 1. MARPOL 1978 delayed the implementation of Annex II and amended one of the provisions concerning the communication of information: MARPOL 1978, Arts. II and III.

[306] MARPOL 73/78, Art. 1. [307] Art. 2(2).

The definition of 'discharge' is similarly broad, and covers intentional and unintentional releases from a ship, including 'any escape, disposal, spilling, leaking, pumping, emitting or emptying'; however, it does not include dumping within the meaning of the 1972 London Convention, releases directly arising from exploration and exploitation of seabed mineral resources, or releases for certain scientific research.[308] MARPOL 73/78 applies to ships which are entitled to fly the flag of a party or operate under the authority of a party, but it does not apply to warships or other state-owned ships operated by a state and used only on governmental non-commercial service.[309] The parties must prohibit and sanction violations and accept certificates required by the regulations which are prepared by other parties as having the same validity as their own certificates.[310] A ship which is in the port or offshore terminal of a party may be subject to an inspection to verify the existence of a valid certificate unless there are 'clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of that certificate'.[311] Where that is the case or where no certificate exists, the inspecting party must ensure that the ship does not sail 'until it can proceed to sea without presenting an unreasonable threat of harm to the marine environment'. MARPOL 73/78 requires parties to apply the Convention to ships of non-parties so as to ensure that 'no more favourable treatment is given to such ships'.[312] MARPOL 73/78 also provides for the detection of violations and enforcement, such as in-port inspections to verify whether ships have discharged harmful substances, reporting requirements on incidents involving harmful substances, the communication of information to the IMO, and technical co-operation.[313] Disputes are to be settled by negotiation or arbitration.[314] MARPOL 73/78 includes six annexes. Annexes I and II bind all parties, whereas Annexes III, IV, V and VI are options which a state may declare it does not accept when first becoming a party to the Convention or may subsequently accede to.[315]

Annex I

Annex I of MARPOL 73/78 comprises twenty-six Regulations for the Prevention of Pollution by Oil and six Appendices. It entered into force on 2 October

[308] Art. 2(3).

[309] Art. 3(1) and (3); warships and other state-owned ships must, however, act in a manner which is consistent, so far as is reasonable and practicable, with the Convention: *ibid.*

[310] Art. 5(1) and (2). [311] Art. 5(2). [312] Art. 5(4).

[313] Arts. 6, 8, 11 and 17. Protocol I sets out detailed Provisions Concerning Reports on Incidents Involving Harmful Substances. See also IMO Assembly Res. A.648(16) on general principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants, 19 October 1989.

[314] Art. 10 and Protocol II. [315] Art. 14.

1983, and has been amended in 1984, 1987, 1990, 1991, 1992, 1994, 1997, 1999 and 2001. Annex I is divided into four Chapters. Chapter I establishes 'General' provisions including definitions and scope of application, rules concerning surveys and inspections of oil tankers, and rules concerning the issue form, and duration of certificates.[316] Chapter II concerns Requirements for Control of Operational Pollution. It prohibits, subject to certain exceptions, any discharge of oil or oily mixtures into the sea.[317] Eight areas are designated as 'special areas' for which the prohibition on discharges is even stricter: the Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea, the 'Gulf area', the Gulf of Aden, the Antarctic and the 'North West European Waters'.[318] Specific regulations are adopted for reception facilities, ballast tanks and crude oil washing, retention of oil on board, discharge monitoring and control system and oily water separating equipment, sludge tanks, pumping and piping arrangements, and specific requirements for drilling rigs and other platforms.[319] At its thirty-second session, the MEPC adopted further amendments to this chapter of Annex I including the adoption of rules requiring 'double hulls' for certain new and existing tankers, a requirement introduced at the urging of the United States following the *Exxon Valdez* accident.[320] Further amendments were adopted in 2001 to bring in a new global timetable for accelerating the phase-out of single-hull oil tankers. The timetable will see most single-hull oil tankers eliminated by 2015 or earlier.[321] Chapter III establishes provisions on 'Requirements for minimising oil pollution from oil tankers due to side and bottom damages', and includes Regulations on tank size limitation and damage stability.[322] Chapter IV, on the 'Prevention of pollution arising from an oil pollution incident', provides for shipboard oil pollution emergency plans.[323]

Annex II

Annex II, which establishes Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk, entered into force on 6 April 1987, as amended by the MEPC.[324] It was further amended in 1989,[325] and 1994, and comprises fourteen Regulations and five Appendices. Regulations deal with definitions, application and categorisation of substances; the discharge of residues inside and outside 'special areas'; pumping, piping and unloading arrangements;

[316] Annex I, Regulations 1, 2 and 4–8.
[317] Annex I, Regulations 9 and 11.
[318] Annex I, Regulation 10.
[319] Annex I, Regulations 12–21.
[320] Res. MEPC.52(32) introducing new Regulations 13F and 13G to Annex I which entered into force on 6 July 1993.
[321] The amendments were adopted on 27 April 2001 and will enter into force on 1 September 2002; in the EU they are implemented by Regulation (EC) No. 417/2002 on the accelerated phasing-in of double hull or equivalent design requirements for single-hull oil tankers, OJ L64, 7 March 2002, 1.
[322] Annex I, Regulations 22–25A.
[323] Annex I, Regulation 26, in force 4 April 1993.
[324] Res. MEPC.17(22) (1985).
[325] Res. MEPC.34(27) (1989).

reception facilities and cargo record books; surveys and certification; requirements for minimising accidental pollution; and the carriage and discharge of oil-like substances.[326]

Annex III

The Regulations for the Prevention of Pollution by Harmful Substances in Packaged Form set out in the draft revised Annex III of MARPOL 73/78 entered into force on 1 July 1992. Annex III, which is implemented through the IMO International Maritime Dangerous Goods Code,[327] includes Regulations on packing, marking and labelling, documentation, stowage, and quantity limitations.[328] It also prohibits the jettisoning of harmful substances except for safety reasons.[329]

Annex IV

The Regulations for the Prevention of Pollution by Sewage, set out in Annex IV of MARPOL 73/78, have not yet entered into force, due to the existing construction of ships. The Regulations address such matters as surveys and certification[330] and reception facilities.[331] When they enter into force, they will, with some exceptions, prohibit the discharge of sewage into the sea, unless the sewage complies with disinfection requirements or the ship has an approved sewage treatment plant, or is situated in the waters of a state imposing less stringent requirements.[332]

Annex V

The Regulations for the Prevention of Pollution by Garbage from Ships, set out in Annex V to MARPOL 73/78, entered into force on 31 December 1988. The Regulations apply to all ships and regulate different types of garbage, subject to rules of special application, special areas and exceptions.[333] The disposal from ships into the sea of all plastics is prohibited;[334] dunnage, lining and packing materials which float cannot be disposed of within twenty-five nautical miles of land; disposal of food waste and all other garbage is prohibited within twelve nautical miles of land, unless it has passed through a comminuter or grinder in which case it may not be disposed of within three nautical miles of land.[335] Except for food wastes, no garbage may be disposed of from any fixed

[326] Annex II, Regulations 1–14.
[327] See IMO Assembly Res. A.81(IV); see chapter 12, pp. 638–41 below.
[328] Annex III, Regulations 2–6. [329] Annex III, Regulation 7.
[330] Annex IV, Regulations 3–7. [331] Annex IV, Regulations 10 and 11.
[332] Annex IV, Regulation 8.
[333] Annex V was amended in 1989, 1990, 1991 and 1995. The exceptions are set out in Regulation 6. See also the Guidelines for the Implementation of Annex V of MARPOL 73/78.
[334] Annex V, Regulation 3(1)(a). [335] Annex V, Regulation 3(1)(b) and (c).

or floating platforms for the exploration, exploitation and associated offshore processing of seabed mineral resources, and from all ships when alongside or within 500 metres.[336] For special areas, more stringent requirements apply, such as a prohibition on the disposal of all plastics and all other garbage and rules on reception facilities located in such areas.[337]

Annex VI

The Regulations for the Prevention of Air Pollution from Ships, set out in Annex VI to MARPOL 73/78, were adopted on 26 September 1997. The Annex will enter into force twelve months after being ratified by fifteen states whose combined fleets of merchant shipping constitute at least 50 per cent of the world fleet.[338] When the Regulations come into force, they will set limits on sulphur oxide (SO_x) and nitrogen oxide (NO_x) emissions from ship exhausts and prohibit deliberate emissions of ozone-depleting substances. A global cap of 4.5 per cent m/m on the sulphur content of fuel oil is included, with the IMO expected to monitor the worldwide average sulphur content of fuel once the Protocol comes into force. The Annex makes provision for the establishment of special 'SO_x Emission Control Areas' with more stringent standards for sulphur emissions by ships in these areas.[339] The Annex also prohibits the incineration on board ship of certain products, such as contaminated packaging materials and polychlorinated biphenyls (PCBs).

Safety agreements

International standards on the safety of shipping have been adopted for load lines,[340] the prevention of collisions at sea,[341] the safety of life at sea[342] and

[336] Annex V, Regulation 4(1). Food wastes may be disposed of provided they have passed through a comminuter or grinder and the location is more than twelve nautical miles from land: Regulation 4(2).

[337] Annex V, Regulation 5(2) to (4). The special areas are the Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea and the Gulf. Regulation 5(1). The North Sea area was added with effect from 18 April 1991, the Antarctic area with effect from 17 March 1992, and the wider Caribbean region with effect from 4 April 1993.

[338] Currently, only three states have ratified, representing 8.42 per cent of world tonnage.

[339] The Baltic Sea is designated as a SO_x Emission Control area under the Protocol.

[340] International Convention on Load Lines, as amended, London, 5 April 1966, in force 21 July 1968, 604 UKTS 133; Protocol, London 11 November 1988, in force 3 February 2000.

[341] Convention on the International Regulations for Preventing Collisions at Sea, London, 20 October 1972, in force 15 July 1977, UKTS 77 (1977) Cmnd 6962; amended in 1981, Misc. 8 (1982), Cmnd 8500, in force 1 June 1983. Further amendments were made in 1987, 1989 and 1993.

[342] International Convention for the Safety of Life at Sea, London, 1 November 1974, in force 25 May 1980, 1184 UNTS 2; see Protocol of 1978, London, 17 February 1978, in force 1 May 1981, UKTS 40 (1981) Cmnd 8277; Protocol of 1988, London, 11 November 1988, in force 3 February 2000.

the training of seafarers and fishing vessel personnel.[343] These address matters relating to safety at sea, rather than operational or accidental discharge, and have attracted broad support from states. As a body of binding rules they establish detailed commitments on the design and construction of ships, as well as equipping, manning, operations and matters related to the training of the crew.

Pollution from seabed activities

T. Treves, 'La Pollution résultant de l'exploration et de l'exploitation des fonds marins en droit international', 24 AFDI 827 (1978); A. L. C. De Mestral, 'The Prevention of Pollution of the Marine Environment Arising from Offshore Mining and Drilling', 20 *Harvard International Law Journal* 469 (1979); J. Kindt, 'The Law of the Sea: Offshore Installations and Marine Pollution', 12 *Pepperdine Law Review* 381 (1984); S. M. Evans, 'Control of Marine Pollution Generated by Offshore Oil and Gas Exploration and Exploitation', 10 *Marine Policy* 82 (1986); J. Kindt, 'The Environmental Aspects of Deep Seabed Mining', 8 *UCLA Journal of Environmental Law and Policy* 125 (1989); B. Barrett and R. Howells, 'The Offshore Petroleum Industry and Protection of the Marine Environment', 2 JEL 53 (1990); A. Nollkaemper, 'Deep Sea-Bed Mining and the Protection of the Environment', 15 *Marine Policy* 55 (1991); M. Gavouneli, *Pollution from Offshore Installations* (1995); Z. Gao (ed.), *Environment Regulation of Oil and Gas* (1998); E. Kirk, 'OSPAR Decision 98/3 and the Dumping of Offshore Installations', 48 ICLQ 458 (1999).

Pollution from seabed activities is caused by the release of harmful substances arising directly from the exploration, exploitation and processing of sea-bed materials. It accounts for only 1 per cent of pollution of the marine environment, although in certain regions, such as the Gulf, the proportion is considerably higher due to oil exploration activities. International legislation on pollution from this source is undeveloped. UNCLOS establishes a basic framework of general commitments, which have so far been supplemented by regional rules in the north-east Atlantic, the North Sea, the Arabian Gulf and the Mediterranean.

UNCLOS

For seabed activities within areas of national jurisdiction, Article 208 of UNCLOS requires coastal states to prevent, reduce and control pollution of the marine environment 'arising from or in connection with seabed activities subject to their jurisdiction and from artificial islands, installations and structures

[343] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, London, 7 July 1978, in force 28 April 1984, UKTS 50 (1984) Cmnd 9266. Amendments in 1995, which completely revised the Convention, entered into force on 1 February 1997. The amended Convention is reprinted in F. Wiswall (ed.), *Benedict on Admiralty* (1998, 7th edn), Doc. 14-6 at 14-483.

under their jurisdiction', which should not be less effective than international rules, standards and recommended practices and procedures. States should also establish detailed global and regional rules, standards and recommended practices.[344]

For seabed activities outside areas of national jurisdiction, under Article 145 of UNCLOS the International Seabed Authority will adopt rules, regulations and procedures for the seabed and ocean floor and subsoil beyond the limits of national jurisdiction (known as 'the Area') for

1. the prevention, reduction and control of pollution and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of the marine environment, particular attention being paid to the need for protection from harmful effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities; and
2. the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.[345]

Rules for the protection of the marine environment are adopted by the institutions comprising the Authority, namely, the Assembly, following provisional adoption by the Council, and in accordance with the recommendations of the Legal and Technical Commission. The Council must refuse to approve areas for exploitation 'where substantial evidence indicates the risk of serious harm to the marine environment'.[346] Under Article 162, the Council can ensure compliance with the provisions on the protection of the marine environment from activities in the international seabed area, including emergency orders to prevent serious harm, and an inspectorate.[347] In 2000, the International Seabed Authority adopted Regulations on Prospecting and Exploration of Polymetallic Nodules in the Area, Part V of which address the 'Protection and Preservation of the Marine Environment'.[348] These require the Authority to establish and keep under review environmental rules, regulations and procedures to ensure effective protection for the marine environment from harmful effects which may arise from activities in the Area, applying (with sponsoring states) a precautionary approach to activities in the Area. The Regulations impose a duty on each contractor to 'take necessary measures to prevent, reduce and control

[344] Art. 208(5).

[345] Art. 145. See also UNCLOS, Annex III, Art. 17(1)(b)(xii), enabling the Authority to adopt minimum standards and practices, including those relating to conservation of the resources and protection of the marine environment; and Section 1, para. 5(g) of the Annex to the 1994 Agreement on Part XI of UNCLOS (requiring the Authority to concentrate on the adoption of rules, regulation and procedures incorprating applicable standards for the protection and preservation of the marine environment).

[346] Art. 162(2)(x). [347] Art. 162(2)(iv) and (3). [348] Regulation 31.

pollution and other hazards to the marine environment arising from its activities in the Area as far as reasonably possible using the best technology available to it'. The duty is elaborated in the Regulations, contractual clauses and recommendations adopted by the Legal and Technical Commission in 2001. The contractor is required to gather environmental data as exploration activities progress and to establish environmental baselines against which to assess the likely effects of its activities on the marine environment. The contractor is also required to establish and implement a programme to monitor and report on such effects. The Regulations also contain procedures for the exercise by the Council, pursuant to Article 162(2)(w) of the Convention, of its power to issue emergency orders to prevent serious harm to the marine environment arising out of activities in the Area.

OSPAR Convention

Under the 1992 OSPAR Convention, the parties are required to prevent and eliminate pollution from offshore sources, including accidents, and comply with the rules set out in Annex III.[349] Dumping of wastes or other matter from offshore installations is prohibited.[350] Discharges or emissions from offshore sources are not included in the prohibition, but they, together with the use of substances which may reach and affect the maritime area, are strictly subject to authorisation or regulation, and monitoring.[351] Disused offshore installations or pipelines must not be dumped, and no disused offshore installation can be left wholly or partly in place without a permit issued on a case-by-case basis granted in accordance with applicable decisions, recommendations and other agreements adopted under the Convention.[352] Permits will not be granted if the disused installation or pipeline contains substances which result or are likely to result in hazards, harms or interference with other legitimate uses of the sea.[353] The Annex includes rules on placement, compliance, sovereign immunity and the role of the OSPAR Commission.[354]

Other treaties

Dumping from offshore installations placed on the continental shelf is regulated by the 1972 London Convention and the 1976 Mediterranean Convention, although they do not apply to disposals which occur in the course of normal operations. In 1982, UNEP adopted Guidelines on Offshore Mining

[349] Art. 5 and Annex III. 'Offshore sources' are defined as 'offshore installations and offshore pipelines from which substances or energy reach the maritime area': Art. 1(k). Exceptions are provided for in Annex III, Arts. 1 and 6.

[350] Annex III, Art. 3. [351] Annex III, Art. 4. [352] Annex III, Art. 5(1).

[353] Annex III, Art. 5(2). [354] Arts. 8–10.

and Drilling,[355] but to date the only international agreements which address this issue are the 1989 Kuwait Protocol Concerning Marine Pollution Resulting from Exploration and Exploitation of the Continental Shelf (1989 Kuwait Exploration Protocol) and the 1994 Mediterranean Protocol Concerning the Protection of the Mediterranean Sea Against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (1994 Madrid Offshore Protocol). The 1992 Black Sea Convention commits parties to adopt laws and regulations to prevent, reduce or control pollution of the Black Sea from continental shelf activities.[356] The 1992 Baltic Sea Convention goes further, committing parties to take 'all measures in order to prevent pollution ... resulting from exploration or exploitation of its part of the seabed and the subsoil thereof'.[357] More detailed obligations are set out in Annex VI, including a commitment to use best available technology and best environmental practice; to carry out an environmental impact assessment before offshore activity can start; to apply discharge limits during exploration and exploitation; and to comply with international reporting and information exchange requirements.[358] Moreover, all abandoned, disused or accidentally wrecked offshore units must be 'entirely removed and brought ashore under the responsibility of the owner' and disused drill wells must be plugged.[359]

Environmental emergencies

Fourteen international conventions and protocols provide a framework for international co-operation to combat emergency situations threatening the marine environment.[360] They were developed in response to individual oil pollution incidents, beginning in 1969 with the *Torrey Canyon* accident which resulted in the escape of 117,000 tons of crude oil in the western approaches to the United Kingdom, causing extensive damage to the British coast and to the coast of France.[361] The ship was registered under the flag of Liberia and the accident occurred outside the territorial sea of the United Kingdom, raising the question of whether the coastal state could intervene to address a pollution incident occurring in areas beyond national jurisdiction. This led to the Brussels Conference of 1969 and the adoption of the 1969 Intervention Convention. Of these international instruments, three are global and eleven are regional; of the latter, eight are Protocols to UNEP Regional Seas Conventions.

[355] UNEP, Environmental Law Guidelines and Principles No. 4, Offshore Mining and Drilling (1982) (Conclusions of the study of legal aspects concerning the environment related to offshore mining and drilling within the limits of national jurisdiction; Decision 10/14/VI of the Governing Council of UNEP, 31 May 1982).

[356] Art. XI(1). [357] Art. 12(1).

[358] Annex VI, Regulations 2–6 and 9. [359] Annex VI, Regulation 8.

[360] See also 1986 IAEA Notification Convention and 1986 IAEA Assistance Convention, chapter 16 below.

[361] Report of the Home Office, *The Torrey Canyon*, Cmnd 3246 (1967).

1969 Intervention Convention

The 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969 Intervention Convention) was adopted under the auspices of IMCO (now IMO).[362] It allows action by coastal states in an area of the global commons without affecting the high seas freedoms or other rights and duties.[363] It allows parties to

> take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences.[364]

Before such action is taken, unless extreme urgency requires otherwise, prior notification or consultation must take place between the coastal state and other affected states, particularly the flag state, and independent experts chosen from an IMO list.[365] The measures taken by the coastal state must satisfy certain principles and conditions: they must be proportionate to the actual or threatened damage, must not go beyond what is reasonably necessary to achieve the purpose of Article I, and must cease as soon as that purpose has been achieved.[366] A party which goes beyond what is permitted by the Convention and causes damage to others will be liable to pay compensation for such damage.[367]

1973 Intervention Protocol

The 1969 Convention was supplemented in 1973 by a Protocol on Intervention on the High Seas in Cases of Marine Pollution by Substances Other Than Oil (1973 Intervention Protocol).[368] The 1973 Protocol allows parties to take similar action to that permitted under the 1969 Convention in relation to substances listed by the IMO and annexed to the Intervention Protocol, as well as other substances 'which are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea'.[369] In the case of the latter, the party taking

[362] Brussels, 29 November 1969, in force 6 May 1975, 9 ILM 25 (1970).

[363] Preamble and Art. VII.

[364] Art. I(1). 'Maritime casualty' includes ship collisions, stranding or navigation incident or other occurrence resulting in material damage to a ship: Art. II(1). The Convention does not apply to warships or state-owned or -operated ships on non-commercial service: Art. I(2).

[365] Arts. III and IV. [366] Art. V. [367] Art. VI.

[368] 2 November 1973, in force 30 March 1983, UKTS 27 (1983), Cmnd 8924.

[369] Art. I(1) and (2). The IMO list annexed is subject to an amendment procedure requiring adoption with the support of two-thirds of parties to the Protocol present and voting. Arts. I(2) and II to VIII of and the Annex to the 1969 Intervention Convention apply to substances in Art. I. Amendments to the list of substances were made in 1991 (in force 30 March 1993) and 1996 (in force 19 December 1997).

action will have the burden of establishing that the substance could reasonably pose a grave and imminent danger which is analogous to that posed by listed substances.[370]

1989 Salvage Convention

The 1989 International Convention on Salvage has the dual purpose of encouraging salvage and measures to protect the marine environment from the consequences of accidents.[371] It was adopted largely as a consequence of the accident in 1978 involving the *Amoco Cadiz*, which resulted in massive pollution of the Brittany coast of France. This highlighted the inadequacy of existing instruments, in particular the 1910 Convention for the Unification of Certain Rules of Law Respecting Assistance and Salvage at Sea,[372] and the need to provide for rules governing the remuneration of efforts by salvors to prevent or mitigate pollution. The 1989 Salvage Convention addresses this point by creating an incentive for salvors to take measures to protect the environment, even if those measures may have no useful result. The Convention also protects the legal position of coastal states with respect to pollution. Article 9 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.

The heart of the Convention is set out in Articles 12 to 14. Under Article 12, salvage operations entitle the salvor to a reward only if the operations have had a useful result, except as otherwise provided. Article 13 recognises that preventing environmental damage can contribute a useful result: the reward is to be fixed to encourage salvage operations and is to take into account, *inter alia*, 'the skill and efforts of the salvors in preventing or minimising damage to the environment'.[373] Moreover, under Article 14, a 'safety net' is established to provide 'special compensation' from the owner of the vessel, equivalent to his expenses, for salvage operations for a vessel which threatened damage to the environment and for which the salvor has not earned a reward under Article 13 which is at least equivalent to the special compensation formula

[370] Art. I(3).
[371] London, 28 April 1989, not yet in force, IMO Leg/Conf.7/27, 2 May 1989.
[372] Brussels, 23 September 1910, UKTS 4 (1913) Cmnd 6677; as amended by Protocol, Brussels, 27 May 1967, UNTS 22 (1978), Cmnd 7095.
[373] Art. 13(1)(b).

provided by Article 14.[374] According to Article 14(2), the special compensation payable by the owner to the salvor under Article 14(1) may be increased by up to 30 per cent of the expenses incurred by the salvor if the salvor has 'prevented or minimised damage to the environment. By way of incentive, the competent tribunal may increase the special compensation up to 100 per cent if it is 'fair and just' to do so and bearing in mind the criteria set out in Article 13. The salvor is also subject to a negative incentive: negligence and the failure to prevent or minimise environmental damage may result in the salvor being deprived of the whole or part of any special compensation due.[375]

1990 OPRC Convention

The 1990 London International Convention on Oil Pollution Preparedness, Response and Co-operation Convention (1990 OPRC Convention)[376] promotes international co-operation in the event of a major oil pollution threat. Its provisions are applicable to ships, offshore units, sea ports and oil handling facilities. Even before it came into force in 1995, the Convention was being implemented by many states pursuant to the resolution of the conference which adopted it,[377] and it has been relied upon on numerous occasions, including to help Saudi Arabia and other countries cope with a major oil spill in the Gulf in 1991.

The Preamble to the 1990 OPRC Convention includes a number of provisions of relevance to general rules of international environmental law, noting the 'importance of precautionary measures and prevention in avoiding oil pollution in the first instance', and taking 'account of the polluter-pays principle as a general principle of international environmental law'. The Convention commits parties to take all appropriate measures in accordance with its provisions to prepare for and respond to an oil pollution incident.[378] These measures include: oil pollution emergency plans on ships, offshore units and sea ports and oil handling facilities; oil pollution reporting procedures; and national and regional systems for preparedness and response.[379] The Convention sets out the action to be taken on receiving an oil pollution report and provides for international co-operation in pollution response.[380] An Annex establishes principles governing reimbursement for costs of assistance, which are without prejudice

[374] Art. 14(1). [375] Art. 14(5).

[376] London, 30 November 1990, in force 13 May 1995, 30 ILM 735 (1991).

[377] Conf.Res.2 (Implementation Pending Entry Into Force), 30 ILM 753 (1991).

[378] Art. 1(1). 'Oil pollution incident' is defined as 'an occurrence or series of occurrences having the same origin, which results or may result in a discharge of oil and which poses or may pose a threat to the marine environment, or to the coastline or related interests of one or more States, and which requires emergency action or other immediate response': Art. 2(2).

[379] Arts. 3, 4 and 6. [380] Arts. 5 and 7.

to the rights of parties to recover from third parties under other applicable provisions of national and international law.[381]

2000 HNS Protocol

The 2000 Protocol to the OPRC Convention on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (2000 HNS Protocol) was adopted at a conference held at IMO headquarters in London in March 2000.[382] The hazardous and noxious substances covered by the Protocol are defined by reference to lists of substances included in other IMO Conventions and Codes and include: oils; other liquid substances defined as noxious or dangerous; liquefied gases; liquid substances with a flashpoint not exceeding 60°C; dangerous, hazardous and harmful materials and substances carried in packaged form; and solid bulk materials defined as possessing chemical hazards. As with the 1992 Convention, the 2000 HNS Protocol seeks to provide a global framework for international co-operation in combating major pollution incidents involving hazardous and noxious substances. Parties to the 2000 HNS Protocol will be required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries. Ships will be required to carry a shipboard pollution emergency plan to deal specifically with incidents involving hazardous and noxious substances.

1969 and 1983 Bonn Agreements

The first regional agreement in this area was the 1969 Bonn Agreement for Co-operation in Dealing with Pollution of the North Sea by Oil (1969 Bonn Agreement),[383] which established a model followed by the other agreements. Limited to pollution by oil which 'presents a grave and imminent danger to the coast or related interests' of one or more parties,[384] the Agreement required parties to share information on relevant national organisations and techniques for avoiding and dealing with oil pollution, to inform other parties without delay of a casualty or the presence of oil slicks which present a serious threat, and to require their ships and aircraft to report such casualties and oil

[381] Annex; it also provides that 'special attention' shall be paid to the 1969 CLC and the 1971 Oil Pollution Fund Convention and any subsequent amendments (see also Art. 11).

[382] London, 15 March 2000, not yet in force.

[383] Bonn, 9 June 1969, in force 9 August 1969, 704 UNTS 3. See also the 1971 Agreement Between Denmark, Finland, Norway and Sweden Concerning Co-operation in Measures to Deal with Pollution of the Sea by Oil, and the 1990 Accord of Co-operation for the Protection of the Coasts and Waters of the Northeast Atlantic Against Pollution Due to Hydrocarbons or Other Harmful Substances, Lisbon, 17 October 1990, 30 ILM 1231 (1991).

[384] Art. 1.

slicks.[385] The 1969 Bonn Agreement divides the North Sea into zones for which parties are responsible for assessing the nature, extent and movement of the spillage, keeping it under observation, and providing information to other parties.[386] Parties are not specifically required to clean up the spillage, but if they engage in disposal, they may seek assistance from other parties likely to be affected, in which case other parties called upon to help must 'use their best endeavours to bring such assistance as is within their power'.[387]

In 1983, the North Sea coastal states adopted the 1983 Agreement for Co-operation in Dealing with Pollution of the North Sea by Oil and Other Harmful Substances (1983 Bonn Agreement) which superseded the 1969 Bonn Agreement.[388] The 1983 Agreement extends the co-operative framework to oil and other harmful substances and includes threatened as well as actual pollution.[389] It goes beyond the 1969 Agreement by requiring parties: to jointly develop and establish guidelines for joint action; to provide information on pollution incidents of this kind which they have dealt with; to establish a standard form for the reporting of pollution; to provide for rules concerning the costs of action covered by the 1983 Agreement in the absence of an agreement concerning financial arrangements; and to have regular meetings of the parties and to designate a secretariat.[390]

UNEP Regional Seas Protocols

Eight of the UNEP Regional Seas Conventions have emergency Protocols: the 1976 Barcelona Emergency Protocol; the 1978 Kuwait Emergency Protocol; the 1981 Abidjan Pollution Emergency Protocol; the 1981 Lima Emergency Agreement (with its 1983 Quito Protocol); the 1982 Jeddah Pollution Emergency Protocol; the 1983 Cartagena Oil Spills Protocol; the 1985 Nairobi Emergency Pollution Protocol; and the 1986 Noumea Pollution Emergencies Protocol. These include similar provisions which establish frameworks for co-operation in cases of grave and imminent danger to the marine environment, the coast or related interests due to the presence of massive quantities of oil or other harmful substances (not those in the 1983 Cartagena Oil Spills Protocol) resulting from accidental causes or an accumulation of small discharges which are polluting or threatening to pollute.[391] Each Protocol reflects variations on

[385] Arts. 4 and 5. [386] Art. 6. [387] Art. 7.

[388] Bonn, 13 September 1983, in force 1 September 1989; IELMT 983:68, Art. 19(2).

[389] Art. 1. [390] Arts. 3(2), 4(e), 5(3) and 9–15.

[391] 1976 Barcelona Emergency Protocol, Art. I; 1978 Kuwait Emergency Protocol, Art. I(2) and (5); 1981 Abidjan Pollution Emergency Protocol, Art. I(2) and (5); 1981 Lima Emergency Agreement, Arts. I and III; 1982 Jeddah Pollution Emergency Protocol, Art. I(2) and (5); 1983 Cartagena Oil Spills Protocol, Arts. I(3) and (4) and II; 1985 Nairobi Emergency Pollution Protocol, Arts. 1(d) to (g) and 2; and 1986 Noumea Pollution Emergencies Protocol, Arts. 1(c) and (d) and 2.

a theme which generally provides for co-operation based upon obligations: to maintain contingency plans for combating pollution; to develop and apply monitoring activities; to salvage and recover harmful substances which have been released or lost overboard; to exchange information; to co-ordinate the means of communication; to ensure the reporting by their ships and aircraft of specified accidents; to take certain actions (including assessment and measures to avert or reduce the effects of pollution) in the event of a threat; to call for assistance first from other parties likely to be affected; and to establish regional or sub-regional co-ordination centres.[392] In each case ensuring implementation of the Protocol is a matter for meetings of the parties to the Protocol[393] or the organ established under the relevant framework convention.[394]

Liability and compensation

Rules of liability and compensation for damage to the marine environment establish an incentive to prevent harm and also may require restoration; several instruments have been adopted to establish rules of liability in relation to pollution or damage to the marine environment, and they are considered in chapter 17 below. At the global level, the principal treaties are the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992 CLC), the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1992 Oil Pollution Fund Convention, which establishes mechanisms for compensation), the 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (1996 HNS Convention) and the 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage (2001 Bunker Oil Convention).[395] UNCLOS establishes basic rules on state responsibility and liability,[396] and the 1972 London Convention and some of the UNEP Regional Seas framework conventions also call

[392] 1976 Barcelona Emergency Protocol, Arts. 3–11 and Annex A; 1978 Kuwait Emergency Protocol, Arts. II to XII (establishing a Marine Emergency Mutual Aid Centre), and Appendix A; 1981 Abidjan Pollution Emergency Protocol, Arts. 4–10; 1981 Lima Emergency Agreement, Arts. IV to XI; and the 1983 Quito Protocol, Arts. I to III (establishing detailed co-operation mechanism for massive oil spills); 1982 Jeddah Pollution Emergency Protocol, Arts. II to XI (establishing a Marine Emergency Mutual Aid Centre); 1983 Cartagena Oil Spills Protocol, Arts. 3–9; 1985 Nairobi Emergency Pollution Protocol, Arts. 3–9; and 1986 Noumea Pollution Emergencies Protocol, Arts. 3–9.

[393] 1976 Barcelona Emergency Protocol, Art. 12; 1981 Abidjan Pollution Emergency Protocol, Art. 11; 1981 Lima Emergency Agreement, Art. XII; 1983 Cartagena Oil Spills Protocol, Art. 10; 1985 Nairobi Emergency Pollution Protocol, Art. 10; and 1986 Noumea Pollution Emergencies Protocol, Art. 10.

[394] 1978 Kuwait Emergency Protocol, Art. XIII; 1982 Jeddah Pollution Emergency Protocol, Art. XIII.

[395] See chapter 18, pp. 912–31 below.

[396] See chapter 18, pp. 922–4 below.

for the development of rules on liability and compensation. However, to date, no such rules have been adopted, although they are being prepared as a Protocol to the 1976 Barcelona Convention.[397]

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B. Cicin-Sain and R. W. Knecht, 'Implications of the Earth Summit for Ocean and Coastal Governance', 24 *Ocean Development and International Law* 323 (1993); A. Nollkaemper, 'Agenda 21 and the Prevention of Sea-Based Marine Pollution: A Spurious Relationship?', 17 *Marine Policy* 537 (1993); U. Beyerlin, 'New Developments in the Protection of the Marine Environment: Potential Effects of the Rio Process', 55 ZaöRV 544 (1995); A. Yankov, 'The Law of the Sea Convention and Agenda 21: Marine Environmental Implications', in A. Boyle and D. Freestone (eds.), *International Law and Sustainable Development* (1999), 271.

One of the most recent efforts by the international community to develop rules for the protection of the marine environment is Chapter 17 of Agenda 21, which recognises that international law, as reflected in the provisions of UNCLOS, 'provides the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources'.[398] Chapter 17 of Agenda 21 establishes seven programme areas for the protection of oceans and seas, of which two are particularly relevant: the programme to provide for integrated management and sustainable development of coastal areas (including the EEZ), and the programme on marine environmental protection.[399] Recognising that coastal resources and the coastal environment are being rapidly degraded and eroded in many parts of the world, Chapter 17 of Agenda 21 outlines proposals to guide future international legislation, including: the establishment of national co-ordinating mechanisms to develop land and water use and siting policies; integrated coastal and marine management; the preparation of coastal profiles; prior environmental impact assessment and systematic observation; disaster contingency plans; the

[397] 1972 London Dumping Convention, Art. X; 1976 Barcelona Convention, Art. 12; 1978 Kuwait Convention, Art. XIII; 1981 Abidjan Convention, Art. 15; 1981 Lima Convention, Art. 11; 1982 Jeddah Convention, Art. XIII; 1983 Cartagena de Indias Convention, Art. 14; 1985 Nairobi Convention, Art. 15; 1986 Noumea Convention, Art. 20.

[398] Agenda 21, Chapter 17, 'Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources', para. 17.1. The WSSD Plan of Implementation aims to promote Chapter 17 of Agenda 21, in particular by advancing implementation of the 1995 Global Programme of Action.

[399] The other five programme areas are: sustainable use and conservation of marine living resources of the high seas; sustainable use and conservation of marine living resources under national jurisdiction; addressing critical uncertainties for the management of the marine environment and climate change; strengthening international (including regional) co-operation and co-ordination; and sustainable development of small islands.

improvement of coastal human settlements (especially by the treatment and disposal of sewage, solid wastes and industrial effluents); and the conservation and restoration of altered critical habitats.[400]

For protection of the marine environment, the emphasis is on preventing marine pollution from land-based sources, for which 'there is currently no global scheme' in the form of an international convention, and on pollution from maritime transport and 'dumping-at-sea activities'.[401] Agenda 21 supports a 'precautionary and anticipatory rather than a reactive approach', requiring: precautionary measures; environmental impact assessments; clean production techniques; recycling; waste audits and minimisation; sewage treatment facilities; quality management criteria for the handling of hazardous substances; and a comprehensive approach to deal with the damaging impacts from air, land and water.[402] More specifically, Chapter 17 calls on states to take account of the 1985 Montreal Guidelines, which should be strengthened and extended, and to co-operate on assessing the effectiveness of the existing regional agreements, developing new regional agreements, providing guidance on technologies, and developing policy guidance for relevant global funding mechanisms.[403] Sewage is a matter for priority action; Agenda 21 calls for the building and maintenance of sewage treatment facilities (locating coastal outfalls so as to avoid exposing shell fisheries, water intakes and bathing areas); promoting environmentally sound co-treatments of domestic and compatible industrial effluents and primary treatment of municipal sewage discharged to rivers, estuaries and seas.[404] Priority issues for other sources of pollution include establishing regulatory and monitoring programmes to control effluent discharges and emission, promoting risk and environmental impact assessment, eliminating discharges of organohalogen compounds, reducing discharges of other synthetic organic compounds, controlling anthropogenic inputs of nitrogen and phosphorus, establishing environmentally-sound, land-based waste disposal alternatives to sea dumping, using environmentally less harmful pesticides and fertilisers and controlling the input of non-point source pollutants.[405]

Agenda 21 calls for additional measures to address degradation of the marine environment from shipping, dumping, offshore oil and gas platforms, and ports.[406] Specific actions promoted include: the development of existing international rules and the creation of new rules for the protection of rare and fragile

[400] Agenda 21, para. 17.6.

[401] Agenda 21, para. 17.19. Agenda 21 estimates that 600,000 tons of oil enter the oceans each year as a result of 'normal shipping operations, accidents and illegal discharges': *ibid.*, para. 17.20.

[402] Agenda 21, para. 17.21.

[403] Agenda 21, para. 17.25; UNEP is invited to convene an intergovernmental meeting on the protection of the marine environment from land-based sources: Agenda 21, para. 17.26. These efforts are now being progressed under the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA).

[404] Agenda 21, para. 17.27. [405] Agenda 21, para. 17.28. [406] Agenda 21, para. 17.30.

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Freshwater resources

R. Baxter, *The Law of International Waterways* (1964); C. B. Bourne, 'International Law and Pollution of International Rivers and Lakes', 21 *University of Toronto Law Journal* 193 (1971); A. Utton, 'International Water Quality Law', 13 *Natural Resources Journal* 282 (1973); F. Florio, 'Water Pollution and Related Principles of International Law', 17 *Canadian Yearbook of International Law* 134 (1979); J. Lammers, *Pollution of International Watercourses: A Search for Substantive Rules and Principles* (1984); J. Sette-Camara, 'Pollution of International Rivers', 186 RdC 117 (1984); H. Ruiz Fabri, 'Règles coutumières générales et droit international fluvial', AFDI 818 (1990); D. Caponera, *Principles of Water Law and Administration, National and International* (1992); A. Nollkaemper, *The Legal Regime for Transboundary Water Pollution: Between Discretion and Constraint* (1993); G. Hafner, 'The Optimum Utilization Principle and the Non-Navigational Uses of Drainage Basins', 45 *Austrian Journal of Public International Law* 45 (1993); E. Benvenisti, 'Collective Action in the Utilization of Shared Freshwater: The Challenges of International Water Resources Law' 90 AJIL 384 (1996); S. Toope and J. Brunee, 'Environmental Security and Freshwater Resources: Ecosystem Regime Building' 91 AJIL 26 (1997); C. Graffy, 'Water, Water Everywhere, Nor Any Drop to Drink: The Urgency of Transnational Solutions to International Riparian Disputes', 10 *Georgetown International Environmental Law Review* 399 (1998); S. Salman and L. Boission de Chazournes (eds.), *International Watercourses: Enhancing Co-operation and Managing Conflict* (World Bank Technical Paper No. 414, 1998); X. Fuentes, 'Sustainable Development and the Equitable Utilization of International Watercourses', 69 BYIL 119 (1998); H. Elver, *Peaceful Uses of Transboundary Watercourses in International Law and Politics* (2000); D. Tarlock, 'Safeguarding International River Ecosystems in Times of Scarcity' 3 *University of Denver Water Law Review* 231 (2000); S. McCaffrey, 'The Harmon Doctrine One Hundred Years Later: Buried, Not Praised', 36 *Natural Resources Journal* 659 (1996); S. McCaffrey, *The Law of International Watercourses: Non-Navigational Uses* (2002).

Introduction

A well-developed body of international rules to prevent pollution of freshwater resources (including rivers, lakes, groundwaters and reservoirs) is set forth in

bilateral and regional treaties, as well as the guidelines in non-binding instruments adopted by UNEP, OECD, ECE and other international organisations, including those in the non-governmental sector, such as the ILA and the IDI. In 1997, under the auspices of the UN, and building on the work of the ILC, a global framework Convention on the Law of Non-Navigational Uses of International Watercourses (1997 Watercourses Convention) was adopted, elements of which are broadly recognised to reflect customary law.[1]

These agreements have emerged for geographical and political reasons: nearly one-half of the world's river basins are shared by two or more countries, and, although they comprise only about 3 per cent of the volume of water on the planet, they provide the vast majority of the supply used in human activity. Nearly 90 per cent of the total is locked into ice caps or glaciers, in the atmosphere or soil, or is deep underground.[2] Thus, the primary source of the planet's supply of freshwater is in rivers, lakes and reservoirs. Rainfall patterns have important implications for the quality of water. Scientists have estimated that the average amount of global runoff (the amount of water that is available for human use after evaporation and infiltration takes place) is between 39,500 km^3 and 42,700 km^3 a year, of which only around 9,000 km^3 is readily accessible to humans, with an additional 3,500 km^3 stored in reservoirs.[3] Rainfall varies widely. Heavy rainfall in the Amazon Basin and south and south-east Asia compares with lower rainfall in arid and semi-arid states, which receive only 2 per cent of the world's runoff.[4] Currently, more than 40 per cent of the world's population lives in conditions of water stress and this percentage is estimated to grow to almost 50 per cent by 2025.[5] Current threats to freshwater resources are two-fold: increased use, and declining quality as a result of anthropogenic sources of pollution. Future threats include climate change,[6] and population growth increasing the worldwide demand for water. Between 1990 and 1995, for example, water use increased at a rate significantly greater than the rate of population growth.[7] Of this use, it is estimated that approximately 70 per cent is for agriculture, 23 per cent for industry and the remainder for domestic use.

Industrial and agricultural activities and population growth are increasing the demand for water, requiring new management techniques. Options

[1] Adopted on 21 May 1997, by General Assembly Resolution 51/229; 36 ILM 700 (1997); not yet in force. See also Committee on Economic, Social and Cultural Rights, General Comment No. 15 (Right to Water), 26 November 2002; chapter 7, p. 298 above.

[2] World Resources Institute, *World Resources 1992–3*, 160.

[3] Revenga *et al.*, *Pilot Analysis of Global Ecosystems: Freshwater Systems* (World Resources Institute, 2000), 25.

[4] *Ibid.*

[5] *Ibid.*, 8. See also chapter 11, pp. 555–8 below, on international efforts to combat drought and desertification.

[6] G. Goldenman, 'Adapting to Climate Change: A Study of International Rivers and Their Legal Arrangements', 17 *Ecology Law Quarterly* 741 (1990).

[7] WMO, *Comprehensive Assessment of the Freshwater Resources of the World* (1997), 9.

include improved efficiency in use; greater re-use; reallocation of water; and limiting pollution of supplies. For pollution, the direct discharge of municipal and industrial waste into rivers and lakes has been reduced in many developed countries, but pollution from diffuse sources (non-point source pollution) has proved to be more difficult to control. Non-point source pollution includes agricultural, industrial and urban runoff, which transports pesticides, nitrates, phosphates and other pollutants into the water supply. This source of pollution of freshwater can be divided into three main types: excess nutrients from sewage and soil erosion; pathogens from sewage; and heavy metals and synthetic organic compounds from industry, mining and agriculture.[8]

Customary law

The rules of international environmental law to protect freshwater resources, including international watercourses, from pollution and over-use, are mainly reflected in piecemeal and *ad hoc* responses to problems with particular rivers, lakes and freshwater ecosystems. The most important of these are described in this chapter, although the contents should not be treated as exhaustive. State practice is reflected in this body of treaty law, in decisions of the ICJ and international arbitral tribunals, in the work of the ILC and private organisations, such as the ILA and the IDI, and in national legislation. These generally address the *use* of freshwater and its contamination by *pollution*. Notwithstanding such practice, as recently as the mid-1980s it was authoritatively claimed that 'there are no rules of global application and, in particular, there is no rule of customary international law prohibiting pollution of international rivers'.[9] If the view was accurate when it was expressed, it certainly no longer holds good today. Activities which may be harmful to international rivers and other freshwaters are subject to the general principles and rules identified in chapter 6, including Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration, as well as the procedural requirements associated with the duty to co-operate, which reflect customary law.[10]

As early as 1929, the PCIJ had held that the utilisation of international rivers, including their flow, was subject to international law: the Court identified the 'community of interests in a navigable river [which] becomes the basis of a common legal right, the essential features of which are the perfect equality of all riparian states in the use of the whole course of the river and the exclusion

[8] Revenga *et al.*, *Pilot Analysis of Global Ecosystems: Freshwater Systems* (World Resources Institute, 2000), 33 (the pollutants include sediments, nutrients, organic materials, disease-causing agents, heavy metals, toxic chemicals, acids, chlorides and increased temperatures).

[9] J. Sette-Camara, 'Pollution of International Rivers', 186 *Receuil des Cours* 117–218 at 198 (1984).

[10] See chapter 6, pp. 235–46 and 248 above; relied upon by Hungary in the *Gabcikovo-Nagymaros Project* case at the ICJ; see p. 471 below.

of any preferential privilege of any one riparian in relation to others'.[11] Some seventy years later, the ICJ revisited the paragraph and extended its application to non-navigational uses:

> Modern development of international law has strengthened this principle for non-navigational uses of international watercourses as well, as evidenced by the adoption of the Convention of 21 May 1997 on the Law of the Non-Navigational Uses of International Watercourses by the United Nations General Assembly. The Court considers that Czechoslovakia, by unilaterally assuming control of a shared resource, and thereby depriving Hungary of its right to an equitable and reasonable share of the natural resources of the Danube – with the continuing effects of the diversion of these waters on the ecology of the riparian area of the Szigetköz – failed to respect the proportionality which is required by international law.[12]

The extended principle reflects an approach that has received wide support from states. It indicates that water resources which are the subject of a 'common legal right', including rivers or lakes or groundwaters, may not be used by states in such a manner as to prevent or otherwise limit other 'riparian' states from making full use of their equitable and reasonable entitlements in relation to that shared resource. Although international law does not necessarily prohibit all pollution, it is clear that the quality of freshwaters should not be altered in such a way as to result in significant or substantial damage to the point that the resource may no longer be used, or that its potential for use is materially diminished.[13] The view that the rights of states in the use of shared rivers are not unlimited is now well established. As early as 1933, the Conference of American States declared that the exploitation of international rivers should not injure the rights of the neighbouring states and should be subject to a process of notification and agreement, stating that 'no state may, without the consent of the other riparian state, introduce into water courses of an international character, for the industrial or agricultural exploitation of their waters, any alteration which may prove injurious to the margin of the other interested state'.[14] States are subject to a customary obligation to negotiate, consult and co-operate to reach an equitable solution to the problems posed by activities which may

[11] *Case Concerning the Territorial Jurisdiction of the International Commission of the River Oder*, Judgment No. 16 (1929) PCIJ Ser. A, No. 23, 27. The language is similar to that of the ICJ in the *Fisheries Jurisdiction* case, nearly fifty years later: see chapter 11, pp. 567–8 below.

[12] (1997) ICJ Reports 7, at para. 85. See also Separate Opinion of Judge Kooijmans in the *Kasikili/Sedudu Island* case (*Botswana* v. *Namibia*) (1999) ICJ Reports 1045, paras. 31–7.

[13] On the level of pollution which may be permitted, see Australia's answer to a question from Sir Humphrey Waldock in the *Nuclear Tests* cases, chapter 8, pp. 319–21 above.

[14] Declaration on the Industrial and Agricultural Use of the International Rivers, Adopted by the Seventh International Conference of American States, Montevideo, 1933, Whiteman, 3 *Digest of International Law* 936.

affect international rivers providing a shared natural resource, including water pollution and excessive use. This view is reflected in treaties, including some very early ones,[15] and non-binding instruments.[16] It is also reflected in the World Bank's Operational Policy 7.50 on Projects on International Waterways, which reflects the Bank's recognition that 'the co-operation and goodwill of riparians is essential for the efficient use and protection of the waterway'. To that end, the Bank seeks to ensure that international aspects of a project on an international waterway are dealt with at the earliest possible opportunity, and requires the state receiving financial support formally 'to notify the other riparians of the proposed project and its Project Details'.[17] The Bank will not lend if the borrower does not notify or allow the Bank to notify.

Lac Lanoux arbitration

The 'community of interests' approach invoked by the PCIJ in 1929 is reflected in the arbitral award in the *Lac Lanoux* case between France and Spain.[18] This concerned a proposal by the French Government to authorise the construction of a barrage to channel water through a hydro-electric power plant, diverting approximately 25 per cent of the flow of the Carol River before returning the same amount of water to the river at a point prior to its use by farmers in Spain. The arbitral tribunal held that the proposed French works did not constitute an infringement of Spain's rights under earlier treaties, although the tribunal did suggest that the Spanish claim to an infringement of rights might have been stronger if it could have shown, which it had not, that the proposed works would pollute the waters of the River Carol or change the chemical composition, temperature or other characteristics of the waters in such a way as to injure its interests.[19] The award considered whether riparian states have any obligation to notify and consult with others who may be potentially affected prior to engaging in activities which may harm a shared river resource. The tribunal held that:

> France is entitled to exercise her rights; she cannot ignore Spanish interests. Spain is entitled to demand that her rights be respected and that her interests be taken into consideration.[20]

[15] See e.g. Convention Relative to the Development of Hydraulic Power Affecting More than One State, Geneva, 9 December 1923, 36 LNTS 76; and the 1997 Watercourses Convention, pp. 466–8 below.

[16] See p. 465 below; and generally chapter 6, p. 250 above.

[17] OP 7.50, June 2001, para. 4. The Bank will ascertain whether the riparians have entered into agreements or arrangements for the international waterway and, following notification, if another riparian raises objections to the proposed project, the Bank may appoint an independent expert to examine the issues (paras. 5 and 6). Para. 7 permits certain limited exceptions.

[18] 24 ILR 101 (1957). [19] *Ibid.*, 123. [20] *Ibid.*, 140.

However, in finding that France was not in breach of her obligation to take into account Spain's interests in the course of negotiations, the tribunal stated that 'the rule that states may utilise the hydraulic power of international watercourses only on condition of a *prior* agreement between the interested states cannot be established as a custom, even less as a general principle of law'.[21]

The award indicates the limits imposed by international law on the use of shared natural resources, and on procedural obligations linked to the substantive aspects of environmental protection and conservation. The award heralds the provisions now set forth in the regional 1992 UNECE Convention on Watercourses and the potentially global 1997 Watercourses Convention, as well as non-binding rules. It also reflected, however, the limited state of customary law in 1957.

Helsinki Rules

The adoption in 1966 of the ILA's non-binding Helsinki Rules on the Uses of the Waters of International Rivers marked an important further stage in international efforts to manage and protect freshwaters.[22] In this case, the effort addressed rivers and international drainage basins. The Helsinki Rules were not the first attempt by international lawyers to consider this question,[23] but reflected a committed effort to identify, in a comprehensive manner, the rights and obligations of states. The Rules govern the use of the waters of an international drainage basin except as otherwise provided by applicable treaty or custom,[24] and provide that each basin state is entitled to 'a reasonable and equitable share in the beneficial use' of the waters, in accordance with the relevant factors in each case.[25] States are obliged to prevent new forms of water pollution or any increase in the degree of existing pollution which would cause 'substantial injury' in the territory of other basin states, and to take all reasonable measures to abate existing pollution.[26] Violation of these obligations

[21] *Ibid.*, 130.

[22] 20 August 1966, Fifty-Second Report of the International Law Association (1967), 484; 2 IPE 5741. See also ILA, Helsinki Rules on Private Law Remedies for Transboundary Damage in International Watercourses (1996).

[23] See e.g. Institut de Droit International, Resolution on International Regulations Regarding the Use of International Watercourses for Purposes other than Navigation (Preamble), Madrid, 19 April 1911, 11 IPE 5702.

[24] Art. I. 'International drainage basin' is described as 'a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus': Art. II.

[25] Arts. III, IV and V(1).

[26] Art. X(1). 'Water pollution' is defined as 'any detrimental change resulting from human conduct in the natural composition, content or quality' of waters: Art. IX.

creates a responsibility for the injury caused, or requires negotiations to reach an equitable settlement.[27] The approach of the Helsinki Rules is generally followed by the subsequent work of the IDI on pollution of rivers and lakes.[28]

Subsequent developments

Since the Helsinki Rules, the ILA has also adopted non-binding Rules on Water Pollution in an International Drainage Basin[29] and Rules on International Groundwaters.[30] The Groundwaters Rules call on states to prevent or abate the pollution of international groundwaters 'in accordance with international law applicable to existing, new, increased and highly dangerous pollution'.[31] International groundwaters are the 'waters of an aquifer that is intersected by the boundary between two or more states', which are basin states within the meaning of the 1966 Helsinki Rules.[32] These non-governmental efforts have been followed by non-binding instruments adopted under the auspices of international organisations, including recommendations and guidelines developed by the UN[33] and UNEP,[34] the OECD[35] and the UNECE, as well as a large number of conventions and the EC framework Directive, which have, increasingly, sought to take a drainage basin approach.[36]

[27] Art. XI.

[28] Resolution on Pollution of Rivers and Lakes and International Law, Athens, 1979, 58-1 AIDI 193 (1979).

[29] Montreal, 4 September 1982, Sixtieth Report of the International Law Association (1983), 535.

[30] Seoul, 30 August 1986, 62 ILA 251 (1987); on the background, see D. Caponera and D. Alhéritière, 'Principles for International Groundwater Law', 18 *Natural Resources Journal* 589 (1978); L. Teclaff and E. Teclaff, 'Transboundary Groundwater Pollution: Survey and Trends in Treaty Law', 19 *Natural Resources Journal* 629 (1979); L. Teclaff and A. Utton, *International Groundwater Law* (1981).

[31] Art. 3(1).

[32] Art. 1. The Rules use the term 'aquifer' to include 'all underground water bearing strata capable of yielding water on a practicable basis, whether these are in other instruments or contexts called by another name such as "groundwater reservoir", "groundwater catchment area" etc. including the waters in fissured or fractured rock formations and the structures containing deep, so-called "fossil waters"': *ibid.*

[33] UN Water Conference, Recommendation on Environment and Health, Mar Del Plata, 25 March 1977, 26 IPE 166, E/CONF.70/29.

[34] UNEP, Environmental Guidelines for Watershed Development, UNEP EMG #3 (1982).

[35] See OECD Council Recommendation, Control of Eutrophication of Waters, 14 November 1974, OECD C(74)220; OECD Council Recommendation, Strategies for Specific Water Pollutants Control, 14 November 1974, OECD C(74)221; OECD Council Recommendation, Water Management Policies and Instruments, 5 April 1978, OECD C(78)4 (Final).

[36] L. Teclaff and E. Teclaff, 'Transboundary Toxic Pollution and the Drainage Basin Concept', 25 *Natural Resources Journal* 589 (1985); 'The International Law of the Hydrologic Cycle', 31 *Natural Resources Journal* 213 (1991) (special issue) (1991).

1997 Watercourses Convention

L. Caflisch, 'La Convenbtion du 27 mai 1997 sur l'utilisation des cours d'eau internationaux à des fins autre que la navigation', 43 AFDI 751 (1997); C. Bourne, 'The Primacy of the Principle of Equitable Utilization in the 1997 Watercourses Convention', 35 CYIL 222 (1997); E. Hey, 'The Watercourses Convention: To What Extent Does it Provide a Basis for Regulating International Uses of Watercourses?', 7 RECIEL 291 (1998); S. McCaffrey, C. Stephen and M. Sinjela, 'The 1997 United Nations Convention on International Watercourses', 92 AJIL 97 (1998); P. Wouters, 'The Legal Response to International Water Conflicts: the UN Water Convention and Beyond', 42 *German Yearbook of International Law* 293 (1999); S. McCaffrey and M. Sinjela, 'The 1997 UN Convention on International Watercourses', 92 AJIL 97 (1998); A. Tanzi and M. Arcari, *The UN Convention on the Law of International Watercourses* (2000).

This body of instruments, together with the treaties identified and described subsequently in this chapter, provided the background for the negotiation and adoption of the 1997 Watercourses Convention, which was based on the codification efforts of the ILC as reflected in the draft Articles on the Law of Non-Navigational Uses of International Watercourses.[37] The 1997 Convention applies to uses of international watercourses and their waters for purposes other than navigation, and encourages watercourse states to enter into watercourse agreements.[38] It establishes a framework of general principles to guide the behaviour of states, and its general approach has been noted with apparent approval by the ICJ.[39]

The Convention comprises an introductory section, and five operational parts. Part II proposes general principles. The Convention is without prejudice to rights and obligations arising from agreements already in force (Article 3(1)), and permits states to enter into new agreements which 'apply and adjust' its provisions 'to the characteristics and uses of a particular international watercourse' (Article 3(3)). Article 5 of the Convention is of central importance: it provides that watercourse states 'shall . . . utilise an international watercourse in an equitable and reasonable manner', which requires the optimal and sustainable utilisation of the watercourse and its benefits 'consistent with adequate

[37] 30 ILM 1575 (1991). The ILC's work began in 1971, following a request from the UN General Assembly. A first reading of a full set of draft Articles was adopted at the ILC's forty-third session in 1991, and a revised set of draft Articles was adopted in 1994. The tension between the interests of upstream and downstream states was tangible during the course of the ILC's efforts, and in the diplomatic negotations leading to the adoption of the 1997 Convention.

[38] Arts. 1(1), 3 and 4. 'Watercourse' is defined as a 'system of surface and ground waters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus': Art. 2(a). 'International watercourse' means 'a watercourse, parts of which are situated in different States': Art. 2(b).

[39] See n. 58 below.

Case Concerning the Gabcikovo-Nagymaros Project[58]

S. Stec and G. Eckstein, 'Of Solemn Oaths and Obligations: The Environmental Impact of the ICJ's Decision in the Case Concerning the Gabcíkovo-Nagymaros Project', 8 *Yearbook of International Environmental Law* 41 (1997); C. Bourne, 'The Case Concerning the Gabcikovo-Nagymaros Project: An Important Milestone in International Water Law', 8 *Yearbook of International Environmental Law* 3 (1997); P. Canelas de Castro, 'The Judgment in the Case Concerning the Gabcikovo-Nagymaros Project: Positive Signs for the Evolution of International Water Law', 8 *Yearbook of International Environmental Law* 21 (1997); A. E. Boyle, 'The Gabcikovo-Nagymaros Case: New Law in Old Bottles', 8 *Yearbook of International Environmental Law* 13 (1997); J. Klabbers, 'The Substance of Form: The Case Concerning the Gabcikovo-Nagymaros Project, Environmental Law, and the Law of Treaties', 8 *Yearbook of International Environmental Law* 32 (1997); A. A. Khavari and D. R. Rothwell, 'The ICJ and the Danube Dam Case: A Missed Opportunity for International Environmental Law?', 22 *Melbourne University Law Review* 507 (1998).

Notwithstanding the fact that the ICJ did not apparently have jurisdiction, in October 1992 Hungary filed an application to the ICJ to submit its dispute with Czechoslovakia over the construction of the Gabcikovo and Nagymaros barrages and the diversion of the Danube River in Slovakia.[59] In July 1993, following further negotiations, Hungary and Slovakia signed a Special Agreement submitting the matter to the ICJ.

The dispute arose over the 1977 Treaty Providing for the Construction and Joint Operation of the Gabcikovo-Nagymaros Barrage System, according to which Hungary and Czechoslovakia agreed to build the Dunakiliti dam and reservoir, a barrage system including two hydro-electric power stations (one on Czechoslovak territory at Gabcikovo, and one on Hungarian territory at Nagymaros), and a 25 km by-pass canal for diverting the Danube from its original course through a system of locks and then back to its original course.[60] The power generators were originally due to begin operation between 1986 and 1990 but the deadline was subsequently put back to 1994. In 1988, as a result of public pressure, the Hungarian Parliament resolved that ecological interests should take priority over economic considerations and prompted the government to order a re-evaluation of the project. This led to a decision by the

[58] *Case Concerning the Gabcikovo-Nagymaros Project* (1997) ICJ Reports 7.

[59] See Declaration of Hungary on the Termination of the 1977 Treaty on the Construction and Operation of the Gabcikovo-Nagymaros Barrage System, 16 May 1992, 32 ILM 1260 (1993); Special Agreement Between Hungary and the Slovak Republic for Submission to the ICJ of the Differences Between Them, 32 ILM 1294 (1993). Although Hungary's Original Application was superseded by the 1993 Special Agreement, it provides interesting historical evidence of Hungary's views on the rules of customary law concerning the diversion of an international river.

[60] Budapest, 16 September 1977, 32 ILM 1247 (1993).

Hungarian Government in May 1989 to suspend construction on its part of the Gabcikovo barrage, and work on the Nagymaros barrage.[61] Following diplomatic exchanges and unsuccessful negotiations between experts appointed by both sides, the Czechoslovak Government decided to continue with a 'provisional solution' to limit construction works and the unilateral diversion of the Danube to the Slovak territory.[62] In February 1992, Hungary formally protested against the 'provisional solution' and the unilateral diversion. In April 1992, the EC Commission accepted a request by the two governments to play a conciliation role and to chair a trilateral committee of experts to find a technically feasible solution. The EC Commission asked both sides to refrain from taking steps during the investigation that would prejudice the committee's findings.[63] On 19 May 1992, Hungary sought unilaterally to terminate the 1977 Treaty with effect from 25 May 1992.[64] In October 1992, following the failure to settle the dispute, Hungary filed its Original Application with the ICJ, and later that month Czechoslovakia diverted a significant proportion of the Danube into a by-pass canal.

In July 1993, by Special Agreement the two sides asked the ICJ to consider the legality of certain acts of each state. The Agreement, which asked the ICJ to decide, on the basis of the 1977 Treaty and 'rules and principles of general international law', three questions: (1) whether Hungary was entitled to suspend and subsequently abandon the works on the project; (2) whether the Czech and Slovak Federal Republic was entitled to proceed to and put in operation the 'provisional solution'; and (3) what were the legal effects of the notification on 19 May 1992 of the termination of the 1977 Treaty?[65] Additionally, the ICJ was asked to determine the legal consequences arising from its judgment on these matters. Under the Special Agreement, the parties also agreed to establish and implement a temporary water management regime, and to request immediate consultation if one party believed that the other party's conduct was endangering its rights, and not to seek protection by asking the ICJ to indicate provisional measures.[66] Although the Special Agreement did not expressly refer to environmental aspects, arguments put forward by Hungary in the case were largely based on perceived environmental consequences.

Hungary's Original Application stated that the 'provisional solution' would cause irreversible damage to the ecology and environmental resources of the region, threaten drinking water reserves, and endanger vegetation and fauna. In its Original Application, Hungary had asked the ICJ to declare: (1) that the 'provisional solution' violated general rules of international law and bilateral and multilateral treaties and agreements; (2) that Czechoslovakia should cancel the 'provisional solution'; (3) that the main course of the Danube should

[61] Paras. 3 and 4. [62] Paras. 5–8. [63] Para. 12. [64] Para. 13.

[65] See *Case Concerning the Gabcikovo-Nagymaros Project* (1997) ICJ Reports 7, para. 2.

[66] 1993 Special Agreement, Art. 4; on provisional measures under Art. 41 of the Statute of the ICJ, see chapter 5, p. 218 above.

remain unaltered; and (4) that the 'provisional works' should be immediately suspended. In its legal arguments in the Original Application, Hungary relied on the violation of its territorial sovereignty and nine principles and rules of customary law on the utilisation of transboundary environmental resources of an international river. The legal arguments were based on the view that the 'provisional solution' would deprive Hungary of its due share of water quantity, water quality and power potential, and would impair the quality and quantity of other natural resources, including forests, groundwater reserves and genetic diversity. The rules of customary international law upon which Hungary relied in its Original Application included the following claimed obligations of states: to maintain ecosystems and related ecological processes; to conserve flora and fauna; to participate in good faith negotiation; to prevent transnational environmental interference; not to cause significant harm to other watercourse states; to make reasonable and equitable use of transboundary resources; to give prior notification of activities which might cause significant transboundary adverse effects; to engage in good faith consultations; and to take precautionary measures to anticipate, prevent or minimise damage to transboundary resources and mitigate adverse effects.[67] Hungary also relied on several regional treaties.

These arguments were refined in the proceedings before the ICJ; Hungary sought to rely on a number of grounds under the law of treaties and general rules of state responsibility to justify its suspension of works and subsequent termination of the 1977 Treaty. To justify its conduct, Hungary relied primarily on a 'state of ecological necessity', contending that the various installations in the Gabcikovo-Nagymaros system of locks had been designed to enable the Gabcikovo power plant to operate in peak mode. Water would only have come through the plant twice each day, at times of peak power demand. Operation in peak mode required the vast expanse (60 km^2) of the planned reservoir at Dunakiliti, as well as the Nagymaros dam, which was to alleviate the tidal effects and reduce the variation in the water level downstream of Gabcikovo. Hungary argued that such a system, considered to be more economically profitable than using run-of-the-river plants, carried ecological risks which it considered to be unacceptable. These included the danger of silting up of the side-arms of the Danube, thereby impairing water quality; the risk of eutrophication of surface waters; the reduction of water flow in the Danube itself; and the resulting loss of fluvial fauna and flora.[68]

[67] Hungarian Application, paras. 24–33. In support of its Application, Hungary relied on a variety of sources, including the 1982 World Charter for Nature; the Legal Principles of the WCED Legal Experts Group; the IUCN Draft Covenant on Environmental Conservation and Sustainable Use of Natural Resources; the *Lac Lanoux Arbitration*; the *River Oder* case; the ILC Draft Articles on International Watercourses; the 1992 UNECE Watercourses Convention; the 1991 Espoo Convention; the *Corfu Channel* case; the *Trail Smelter* award; Principle 21 of the Stockholm Declaration; and Principle 15 of the Rio Declaration.

[68] (1997) ICJ Reports 7, para. 40

As for the dam at Nagymaros, Hungary argued that, if it had been built, the bed of the Danube upstream would have silted up causing deterioration of water quality in this sector. Moreover, the operation of the Gabcikovo power plant in peak mode would have occasioned significant daily variations in the water level in the reservoir upstream, threatening aquatic habitats. Hungary also contended that the construction and operation of the Nagymaros dam would have caused the erosion of the riverbed downstream, lowering the water level in this section of the river and appreciably diminishing the yield of the bank-filtered wells providing two-thirds of the water supply of the city of Budapest. The filter layer would also have shrunk or perhaps even disappeared, and fine sediments would have been deposited in certain pockets in the river, further contributing to the deterioration of water quality.[69]

The ICJ considered the question of the existence of a 'state of ecological necessity' in the light of the criteria laid down by the ILC in Article 33 of the draft Articles on the International Responsibility of States adopted on first reading, which the parties had agreed were applicable.[70] Article 33 at the time of the Court's decision was worded as follows:

> 1. A state of necessity may not be invoked by a State as a ground for precluding the wrongfulness of an act of that State not in conformity with an international obligation of the State unless:
> (a) the act was the only means of safeguarding an essential interest of the State against a grave and imminent peril; and
> (b) the act did not seriously impair an essential interest of the State towards which the obligation existed.
>
> 2. In any case, a state of necessity may not be invoked by a State as a ground for precluding wrongfulness:
> (a) if the international obligation with which the act of the State is not in conformity arises out of a peremptory norm of general international law; or
> (b) if the international obligation with which the act of the State is not in conformity is laid down by a treaty which, explicitly or implicitly, excludes the possibility of invoking the state of necessity with respect to that obligation; or
> (c) if the State in question has contributed to the occurrence of the state of necessity.

In the ICJ's view, draft Article 33 established five basic conditions for the existence of a state of necessity, which reflected customary international law.

[69] *Ibid.*

[70] For the text of the Draft Articles adopted on first reading, see ILC, *Yearbook of the International Law Commission 1996*, vol. II (Part 2), 58–65. In 2001, the ILC adopted a final text of the Articles; see chapter 18, p. 873 below.

1. the breach of an international obligation must have been occasioned by an 'essential interest' of the state which was the author of the wrongful act;
2. that interest must be threatened by a 'grave and imminent peril';
3. the act being challenged should be the 'only means' of safeguarding that interest;
4. that act should not have 'seriously impaired an essential interest' of the State towards which the obligation existed; and
5. the state which was the author of that act should not have 'contributed to the occurrence of the state of necessity'.[71]

The ICJ stated that it had 'no difficulty in acknowledging that the concerns expressed by Hungary for its natural environment in the region affected by the Gabcikovo-Nagymaros Project related to an "essential interest" of that state, within the meaning given to that expression in [draft] Article 33'.[72] However, the ICJ did not consider that the objective existence of a 'peril' had been established, notwithstanding the 'serious uncertainties' raised by Hungary as to the ecological impact of putting in place the Gabcikovo-Nagymaros barrage system. The ICJ stated that:

> The word 'peril' certainly evokes the idea of 'risk'; that is precisely what distinguishes 'peril' from material damage. But a state of necessity could not exist without a 'peril' duly established at the relevant point in time; the mere apprehension of a possible 'peril' could not suffice in that respect. It could moreover hardly be otherwise, when the 'peril' constituting the state of necessity has at the same time to be 'grave' and 'imminent'. 'Imminence' is synonymous with 'immediacy' or 'proximity' and goes far beyond the concept of 'possibility'. As the International Law Commission emphasized in its commentary, the 'extremely grave and imminent' peril must 'have been a threat to the interest at the actual time' (Yearbook of the International Law Commission, 1980, vol. II, Part 2, p. 49, para. 33). That does not exclude, in the view of the Court, that a 'peril' appearing in the long term might be held to be 'imminent' as soon as it is established, at the relevant point in time, that the realization of that peril, however far off it might be, is not thereby any less certain and inevitable.[73]

The ICJ's approach to the issue of the existence of an environmental 'peril' seemingly does not apply.[74] Without ruling on the merits of the parties' differing views as to the likelihood of environmental damage (advanced in an 'impressive amount of scientific material'), the ICJ found that the perils invoked by Hungary were not sufficiently established in 1989, nor were they 'imminent' since

[71] *Case Concerning the Gabcikovo-Nagymaros Project* (1997) ICJ Reports 7, para. 52.
[72] *Ibid.*, para. 53. [73] *Ibid.*, para. 54.
[74] Principle 15 of the Rio Declaration; see chapter 6, p. 268 above.

they were long-term in nature and uncertain.[75] As a consequence of these findings, the ICJ concluded that Hungary's ecological concerns over the project were not sufficient to justify a suspension of works in 1989 on the basis of necessity.[76]

The ICJ then turned to the question of whether the Czech and Slovak Federal Republic was entitled to proceed to the 'provisional solution' following Hungary's suspension of works on the project. Czechoslovakia had submitted that the 'provisional solution' was essentially no more than what Hungary had already agreed to and that the only modifications made were those which had become necessary by virtue of Hungary's decision not to implement its treaty obligations. While the ICJ agreed that Hungary, in concluding the 1977 Treaty, had consented to the damming of the Danube and the diversion of its waters into the by-pass canal, it had done so 'only in the context of a joint operation and a sharing of its benefits'. Thus, although Hungary's refusal to continue with the joint operation constituted a violation of its legal obligations, that did not mean that Hungary forfeited its basic right to an equitable and reasonable sharing of the resources of an international watercourse.[77] Accordingly, the ICJ concluded that Czechoslovakia had committed an internationally wrongful act by putting the provisional solution into operation. Significantly, the ICJ distinguished between preparatory actions and the wrongful act itself in determining the point of time at which the internationally wrongful act crystallised. The ICJ noted that:

> between November 1991 and October 1992, Czechoslovakia confined itself to the execution, on its own territory, of the works which were necessary for the implementation of Variant C, but which could have been abandoned if an agreement had been reached between the parties and did not therefore predetermine the final decision to be taken. For as long as the Danube had not been unilaterally dammed, Variant C had not in fact been applied.[78]

The ICJ went on to consider whether the wrongfulness of Czechoslovakia's actions might be precluded on the ground that it was a lawful countermeasure, adopted in response to Hungary's prior failure to comply with its obligations under the 1977 Treaty. While the ICJ concluded that Czechoslovakia's actions met some of the conditions for lawful countermeasures, they did not satisfy the 'important consideration' that the 'effects of a countermeasure must be commensurate with the injury suffered, taking into account the rights in question'.[79] Referring to the decision of the PCIJ in the *River Oder Case*[80] and modern

[75] *Case Concerning the Gabcikovo-Nagymaros Project* (1997) ICJ Reports 7, paras. 56 and 57.

[76] *Ibid.*, para. 57. [77] *Ibid.*, para. 78. [78] *Ibid.*, para. 79. [79] *Ibid.*, para. 85.

[80] *Case Concerning the Territorial Jurisdiction of the International Commission of the River Oder*, Judgment No. 16 (1929) PCIJ Ser. A, No. 23, 27.

developments evidenced by the recent adoption of the Watercourses Convention, the ICJ stated that:

> Czechoslovakia, by unilaterally assuming control of a shared resource, and thereby depriving Hungary of its right to an equitable and reasonable share of the natural resources of the Danube – with the continuing effects of the diversion of these waters on the ecology of the riparian area of the Szigetkoz – failed to respect the proportionality which is required by international law.[81]

Consequently, the ICJ held that the diversion of the Danube carried out by Czechoslovakia was not a lawful countermeasure because it was not proportionate.

To justify its termination of the 1977 Treaty, Hungary again raised an argument of necessity, together with arguments based on: the impossibility of performance of the Treaty; the occurrence of a fundamental change of circumstances; the material breach of the Treaty by Czechoslovakia; and the development of new norms of international environmental law. These arguments were dismissed by the ICJ, which found that Hungary's purported notification of termination in 1992 did not have the legal effect of terminating the 1977 Treaty and related instruments.[82] However, the ICJ pointed out that newly developed norms of environmental law were relevant for the implementation of the Treaty and that the Treaty itself made provision for their incorporation, with the agreement of the parties, through various Articles 'requiring the parties, in carrying out their obligations to ensure that the quality of the water in the Danube is not impaired and that nature is protected, to take new environmental norms into consideration when agreeing upon the means to be specified in the Joint Contractual Plan'.[83] The ICJ remarked that the 'awareness of the vulnerability of the environment and the recognition that environmental risks have to be assessed on a continuous basis have become much stronger in the years since the Treaty's conclusion'.[84] The ICJ recognised that both parties agreed on the need to take environmental concerns seriously and to take the required precautionary measures, but fundamentally disagreed over the consequences this had for the joint project.[85] However, the ICJ itself provided no resolution of this issue, instead recommending that 'third-party involvement may be helpful and instrumental in finding a solution, provided each of the parties is flexible in its position'.[86]

The ICJ took a similar approach in deciding the appropriate future conduct of the parties in respect of the project. It noted that it was of 'cardinal importance' that it had found that the 1977 Treaty was still in force and governed the relationship between the parties, although it acknowledged that it could not

[81] *Case Concerning the Gabcikovo-Nagymaros Project* (1997) ICJ Reports 7, para. 85.
[82] *Ibid.*, para. 115. [83] *Ibid.*, para. 112. [84] *Ibid.* [85] *Ibid.*, para. 113. [86] *Ibid.*

overlook the factual situation – or the practical possibilities or impossibilities to which it gave rise – in deciding on the legal requirements for the future conduct of the parties.[87] In light of the course of events, the ICJ considered that decisions on the future implementation of the Gabcikovo-Nagymaros project were, first and foremost, for the parties themselves.[88] The ICJ stressed that in future negotiations between the parties the project's impact upon, and implications for, the environment, should be a key issue. Evaluation of the environmental risks would need to be undertaken, taking into account current standards.[89] The ICJ was also mindful of the need for vigilance and prevention in the field of environmental protection 'on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage'.[90] The ICJ referred to the concept of 'sustainable development', remarking that, for the purposes of the present case, this meant that:

> the Parties should look afresh at the effects on the environment of the operation of the Gabcikovo power plant. In particular they must find a satisfactory solution for the volume of water to be released into the old bed of the Danube and into the side-arms on both sides of the river.[91]

The ICJ considered that it was not for it to determine the final result of the negotiations between the parties. Instead, the ICJ instructed the parties 'to find an agreed solution that takes account of the objectives of the Treaty, which must be pursued in a joint and integrated way, as well as the norms of international environmental law and the principles of the law of international watercourses'.[92]

On the final issue of reparation for the internationally wrongful acts committed by both parties, the ICJ noted that both Hungary and Slovakia were under an obligation to pay compensation to the other.[93] However, the ICJ declined to indicate the quantum of damages payable, instead resolving the issue as follows:

> Slovakia is . . . entitled to compensation for the damage suffered by Czechoslovakia as well as by itself as a result of Hungary's decision to suspend and subsequently abandon the works at Nagymaros and Dunakiliti, as those actions caused the postponement of the putting into operation of the Gabcikovo power plant, and changes in its mode of operation once in service.
>
> Hungary is entitled to compensation for the damage sustained as a result of the diversion of the Danube, since Czechoslovakia, by putting into operation Variant C, and Slovakia, in maintaining it in service, deprived Hungary of its rightful part in the shared water resources, and exploited those resources essentially for their own benefit.

[87] *Ibid.*, para. 132. [88] *Ibid.*, paras. 133–7. [89] *Ibid.*, para. 140.
[90] *Ibid.* [91] *Ibid.* [92] *Ibid.*, para. 141. [93] *Ibid.*, para. 152.

> Given the fact, however, that there have been intersecting wrongs by both Parties, the Court wishes to observe that the issue of compensation could satisfactorily be resolved in the framework of an overall settlement if each of the Parties were to renounce or cancel all financial claims and counter-claims.[94]

Overall, the ICJ's judgment affirms the importance of environmental considerations in addressing the rights and obligations of riparian states in an international watercourse. In assessing the implications of the judgment it must be borne in mind that the ICJ was largely concerned with the application of the law as it was in 1989 and in 1992, when the relevant acts occurred. It is perhaps for this reason that the ICJ was reluctant to go too far, for example in recognising or applying a precautionary approach. But the ICJ has made an important contribution to the development of international environmental law in this area, recognising the concept of 'ecological necessity' and the need for environmental risks associated with a project to be assessed on a continuous basis, in light of current environmental standards. That said, the ICJ shied away from offering more detailed guidance on broader questions, such as the relationship between equitable utilisation and the obligation to prevent environmental damage, and the principles to be applied in valuing environmental damage.

Regional rules

Apart from the obligations of general and global application, many bilateral regional agreements establish binding obligations for states.

Europe

The EC has adopted rules on various aspects of water quality (groundwater, drinking water, bathing water),[95] and in 2000 adopted a far-reaching and innovative framework Directive on the protection of inland surface waters, transitional waters, coastal waters and groundwater.[96] Additionally, more than forty bilateral treaties are in force between European states which protect the quality and use of freshwaters.[97] These include pollution prevention or

[94] *Ibid.*, paras. 152–3.

[95] Chapter 15, pp. 771–5 below; see generally J. Lammers, 'International and European Community Law Aspects of Pollution of International Watercourses', in W. Lang, H. Neuhold and K. Zemanek (eds.), *Environmental Protection and International Law* (1991), 115; R. Macrory, 'European Community Water Law', 20 *Ecology Law Quarterly* 119 (1993).

[96] Chapter 15, p. 775 below.

[97] For a partial list, see E. Brown Weiss, P. C. Szasz and D. B. Magraw, *International Environmental Law: Basic Documents and References* (1992), 47–50.

environmental protection agreements for Lake Constance,[98] Lake Geneva,[99] the River Danube,[100] the River Elbe,[101] the Mosel,[102] the Scheldt,[103] the Meuse,[104] Luso-Spanish River Basins,[105] and for the Benelux countries generally.[106] Other regional agreements not directly dealing with freshwater resources also have indirect benefits. The EC's 1988/2001 Large Combustion Directive and the SO_2 Protocols to the 1979 LRTAP Convention, as well as the more recent Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone, were also, to a large extent, the result of efforts to combat acidification of lakes and other freshwater resources in Europe.[107]

Rhine

A well-developed regime exists for the River Rhine, which flows through France, Switzerland, the Netherlands and Germany, and its basin which covers 225,000 square kilometres and includes eight countries. The Rhine has been the subject

[98] Convention on the Protection of Lake Constance Against Pollution, Steckborn, 27 October 1960, in force 10 November 1961, 620 UNTS 191.

[99] Convention Concerning the Protection of the Waters of Lake Geneva Against Pollution, Paris, 16 November 1962, in force 1 November 1963, 922 UNTS 49.

[100] See Convention on Co-operation for the Protection and Sustainable Use of the Danube River, Sofia, 29 June 1994, in force 22 October 1998. See also Declaration on Co-operation by the Danube States in Matters of Water Management of the Danube, in particular for the Protection of the Waters of the Danube Against Pollution, Bucharest, 13 December 1985, 37 ÖZRV 430 (1987); Agreement on Co-operation on Management of Water Resources in the Danube Basin, Regensburg, 1 December 1987, not yet in force; OJ L90 5 April 1990, 20.

[101] Convention for the International Commission for the Protection of the Elbe, Magdeburg, 8 October 1990, IELMT 990:75.

[102] Protocol Concerning the Constitution of an International Commission for the Protection of the Mosel Against Pollution, Paris, 20 December 1961, in force 1 July 1962, 940 UNTS 211.

[103] Agreement on the Protection of the River Scheldt, 26 April 1994, in force 1 March 1995, 34 ILM 859 (1995).

[104] Agreement on the Protection of the River Meuse, 26 April 1994, in force 1 March 1995, 34 ILM 854 (1995); see Jan M. van Dunné, *Non-Point Source River Pollution: The Case of the River Meuse* (1996).

[105] Convention on Co-operation for the Protection and Sustainable Use of the Waters of the Luso-Spanish River Basins, 30 November 1998, in force 17 January 2000; see 'La Convención Luso-Española sobre las Aguas de las Cuencas Hidrográficas Compartidas: Un marco de cooperación para la protección de las aguas y para el desarrollo sostenible', in A. Fabra and A. Barreira (eds.), *La aplicación de la Directiva Marco del Agua en España: Retos y Oportunidades* (2000); see also 10 *Yearbook of International Environmental Law* 236–8 (1999); A. Barreira, 'Monitoring and Evaluation of the Portuguese–Spanish Convention Appliance: Public Involvement and Participation', in Luso-American Foundation for Development, *Implementing Transboundary River Conventions* (2002).

[106] Protocol to Establish a Tripartite Standing Committee on Polluted Waters, Brussels, 8 April 1950, in force 8 April 1950, 66 UNTS 285.

[107] Chapter 8, pp. 327–33 and 335–9 above; and chapter 15, pp. 762–7 below.

of five environmental protection treaties, apart from earlier agreements on fishing and navigation.[108] The 1963 Berne Agreement on the International Commission for the Protection of the Rhine Against Pollution (1963 Berne Pollution Agreements) established an international commission (the Rhine Commission) to research and propose measures to protect the Rhine from pollution, and prepare arrangements for its protection.[109] It was one of the first international institutions to be granted an environmental mandate.

The 1963 Berne Pollution Agreement was amended in 1976 and two new treaties were adopted. The 1976 Convention for the Protection of the River Rhine Against Chemical Pollution (1976 Rhine Chemical Pollution Convention) requires parties to eliminate pollution of the surface waters of the Rhine basin by those dangerous substances listed in Annex I and to reduce pollution by those dangerous substances listed in Annex II.[110] Parties are required, for their own use, to establish national inventories of discharges and to communicate their contents to the Rhine Commission.[111] The Convention also establishes a scheme of prior authorisation for the discharge of Annex I substances, emissions standards for maximum permissible concentrations and quantities of discharges, and national programmes for the discharge of Annex II substances.[112] Limit values are proposed by the Rhine Commission, which may also propose measures for the protection of underground waters, on the basis of toxicity, persistence and bioaccumulation, taking into account the 'best technical facilities available'.[113] The Convention also provides for information exchange, monitoring, and emergency situations.[114] This mechanism failed in November 1986 to ensure that the Swiss authorities notified other parties of the discharge of large quantities of toxic chemicals into the Rhine following a fire at a facility owned by the Sandoz company in Basel, Switzerland. These destroyed living resources in the river ecosystem, including eels, fish and waterfowl, and the consequences of the pollution were felt in France, Germany, the Netherlands and at the point of discharge into the North Sea. Groundwater resources were contaminated, and other damage was caused to the fishing industry, to agriculture as a result of contaminated water supplies, and to tourism. In September 1987, Sandoz agreed to pay an indemnity of just under

[108] Berne Convention Establishing Uniform Regulations Concerning Fishing in the Rhine Between Constance and Basel, 9 December 1869, 9 IPE 4695.

[109] Berne, 29 April 1963, in force 1 May 1965, 994 UNTS 3; amended Bonn, 3 December 1976, IELMT 976:91, Art. 2.

[110] Bonn, 3 December 1976, in force 1 February 1979, 1124 UNTS 375, Art. 1(1). The Rhine is defined in Annex A. See generally A. Kiss, 'The Protection of the Rhine Against Pollution', 25 *Natural Resources Journal* 613 (1985); I. Romy, *Les pollutions transfrontières des eaux: l'exemple du Rhin* (1990).

[111] Art. 2 and Annex III. [112] Arts. 3, 4 and 6(1)–(3).

[113] Arts. 5(1), (2) and (5) and 7(2). Once limit values have been adopted, they are included in Annex IV.

[114] Arts. 10–12.

US$10 million to cover reimbursement of the French Government's costs, compensation to individuals and groups, and a programme of analysis, monitoring, restoration and emergency information.[115]

The 1976 Convention for the Protection of the Rhine River Against Pollution by Chlorides (1976 Rhine Chlorides Convention) has more specific objectives, aiming to reduce the discharge of chloride ions, and requiring France to construct a plant to reduce discharges from the Alsace potassium mines.[116] The Convention is one of the earliest to address the economic aspects of international environmental obligations, by providing for the costs of the works to be borne primarily by France, and by stating that Germany, the Netherlands and Switzerland should contribute a total of FFr132 million between them. The Convention also provides for the circumstances in which the work should be halted and in which the parties might compensate France for damage which cannot be fully compensated by the constructors of the works or by third parties.[117] Each party must take measures to prevent increases in the quantity of chloride ions discharged into the Rhine basin, in accordance with national concentration figures set out in Annex II to the Convention, and control all discharges of chloride ions greater than one kilogram per second in the Rhine basin.[118] The Rhine Commission receives annual reports from the parties, provides opinions on increases in concentrations, and may request parties to take steps to halt increases in concentration levels.[119] The Convention also provides for the installation and operation of measuring equipment and action to be taken where sudden and sizeable increases of concentrations occur.[120]

In September 1991, the five parties adopted a Protocol to the 1976 Rhine Chlorides Convention to further reduce chlorides in the river and to ensure that the water was restored to a drinkable quality.[121] The Protocol requires France to take additional measures to those required by Article 2(2) of the 1976 Convention to reduce the inputs of chlorides where the level of chlorides exceeds 200 milligrams per litre in the Rhine at the Netherlands–Germany border, and to provisionally store the chlorides on land.[122] The stored chlorides may subsequently be discharged into the Rhine after the Mine de Potasse d'Alsace has reduced its output, and in accordance with criteria fixed by the parties on the basis of a proposal by the Rhine Commission, and taking account of ecological requirements and the different uses of the waters.[123] In addition the Netherlands is required to take measures to limit discharges of chlorides

[115] See A. Kiss and D. Shelton, *International Environmental Law* (1991), 220.
[116] Bonn, 3 December 1976, in force 5 July 1985, 16 ILM 265 (1977); Art. 2(1) and (2) and Annex 1.
[117] Arts. 4, 5 and 7(1) and (2).
[118] Art. 3(1) and (4). Art. 3 and Annex II have been replaced by the provisions of the 1991 Protocol: see n. 121 below.
[119] Arts. 3(3) and (5) and 9. [120] Arts. 11 and 12.
[121] Brussels, 25 September 1991. [122] Art. 1(1) and Annex I. [123] Art. 2.

into the Ijsselmeer and discharges of salt water into the Wadden Sea.[124] The Protocol established new obligations in respect of the discharge of chloride ions and replaced Annex II to the 1976 Convention with a new Annex IV.[125] The Protocol also allocates the costs incurred by the parties in fulfilment of these obligations.[126]

More recently, the parties have concluded a new 1999 Convention on the Protection of the Rhine.[127] On its entry into force, the 1963 Berne Pollution Agreement and the 1976 Rhine Chlorides Convention will be repealed, and replaced with an updated approach.[128] The parties undertake to pursue a number of aims, including the sustainable development of the Rhine ecosystem, the production of drinking waters from the Rhine, the improvement of sediment quality, general flood prevention, and the protection and restoration of the North Sea in conjunction with other actions taken to protect it.[129] Article 4 sets out a number of guiding principles to be observed in pursuing these aims, including the precautionary principle, the polluter-pays principle and the principle of sustainable development. The contracting parties also agree on various specific measures to protect the Rhine, including: prior authorisation of waste water discharges or general rules laying down emission limits; gradual reduction of discharges of hazardous substances, with a view to their complete elimination; monitoring of compliance with authorisations, discharges and general rules; periodical examination and adjustment (when substantial improvements in the state of the art permit or when the state of the receiving medium so necessitates) of authorisations and general rules; reduction of risk of pollution from incidents or accidents; and prior authorisation of technical measures liable to have a serious effect on the ecosystem.[130] The Rhine Commission's powers are strengthened by the Convention, including the power to take binding decisions on measures to be implemented by the contracting parties.[131]

In 1986, following the Sandoz accident, the Rhine states adopted the Rhine Action Programme, which was intended to produce potable water from the river and to improve it sufficiently to allow the return of indigenous aquatic life. This was to be achieved on the basis of a 50 per cent reduction of discharges of thirty priority substances to 1985 levels by 1995. The Action Programme has now been succeeded by the 2001 Programme on the Sustainable Development of the Rhine, to implement the general aims and principles set forth in Articles 3 and 4 of the 1999 Convention.[132] The Programme defines general protection targets for the next twenty years including restoration of the main stream,

[124] Art. 3 and Annex II. [125] Arts. 5 and 6 and Annex IV. [126] Art. 4 and Annex III.

[127] Convention on the Protection of the Rhine, Berne, 12 April 1999, OJ L289, 16 November 2000, 30.

[128] Art. 19. [129] Art. 3. [130] Art. 5(4). [131] Arts. 8 and 10.

[132] Conference of the Rhine Ministers, 'Rhine 2020: Programme on the Sustainable Development of the Rhine', Strasbourg, 29 January 2001.

permanent compliance with the target values of all substances relevant for the Rhine in water, suspended matter, sediments and organisms, protection of groundwater against infiltration of polluted Rhine water and protection of Rhine water against polluted groundwater.[133]

1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes

The 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992 Watercourses Convention), adopted under the auspices of the UNECE,[134] reflected a move towards rules of general applicability to all transboundary waters in the territories of the parties, as well as transboundary waters between parties and non-parties.[135] The 1992 Watercourses Convention draws heavily on the 1980 UNECE Declaration of Policy on Prevention and Control of Water Pollution (Including Transboundary Pollution), which called for a range of new approaches to the protective regulation of watercourses, including standardisation of water quality, the use of legal and administrative measures and suitable economic incentives, and the adoption as far as possible of the general principle that 'the direct or indirect costs attributable to pollution should be borne by the polluter'.[136] Under the 1992 Convention, the parties accept a general obligation to take all appropriate measures to prevent, control and reduce any transboundary impact. They commit to preventing pollution of waters which causes or is likely to cause transboundary impact, to use transboundary waters in an ecologically sound and rational, and reasonable and equitable way, and to ensure conservation and restoration of ecosystems.[137] The Convention encourages the adoption of preventive measures at source, prohibits the transfer of pollution to other

[133] *Ibid.*, Part 2.

[134] Helsinki, 17 March 1992, in force 6 October 1996; 31 ILM 1312 (1992); states are party. See also the earlier related instruments adopted by the UNECE: Declaration of Policy on Water Pollution Control, 29 April 1966, ECE/RES/10(XXI); Decision on Body on Water Resources and Water Pollution Control Problems, 2 May 1968, ECE/DEC/E(XXIII); Decision on International Co-operation on Shared Water Resources, 2 April 1982, ECE/DEC/D(XXXVII); Declaration of Policy on the Rational Use of Water, 14 April 1984, ECE/DEC/C(XXXIX); Decision on Co-operation in the Field of Transboundary Waters, 26 April 1986, ECE/DEC/B(41); Decision on Principles on Co-operation in the Field of Transboundary Waters, 10 April 1987, ECE/DEC/I(42); Charter on Groundwater Management, 21 April 1989, ECE/DEC/E(44). See generally A. Tanzi, 'Regional Integration and the Protection of the Environment: The UNECE Process on Water Law as a Model for the Global Dimesnion', in T. Scovazzi, *The Protection of the Environment in a Context of Regional Economic Integration* (2001), 347.

[135] 'Transboundary waters' are defined as 'any surface or ground waters which mark, cross or are located on boundaries between two or more States': Art. 1(1).

[136] ECE/DEC/B(XXXV), E/1980/28, 23 April 1980, paras. 4, 5 and 11.

[137] Art. 2(1) and (2). 'Transboundary impact' is defined as 'any significant adverse effect on the environment resulting from a change in the conditions of transboundary waters caused by human activity': Art. 1(2).

parts of the environment, and calls for measures to be guided by the application of the precautionary and polluter-pays principles.[138] The Convention does not preclude other bilateral and multilateral agreements and allows parties to adopt and implement more stringent measures than those set out in the Convention.[139]

In requiring measures for the prevention, control and reduction of transboundary impact, the Convention identifies a range of options including: the use of low- and non-waste technologies; biological or equivalent treatment of municipal waste water; and a reduction of nutrient inputs and hazardous substances from industrial, municipal and other sources.[140] These approaches may be elaborated in amendments or protocols to the 1992 Convention.[141] The Convention supports a standard based upon 'best environmental practices', guidelines for which are set out in Annex II to the Convention.[142] The Convention calls for: the prior licensing and subsequent monitoring of waste water discharges (with limits to be based on best available technology for discharges of hazardous substances); stricter requirements (including prohibition) when the ecosystem so requires; environmental impact assessment; and sustainable water resources management including an ecosystems approach.[143]

The Convention signals efforts to regulate directly particular industries and activities, requiring each party to set limits for discharges for specific industries from which hazardous substances derive, based on 'best available technology'.[144] The Guidelines in Annex III require parties to develop general water-quality objectives and criteria,[145] and to provide for monitoring, research and development, the exchange of information,[146] and international efforts to elaborate rules on responsibility and liability.[147]

[138] Art. 2(3)–2(5). [139] Art. 2(6) and (8).

[140] Art. 3(1)(a), (e), (f) and (g). [141] See p. 484 below.

[142] Under Annex II, the measures to be considered in developing 'best environmental practices' include: the provision of information to the public and users; codes of practice covering the whole of the product's life; product labels; recycling, recovery and re-use; economic instruments; and licensing. The choice of particular measures should take into account the environmental hazard of the product (including production, use and disposal), substitute processes or substances, and scale of use.

[143] Art. 3(1)(b), (c), (d), (h) and (i). Annex I defines 'best available technology' as 'the latest stage of development of processes, facilities or methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste'. The Annex identifies a range of factors which should be given special consideration, and states that the 'best available technology' for a particular process will change with time in the light of technological advances, economic and social factors, and changes in scientific knowledge and understanding.

[144] Art. 3(2). 'Hazardous substances' means substances which are toxic, carcinogenic, mutagenic, teratogenic or bioaccumulative, especially when they are persistent: Art. 1(6).

[145] Art. 3(3). [146] Arts. 4, 5, 6 and 8.

[147] Arts. 4–8. Research and development is to include 'the physical and financial assessment of damage resulting from transboundary impact': Art. 5(h).

Part II of the Convention includes provisions for riparian parties, and goes some way towards codifying on a regional basis the rules as established by the treaties and arbitral awards identified earlier. Bilateral and multilateral co-operation is to focus on the development or adaptation of treaties in conformity with the basic principles of the convention, including the establishment of joint bodies to deal with specified catchment areas.[148] Riparian parties are also encouraged to co-operate through consultations, joint monitoring and assessment, and common research and development.[149] Exchange of information includes facilitating the exchange of best available technology and, in the event of a critical situation that may have a transboundary impact, riparian parties must inform each other 'without delay'.[150] The Convention also requires warning and alarm systems and the provision of mutual assistance between parties.[151] According to the provisions on public information, the parties must make available to the public, at all times and at reasonable cost, relevant information including water-quality objectives, permits and their conditions, and the results of monitoring and assessment.[152] The implementation of the Convention will be reviewed by meetings of the parties to be held at least every three years, with the assistance of a secretariat provided by UNECE.[153]

The parties to the 1992 Convention have taken further steps to give effect to its general objectives. In 1999, they adopted a Protocol on Water and Health,[154] whose objective is to promote the protection of human health and well-being by improving water management, including protection of water ecosystems.[155] The Protocol commits parties to ensure adequate supplies of wholesome drinking water, adequate sanitation (thorough collective systems), effective protection of drinking water supplies, safeguards for human health against water-related diseases, and effective monitoring.[156] These measures are to be based on an assessment of any proposed measure in respect of all its implications for human health, water resources and sustainable development, and are to be guided by the precautionary and polluter-pays principles.[157] In taking their actions, parties are also to be guided by other principles and approaches, including the need to take preventive action, to ensure intergenerational equity, to adopt actions at the lowest appropriate administrative level, to make use of economic instruments, to ensure access to information and public participation, and to manage water resources in an integrated manner.[158] The Protocol also requires each party to establish and publish national and/or local targets to achieve or maintain a high level of protection against water-related diseases, and to that end to establish appropriate legal and institutional

[148] Art. 9(1) and (2). The tasks of the joint bodies relate to data collection and assessment, monitoring, inventories, emissions limits, water-quality objectives, action programmes, warning and alarm procedures, exchange of information and environmental impact assessments: Art. 9(2).
[149] Arts. 10–12. [150] Arts. 13 and 14. [151] Arts. 14 and 15. [152] Art. 16.
[153] Arts. 17 and 19. [154] London, 17 June 1999, not yet in force. [155] Art. 1.
[156] Art. 2(2). [157] Art. 4(4) and 5(a) and (b). [158] Art. 5.

frameworks.[159] The Protocol includes provisions on the review and assessment of progress, response systems and public awareness and information,[160] and provisions on international co-operation (including on transboundary waters) and joint and co-ordinated international action.[161] As with other recent international agreements, provision is also made for reviewing compliance by means of 'non-confrontational, non-judicial and consultative' means.[162] In July 2001, the parties to the 1992 Convention (and the 1992 Industrial Accidents Convention) established an intergovernmental negotiation process aimed at adopting a legally binding instrument on civil liability for transboundary damage caused by hazardous activities.[163]

Americas

Since the early part of the twentieth century, the states of North and South America have adopted several bilateral agreements for the protection of freshwater resources. The most comprehensive rules are found in the agreements between Canada and the United States which relate to the protection and use of the Great Lakes, although important instruments are also in force between the United States and Mexico[164] and between Central and South American countries.[165]

1909 Washington Treaty Relating to Boundary Waters and Questions Arising Along the Boundary Between the US and Canada

The 1909 Boundary Waters Treaty between the United States and Canada was a pioneering treaty which was adopted to protect water levels and the navigability of the Great Lakes and other boundary waters. It includes one of the earliest

[159] Art. 6. Targets are to include, *inter alia*, quality of drinking water, reduction of diseases, areas to be covered by collective systems, the occurrence of discharges of untreated waters, and the disposal or re-use of sludge.

[160] Arts. 7–10. [161] Arts. 11–13.

[162] Art. 15. Art. 20 includes traditional dispute settlement provisions.

[163] See ECE/MP.WAT/7-ECE/CP.TEIA/5; chapter 18, p. 937 below.

[164] Washington Treaty Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande, 3 February 1944, 3 UNTS 314; Agreement Concerning the Permanent and Definitive Solution to the International Problems of the Salinity of the Colorado River, 30 August 1973, 915 UNTS 203; see P. Mumme, 'Innovation and Reform in Transboundary Resource Management: A Critical Look at the International Boundary Water Commission, US and Mexico', 33 *Natural Resources Journal* 93 (1993); 'Symposium: Water Issues in the US–Mexico Borderlands', 40, *Natural Resources Journal* 199 (1999).

[165] Treaty on the River Plate Basin, Brasilia, 23 April 1969, in force 14 August 1970, 875 UNTS 3; Treaty Concerning the Rio de la Plata and the Corresponding Maritime Boundary, 19 November 1973, Brasilia, 23 April 1969, in force 14 August 1970, 875 UNTS 3; see J. Trevin and J. Day, 'Risk Perception in International River Basin Management: The Plata Basin Example', 30 *Natural Resources Journal* 87 (1990); L. de Castillo Laborde, 'Legal Regime of the Rio de la Plata', 36 *Natural Resources Journal* 251 (1996).

treaty provisions on the prevention of pollution, and was the first instrument to establish an international institution with competence for pollution matters.[166] Article IV of the 1909 Treaty provides that 'boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property of the other'; the Treaty does not define the terms 'pollution' or 'injury'. The Treaty established a permanent International Joint Commission comprising six commissioners with three appointed by each party.[167] Its functions include approval of governmental applications for works which may affect the level or flows of boundary and other waters, surveillance and monitoring, and dispute settlement provisions (which have not yet been invoked).[168] Under Article IX, the parties can refer to the Commission any question involving the rights or interests of either party along the common frontier, following which the Commission can adopt reports and make recommendations which are advisory. The Commission has considered a number of pollution problems, following references from the parties, resulting in the adoption of publications such as the 1970 report on phosphate and other pollution, which led directly to the 1972 Agreement between the United States and Canada.[169]

Gut Dam arbitration

The use of the waters of the Great Lakes by Canada and the US has been the subject of numerous disputes between the two states, and led to the establishment of the Lake Ontario Claims Tribunal in 1965 to adjudicate claims by US nationals against Canada for damage caused to property owned by US nationals by the construction and operation of the Gut Dam[170] on the St Lawrence River between Adams Island in Canadian territory and Les Galops Island in US territory.[171] The dam was intended to stop the flow of water through the channel between the two islands. Between 1904 and 1951, the water level of the St Lawrence River and Lake Ontario increased, principally as a result of the diversion by Canada of water into the Great Lakes to increase hydro-electric power generation, and also because of a reduction in the rate at which the US withdrew water at Chicago. In 1951 and 1952, the water in the St Lawrence

[166] 11 January 1909, in force 5 May 1910, TS No. 548, 10 IPE 5158. See S. Toope and J. Brunnée, 'Freshwater Regimes: The Mandate of the International Joint Commission', 15 *Arizona Journal of International and Comparative Law* 273 (1998).

[167] Art. VII. [168] Arts. VIII to X.

[169] International Joint Commission, *Pollution of Lake Erie, Lake Ontario and the International Section of the St Lawrence River* (1970). See also International Joint Commission, 'Risks of Oil Pollution in Lake Erie', 27 October 1969, 8 ILM 1363 (1969).

[170] The details concerning the dispute are set out in the Report of the Agent of the United States, 8 ILM 118 (1968); see also the Agreement establishing the Tribunal, 4 ILM 468 (1965).

[171] The US gave permission for the construction, subject to the condition that Canada would pay compensation if the dam caused damage or detriment to US property owners: Report of the US Agent, 120.

River reached unprecedented levels which, after severe storms, caused extensive flooding and erosion damage to the north and south shores of all the Great Lakes, including Lake Ontario. The damage which was caused to US property was argued by the owners to be the result of the construction of the Gut Dam. In 1953, Canada removed the Gut Dam, and following the failure of efforts to reach a friendly settlement the Tribunal was established in 1965.

The US claimed a total of US$653,386.02 from Canada. In 1968, the US and Canada settled the case for US$350,000 as full and final satisfaction of all claims of US nationals 'for damage allegedly caused by Gut Dam'.[172] The settlement followed the earlier findings by the Tribunal that Canada was potentially liable to any citizen of the US whose property suffered damage or who suffered detriment caused by the construction and operation of Gut Dam (not only property owners on Les Galops Island, as Canada had argued), and that Canada had in diplomatic correspondence, prior to the establishment of the Tribunal, recognised its obligation to pay compensation for damage attributable to the Gut Dam.[173] Canada agreed to settle after the Tribunal had concluded that its only task was to determine whether the dam had caused the damage for which claims were filed and the quantum of such damages. Although the settlement was stated to be without prejudice to the legal and factual positions maintained by the parties, it is not unreasonable to infer that the episode supports the conclusion that states are subject to limitations on their use of international waters, and that they may be subject to an international claim if such use leads to damage to foreign private property. The case does not provide support either way on the question of whether states are liable for pure environmental damage, since all the claims related to property damage resulting from changes to the environment.

1978 Great Lakes Water Quality Agreement

In 1978, the United States and Canada signed an Agreement on Great Lakes Water Quality (1978 Great Lakes Water Quality Agreement)[174] which has been amended by Protocols in 1983[175] and 1987[176] and supersedes the earlier 1972 Agreement.[177] The 1978 Agreement is designed to 'restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes

[172] *Ibid.*, 141. [173] *Ibid.*, 138–9.

[174] Ottawa, 22 November 1978, in force 22 November 1978, 30 UST 1383; see T. Vigod, 'Global Environmental Problems: A Legal Perspective on Great Lakes Toxic Pollution', 12 *Syracuse Journal of International Law and Commerce* 185 (1985); G. Francis, 'Binational Co-operation for Great Lakes Water Quality: A Framework for the Groundwater Connection', 65 *Chicago-Kent Law Review* 359 (1989).

[175] 16 October 1983, in force 16 October 1983, TIAS No. 10798.

[176] 18 November 1987, not yet in force.

[177] See 1972 Agreement Between the United States and Canada Concerning Great Lakes Water Quality, Ottawa, 15 April 1972, in force 15 April 1972; 11 ILM 694 (1972).

Basin Ecosystem', including by the elimination or reduction to the maximum extent practicable of the discharge of pollutants into the Great Lakes system.[178] The 1978 Agreement records that it is the policy of the parties to prohibit or 'virtually eliminate' the discharge of toxic or persistent toxic substances, to provide public financial assistance to construct publicly owned waste treatment works, and to co-ordinate planning processes and best management practices.[179] The 'General Objectives' of the 1978 Agreement are to keep the Great Lakes system unpolluted by a specified range of substances, including those which will form sludge deposits or adversely affect aquatic life or waterfowl, floating materials, and toxic or otherwise harmful materials, as well as nutrients that contribute to aquatic life.[180] 'More Specific Objectives' are adopted under Article IV and Annex 1: they establish maximum water concentration levels for specific chemicals which are persistent and non-persistent toxic substances, as well as other substances, and objectives for physical material and microbiological and radiological matter. Other specific objectives include the elimination of 'Areas of Concern, Critical Pollutants and Point Source Impact Zones' identified in Annex 2. The 1978 Agreement makes it clear that these objectives represent minimum levels of water quality and do not preclude the parties from adopting more stringent requirements.

The 1978 Agreement requires the parties to adopt water quality standards and other regulatory requirements which are consistent with the 'General and Specific Objectives', and to develop and implement programmes and other measures to fulfil the objectives of the Agreement.[181] To that end, the programmes and measures are to be developed for pollution from municipal and industrial sources, for an inventory of pollution abatement requirements, for eutrophication, and for pollution from agricultural and other land use, from shipping and dredging activities, and from onshore and offshore facilities.[182] Measures and programmes are also to be developed for contingency plans, for surveillance and monitoring, and for elaborating lists of hazardous substances, the control of persistent toxic substances, and airborne pollution.[183] The parties also agree to exchange information between themselves, to consult as appropriate,[184] and to meet twice a year to co-ordinate work plans and evaluate progress.

The International Joint Commission assists in implementation of the 1978 Agreement by collating, analysing and disseminating data and information, by tendering advice and recommendations, by providing assistance, and by investigating such matters as the parties may refer to it.[185] The powers of the Commission are broad, and include a competence to conduct public hearings

[178] Art. II. The system includes all streams, rivers, lakes and other bodies of water within the drainage basin of the St Lawrence River: *ibid.*, Art. I(h).
[179] *Ibid.* [180] Art. III. [181] Arts. V and VI.
[182] Art. VI(1)(a)–(h), and Annexes 3–8. [183] Art. VI(1)(i)–(m) and Annexes 9–12.
[184] Arts. IX and X. [185] Art. VII(1).

and to compel testimony and the production of documents,[186] to publish reports at its discretion, to verify data provided to it, and to request the provision of information relating to water quality.[187] A Great Lakes Water Quality Board and a Science Advisory Board assist the Commission.[188]

Africa

African states have also adopted a number of important bilateral and regional treaties to protect and manage freshwater resources. Of particular note, because of their comprehensive approach, are the regimes established by treaty for the Niger basin and the Zambezi River system.[189] Other arrangements, for example in relation to the Nile, are under discussion.[190]

Niger basin

Under the 1963 Act Regarding Navigation and Economic Co-operation Between the States of the Niger Basin, the parties undertake to co-operate closely on projects likely to have an appreciable effect on the conditions of the waters and biological characteristics of the fauna and flora of the River Niger and its tributaries, under the auspices of an 'Intergovernmental Organisation Concerned with the Exploitation of the River'.[191] This organisation was subsequently renamed the River Niger Commission, under which the riparian states agree to inform the Commission of certain works which they propose to undertake and to abstain from carrying out any works likely to pollute the waters or modify the flora and fauna without adequate notice to and prior consultation with the Commission.[192] The Convention Creating the Niger Basin Authority replaced the River Niger Commission with the Niger Basin Authority, which was designed to ensure the integrated development of the Niger Basin.[193] The responsibilities of the Authority extend to environmental control and preservation, including the establishment of norms and measures in the alternative

[186] Art. VII(2), under legislation passed pursuant to the Boundary Waters Treaty.

[187] Arts. VII(2) and (4), (5) and IX(1). [188] Art. VIII.

[189] See also treaties for the Lake Chad Basin, the Senegal River and the River Gambia.

[190] C. Mallat, 'Law and the Nile River: Emerging International Rules and the Shari'a', in P. Howell and J. A. Allen (eds.), *The Nile: Sharing a Scarce Resource* (1994), 365; J. Brunnée and S. Toope, 'The Changing Nile Basin Regime: Does Law Matter?', 43 *Harvard International Law Journal* 105 (2002).

[191] Niamey Act Regarding the Navigation and Economic Co-operation Between the States of the Niger Basin, Niamey, 26 October 1963, in force 1 February 1966, 587 UNTS 9, Arts. 4 and 5.

[192] Agreement Concerning the Niger River Commission and the Navigation and Transport on the River Niger, Niamey, 25 November 1964, in force 3 December 1982, 587 UNTS 21, Art. 12.

[193] Faranah Convention Creating the Niger Basin Authority, Faranah, 21 November 1980, IELMT 980:86, Art. 3(1).

uses of the waters, prevention and reduction of pollution, and preservation of human health and genetic resources.[194]

Southern Africa, including the Zambezi River

The 1987 Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System establishes an ambitious programme for environmentally sound water resources management to strengthen regional co-operation for sustainable development in eight African countries, under the auspices of the Southern African Development Community (SADC) (formerly the Southern African Development Co-ordination Conference or SADCC).[195] The Agreement adopts the Action Plan for the Environmental Management of the Common Zambezi River System (ZACPLAN) set out in Annex I to the Agreement, in the context of the Mar del Plata Action Plan and UNEP's programme on the environmentally sound management of inland water (EMINWA). The ZACPLAN, which is designed to deal with water resource and environmental management problems of the river system in a co-ordinated manner to avoid possible future conflicts, is divided into four component elements comprising environmental assessment, environmental management, environmental legislation, and supporting measures.[196] While setting a broad framework for co-operation, the ZACPLAN also identifies programme categories and specific programmes, establishes a workplan and timetable, and institutional and financial arrangements, including the establishment of a Trust Fund.[197] The Zambezi Action Plan is implemented by the SADC, an Intergovernmental Monitoring and Co-ordinating Committee, a Co-ordinating Unit, and national focal points.[198]

In 1995, the SADC states concluded a Protocol on Shared Watercourses in the SADC region, which was revised in August 2000.[199] The Protocol's objective is to 'foster closer co-operation for judicious, sustainable and co-ordinated management, protection and utilisation of shared watercourses and advance the SADC agenda of regional integration and poverty alleviation'.[200] The states parties recognise the unity and coherence of shared watercourses and

[194] Art. 4(2)(d).

[195] Harare Agreement, 28 May 1987, in force 28 May 1987, 27 ILM 1109 (1988).

[196] Annex I, paras. 28–39.

[197] Annex II, paras. 25–7 and Appendix II.

[198] Arts. 2 and 3.

[199] Protocol on Shared Watercourses in the Southern African Development Community (SADC) Region, Maseru, 16 May 1995, in force 29 September 1998; K. K. Lebotse, 'Southern African Community Protocol on Shared Watercourses: Challenges of Implementation', 12 *Leiden Journal of International Law* 173 (1999), S. Salman, 'Legal Regime for the Use and Protection of International Watercourses in the Southern African Region: Evolution and Context', 41 *Natural Resources Journal* 981 (2001). The Heads of State or Government of the SADC agreed to a Revised Protocol in August 2000 which will repeal and replace the 1995 Protocol once it enters into force.

[200] Art. 2.

that their utilisation should be open to each watercourse state on an equitable and reasonable basis.[201] The states parties also undertake to respect existing rules of 'customary or general' international law relating to shared watercourse utilisation and management.[202]

Under the Protocol, parties are required, individually or jointly, to protect and preserve shared watercourse ecosystems.[203] States parties must notify other watercourse states of planned measures which may have a 'significant adverse effect' and, if necessary, to negotiate the possible effects of planned measures on the condition of a shared watercourse.[204] States parties using a shared watercourse must take all appropriate measures to prevent causing significant harm to other watercourse states, but, if harm is nevertheless caused, the state causing the harm shall take 'all appropriate measures' to eliminate or mitigate the harm; and, where appropriate, discuss the question of compensation.[205] The Protocol establishes several organs responsible for implementation of the Protocol, including a Committee of Water Ministers and a Water Sector Co-ordinating Unit.[206]

Asia

Since the first edition of this book, there have been a number of significant developments in Asia, to supplement the limited number of earlier river treaties.[207]

Mekong River Basin

Of particular note – as a regional effort – is the 1995 Agreement on Co-operation for the Sustainable Development of the Mekong River Basin. This commits Thailand, Vietnam, Laos and Cambodia to co-operate 'in all fields of sustainable development, utilization, management and conservation of the water and related resources of the Mekong River Basin', including irrigation, hydro-power, navigation, flood control, fisheries, timber floating, recreation and tourism, with a view to minimising harmful effects that might result from natural occurrences and man-made activities.[208] The Agreement commits parties to the protection of the environment, the application of the principles of reasonable and equitable utilisation and the prevention and cessation of harmful effects, as well as the application of state responsibility for harmful effects which cause 'substantial damage'.[209] The Agreement establishes a Mekong River Commission, now based in Phnom Penh.[210]

[201] Art. 3.1, 3.2 and 3.7. [202] Art. 3.3. [203] Art. 4.2(a).
[204] Art. 4.1. [205] Art. 3.10. [206] Art. 5.1.
[207] I. Kasto, *Water Management and Environmental Protection in Asia and the Pacific* (1983).
[208] Chiang Rai (Thailand), 5 April 1995, in force 5 April 1995 34 ILM 864 (1995), Art. 1; G. Bowder and L. Ortolano, 'The Evolution of an International Water Resources Management Regime in the Mekong River Basin', 40 *Natural Resources Journal* 499 (2000).
[209] Arts. 3, 5, 7 and 8. [210] Arts. 11–33.

India/Bangladesh and India/Nepal

India became a party to two important bilateral treaties in 1996, notable for their differing approaches. The Bangladesh–India Treaty on sharing the waters of the Ganges River[211] and the India–Nepal Treaty on sharing the waters of the Mahakali River[212] are intended to bring to an end long-running differences between India and her neighbours over the entitlement to water flows following the construction by India of barrages on the Ganges and Mahakali Rivers.[213] The treaties aim to establish long-term water discharge regimes of thirty and seventy-five years respectively, focusing on the utilisation of waters rather than their conservation. These instruments take only limited account of recent developments in the international law of watercourses and efforts to promote sustainable development. The two treaties adopt similar approaches, but differ in their scope of application, the extent of their reliance upon general principles governing rights over shared watercourses, and dispute settlement arrangements.

The Bangladesh–India Treaty has as its principal objective the determination of the amount of water to be released by India to Bangladesh at the Farraka Barrage on the Ganges for a period of thirty years (Articles I and XII). It entered into force upon signature and fills the gap left when a 1977 Agreement lapsed.[214] The difficulty of that task will not be apparent from the text of the Treaty, which makes only implicit reference to the long-running dispute between the two countries following the construction and operation by India of the Farraka Barrage.[215] The 1996 Treaty establishes a new formula for sharing the Ganges waters at Farraka in the dry season (1 January to 31 May), and also provides that below Farraka the waters are not to be reduced further except for 'reasonable use' in a limited amount (Article III). Further provision is made for the situation where the flow falls below 50,000 cusecs (Article II(iii)). The sharing arrangements are to be reviewed every five years and if no agreement can be reached on adjustments India is to release at least 90 per cent of Bangladesh's share as provided by Article II. The Treaty makes reference to a number of guiding principles. It aims to achieve 'optimum utilisation' of the waters of the

[211] New Delhi, 12 December 1996, 36 ILM 519 (1997).

[212] New Delhi, 12 February 1996, 36 ILM 531 (1997).

[213] B. Desai, 'Sharing of International Water Resources: The Ganga and Mahakali River Treaties', 3 *Asia Pacific Journal of Environmental Law* 172 (1998); S. Salman and K. Uprety, 'Hydro-Politics in South Asia: A Comparative Analysis of the Mahakali and the Ganges Treaties', 39 *Natural Resources Journal* 295 (1999); S. Subedi, 'Hydro-Diplomacy in South Asia: The Conclusion of the Mahakali and Ganges River Treaties', 93 AJIL 953 (1999).

[214] Bangladesh–India, Agreement on Sharing of the Ganges' Waters, Dacca, 5 November 1977, 17 ILM 103 (1978).

[215] See Nazrul Islam, 'International Watercourses Law and the Farraka Barrage Dispute' (unpublished PhD thesis, London University, 2000).

region, bringing a 'fair and just' solution to the Farraka waters problem but without establishing 'any general principles of law or precedent' (Preamble). It provides for application of the principles of 'equity, fair play and no harm to either party' to emergency situations, future adjustments of the Treaty, and the conclusion of agreements for other rivers (Articles II(iii), X and IX). The Treaty establishes an Indo-Bangladesh Joint Rivers Commission with the more limited mandate of monitoring daily flows, submitting data, and implementing arrangements under the Treaty (Articles IV, VI and VII). The Treaty refers disputes to the Indo-Bangladesh Joint Rivers Commission and then the two governments (Article VII).

The Mahakali River (known as the Sharda River in India) has formed the border between Nepal and India since 1816, and has been the subject of tension between the two countries since India's occupation of some 50 square kilometres of land at its source following the India–China conflict of 1961. The 1996 Treaty replaces a 1992 agreement which Nepal had rejected as providing inadequate amounts of water and electricity. The new Treaty has four objectives. First, it settles Nepal's entitlement to waters from the existing Sarada Barrage (Article 1). Secondly, it authorises (without prejudice to Nepal's sovereign rights over that land) India's prior construction of the part of the recently constructed Tanakpur Barrage which occurred on 2.9 hectares of Nepalese territory; in return Nepal will receive an agreed supply of water, a guaranteed amount of electricity annually, the construction by India of a new electricity transmission line, and additional water and electricity in the event that the flow of the Mahakali River is subsequently augmented by new works (Article 2). Thirdly, it provides framework rules for the construction of an integrated Pancheshwar Multipurpose Project on the boundary along the Mahakali River where the two states have equal rights in the water (to be the largest dam in Asia, with two power stations of equal capacity, the costs and total energy output of which are to be shared, although Nepal agrees to sell some of its electricity to India (Article 3). Fourthly, it commits India to supply irrigation water to Nepal (Article 4). The Treaty also requires all other projects in the Mahakali River – where it is a boundary river – to be designed and implemented on the basis of the 'principles' set forth in the Treaty (Article 6). The Treaty provides for 'equal partnership' in the context of the Project's objective of producing 'maximum total net benefit' (Article 3(1)), and makes only limited reference to underlying principles of 'equality, mutual benefit and no harm to either party' (Article 9(1)). Nepal's water requirements are to be given 'prime consideration' (Article 5(1)), and the parties agree not to obstruct or divert the waters so as to adversely affect its natural flow and level except by agreement, provided that local users may take a limited amount (Article 7). The Treaty establishes the Mahakali River Commission, to make recommendations for the conservation and utilisation of the river, evaluation of projects, and examination of differences between the parties concerning interpretation and application of the Treaty (Article 9(3)).

Disputes are to go to a tribunal of three arbitrators, the decisions of which are to be final, definitive and binding (Article 11).

Israel–Jordan Peace Treaty

The 1994 Israel–Jordan Peace Treaty is of singular importance for the development of water law in the Middle East.[216] Its Article 6 is intended to contribute to a 'comprehensive and lasting settlement of all the water problems' between the two countries. It commits the parties to agree mutually to recognise the rightful allocations of both of them in Jordan River and Yarmouk River waters and in certain ground waters 'in accordance with agreed acceptable principles, quantity and quality' as provided for in Annex II to the Treaty (Article 6(1)). By Article 6(2), the parties,

> recognising the necessity to find a practical, just and agreed solution to their water problems . . . jointly undertake to ensure that the management and development of their water resources do not, in any way, harm the water resources of the other Party.[217]

The parties agree to co-operate on alleviating water shortages, recognising that water issues must be dealt with 'in their totality', and commit to develop existing and new water resources, prevent contamination, assist in alleviation, share information and conduct joint research and development.[218] Annex II to the Treaty provides for detailed allocations of water quantities, for storage arrangements and the maintenance of water quality and protection against 'any pollution, contamination, harm or unauthorized withdrawals of each other's allocations'. It also makes provision for the disposal of wastewaters, for the protection and use of groundwaters, and for co-operation, including through the establishment of a Joint Water Committee.

UNCED and WSSD

Agenda 21 set out seven programme areas to protect the quality and supply of freshwater resources.[219] While short on detailed commitments or restatements of any existing obligations, it set out the basis of the measures to be adopted

[216] 34 ILM 46 (1995); see R. Fathallah, 'Water Disputes in the Middle East: An International Law Analysis of the Israel–Jordan Peace Accord', 12 *Journal of Land Use and Environmental Law* 119 (1996), and, more generally, J. A. Allan and C. Mallat (eds.), *Water in the Middle East: Legal, Political and Commercial Implications* (1995). See also Israel–Jordan–PLO Declaration on Co-operation on Water-Related Matters, 13 February 1996, 36 ILM 761 (1997).

[217] Art. 6(2). [218] Art. 6(3).

[219] Agenda 21, Chapter 18, 'Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources'.

in future international legal instruments. The sensitivities associated with legal issues relating to these resources is evident throughout Chapter 18 of Agenda 21; even the introduction is limited to noting that co-operation among riparian states 'may' be desirable 'in conformity with existing agreements and/or other relevant arrangements, taking into account the interests of all riparian states concerned'.[220] The two programme areas most relevant to the development of international law relate to integrated water resources development and management, and protection of water resources, water quality and aquatic ecosystems.[221]

The programme on integrated development and management of water resources established a soft target for all states, according to their capacity and available resources, to put in place national action plans, institutional structures and legal instruments, and to establish efficient water use programmes, by the year 2000.[222] For transboundary water resources, the programme recognises the need for riparian states to formulate water resource strategies and to consider the harmonisation of strategies and action programmes.[223] The programme does not call for any international legal action at the global level, limiting itself to calling for improved delineation of responsibilities and co-ordination of international organisations and programmes.[224]

The programme area for the protection of water resources is more specific. It supports the 'holistic management of resources and a recognition of the interconnectedness of the elements related to freshwater and freshwater quality', taking a 'catchment management approach'.[225] The protection of groundwater is identified as an essential element of water resource management, and aquatic ecosystems are to be preserved from 'any form of degradation on a drainage basin basis'.[226] This is to be achieved through, *inter alia*, identification of, and preparation of, 'outlines' for, the protection, conservation and rational use of all potential sources of water supply; water pollution prevention and control programmes (based on pollution reduction-at-source strategies, environmental impact assessment and enforceable standards for major point source discharges and high risk non-point sources); and international water quality monitoring and management programmes.[227] The programme also envisages the following activities to protect water resources and to prevent pollution: rehabilitation of degraded catchment areas; application of the polluter-pays principle; treatment facilities for domestic and industrial effluent; the establishment of effluent discharge standards;

[220] *Ibid.*, para. 18.4.

[221] The other programme areas relate to: assessment of water resources; drinking water supply and sanitation; water and sustainable urban development; water and sustainable food production; and the impact of climate change on water resources.

[222] Agenda 21, para. 18.11. [223] *Ibid.*, para. 18.10. [224] *Ibid.*, para. 18.12(o)(iv).

[225] *Ibid.*, paras. 18.35–18.36. [226] *Ibid.*, paras. 18.37–18.38.

[227] *Ibid.*, paras. 18.39(a), (c) and (d).

the introduction of the precautionary approach; the mandatory environmental impact assessment of all major projects potentially impairing water quality and aquatic ecosystems; and the use of risk assessment and risk management.[228]

The protection of groundwater focuses on non-degrading agricultural practices; mitigation of saline intrusion; regulation of toxic substances and establishment of protection zones in groundwater recharge and abstraction areas; and design and management of landfills based upon sound hydrogeological information and impact assessment, using the best practicable and best available technology.[229] Measures envisaged to protect aquatic ecosystems include: rehabilitation of polluted and degraded water bodies and agricultural lands; conservation and protection of wetlands; and control of noxious aquatic species.[230] This programme area also identifies the development of the necessary international legal instruments. These are for: monitoring and control of pollution and its effects on national and transboundary waters; control of long-range atmospheric transport of pollutants; control of spills in national or transboundary water bodies; and environmental impact assessment.[231]

In 2002, the World Summit on Sustainable Development (WSSD) adopted a number of specific goals, to give effect to UNCED commitments. Among the commitments adopted were the goals of:

- halving, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water, and the proportion of people without access to basic sanitation;
- intensifying water pollution prevention to reduce health hazards and protect ecosystems by introducing appropriate technologies and mitigating the effects of groundwater contamination, and establishing at the national level monitoring systems and effective legal frameworks;
- adopting prevention and protection measures to promote sustainable water use and to address water shortages;
- developing integrated water resource management and water efficiency plans by 2005; and
- developing and implementing national and regional strategies, plans and programmes on integrated river basin, watershed and groundwater management.[232]

[228] *Ibid.*, para. 18.40(a) and (b). [229] *Ibid.*, para. 18.40(d). [230] *Ibid.*, para. 18.40(e).
[231] *Ibid.*, para. 18.40(h). Whether by coincidence or design, the four areas mirror the four ECE conventions adopted since 1979 without specifically identifying them by name (1979 LRTAP Convention and Protocols; 1991 Espoo Convention; 1992 Watercourses Convention; and 1992 Industrial Accidents Convention).
[232] WSSD Plan of Implementation, paras. 24–8.

Conclusions

Many consider the management of fresh water to be the single greatest environmental challenge facing the international community, in large part because pollution and overuse have contributed to the unsanitary conditions leading to the world's most serious health problems. It is also, clearly, a major human rights issue. According to the World Bank, one billion people in developing countries do not have access to clean water and nearly two billion have no access to sanitation, resulting in the deaths of more than three million children every year.[233] In the face of statistics such as these, international law cannot, in the absence of strong political will and adequate financial resources, be expected to produce immediate results.

What international law can do is to set the framework according to which minimum international standards can be developed and effective, practical measures applied. Apart from the principles and rules of international law to which they are subject, freshwater resources are now the subject of a global framework convention, together with a range of bilateral and regional agreements which specifically address the use of freshwater resources, and their protection from contamination by pollution. These provide the first steps on which further developments might be constructed. Although the main emphasis in the past has been on developing co-operative international arrangements to govern use, in recent years the attention given to conservation has increased markedly, and recent treaties such as the 1992 Watercourses Convention and the 1997 Watercourses Convention reflect the widely held view that states are no longer entitled, as a matter of international law, to allow activities to take place which cause significant pollution to shared freshwater resources.

This conclusion nevertheless should not obscure the significant amount of work which remains to be done if international law is to contribute to halting overuse of freshwater and its pollution. There continue to be three priority areas. First, it is clear that rules establishing general standards and obligations, including those established by customary law, will be wholly inadequate. There is a need to develop specific international water quality standards, at the regional or global level, which may be of general application and which take account of particular regional or local circumstances. On the basis of these standards, targets and timetables can be adopted for the elimination of harmful substances, or the conduct of certain activities, for particular rivers, or lakes or groundwater resources, or on the basis of a regional approach.

Secondly, and in a similar fashion to that needed for the protection of oceans and seas, it is evident both from this chapter and from the rest of this book that protecting freshwater resources from pollution and overuse cannot be

[233] World Bank, *World Development Report* (1992), 5.

achieved otherwise than by addressing the root causes of the problem (basically, agricultural practices and industrial activities). Without effective environmental assessment on a broad scale of these practices and activities, both before and after their authorisation, it is unlikely that freshwater resources can benefit from anything other than cosmetic protection. In this regard, it will be equally important that the findings of such assessments are fully integrated into decision-making processes.

Thirdly, the protection of freshwater resources will not be achieved without effective enforcement mechanisms available to public and private entities which allow cases of non-compliance to be challenged.