ENVIRONMENTAL LAW AND POLICY

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Preface

Environmental law and policy constitute a multifaceted framework aimed at addressing various environmental challenges and promoting sustainable practices. These regulations and guidelines are crucial for protecting natural resources, conserving biodiversity, and mitigating the impacts of pollution and climate change.

One of the central objectives of environmental law and policy is pollution control. Regulations set standards for emissions and discharges from industrial facilities, vehicles, and other sources, aiming to prevent and reduce pollution of air, water, and soil. Compliance mechanisms and enforcement measures ensure that polluters adhere to these standards, safeguarding public health and environmental quality.

Resource management is another key focus area. Environmental laws govern the sustainable use and conservation of natural resources such as water, forests, and wildlife. They establish frameworks for managing resource extraction, promoting responsible stewardship, and balancing competing interests to ensure the long-term viability of ecosystems.

Conservation laws play a critical role in protecting biodiversity and ecosystems. They establish protected areas, regulate activities that may harm endangered species or habitats, and promote conservation measures to restore degraded ecosystems. By safeguarding biodiversity, these laws help maintain ecological balance and resilience in the face of environmental challenges.

Addressing climate change is a prominent aspect of environmental law and policy. Regulations seek to reduce greenhouse gas emissions, promote renewable energy sources, and implement adaptation measures to mitigate the impacts of climate change. International agreements such as the Paris Agreement provide frameworks for global cooperation in combating climate change.

Environmental law and policy also emphasize the importance of environmental justice and equity. They seek to ensure that marginalized communities, often disproportionately affected by environmental hazards, have equal access to environmental resources and decision-making processes. These laws aim to address environmental inequalities and promote inclusive and participatory approaches to environmental governance.

Furthermore, environmental law and policy foster international cooperation to address transboundary environmental issues. They provide frameworks for managing shared resources, resolving disputes, and coordinating efforts to address global environmental challenges such as pollution, deforestation, and biodiversity loss.

Environmental law and policy serve as essential tools for promoting sustainable development and protecting the planet's natural resources. By establishing legal frameworks and mechanisms for environmental protection, they play a vital role in safeguarding environmental integrity and ensuring a healthy and prosperous future for all.

The book on Environmental Law and Policy provides a comprehensive overview of regulations and strategies aimed at safeguarding the environment and promoting sustainable development practices.

–Author

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The Act for Protection of Environment and Associated Laws

PROTECTION ACT 1986

The main objective of this Act is to provide the protection and improvement of environment (which includes water, air, land, human being, other living creatures, plants, microorganism and properties) and for matters connected therewith. There is a constitutional provision also for the environment protection.

Article 48A, specify that the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country and every citizen shall protect the environment (51 A).

The Environment (Protection) Act is applicable to whole of India including Jammu & Kashmir. *Environment*: It includes water, air, and land and the inter-relationship which exists among and between water, air and land and human beings, other living creatures, plants, microorganism and property.

ENVIRONMENTAL POLLUTION

It means any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to environment and human being are known as pollutant and presence of any pollutant in the environment in such proportion and concentration that has bearing on health and environment is termed as "Environmental Pollution". Handling: In relation to any substance, it means the manufacturing, processing, treatment, packaging, storage, transportation, use, collection, destruction, conversion, offering for sale, *etc.*

OCCUPIER

It means a person who has control over the affairs of the factory or the premises, and includes, in relation to any substance, the person in possession of the substance. The Act provide power to make rules to regulate environmental pollution, to notify standards and maximum limits of pollutants of air, water, and soil for various areas and purposes,; prohibition and restriction on the handling of hazardous substances and location of industries.

The Central Government is empowered to constitute authority or authorities for the purpose of exercising of performing such of the powers and functions (Sec 3), appoint a person for inspection, for analysis or samples and for selection or notification of environmental laboratories. Such person or agency has power to inspect or can enter in the premises or can take samples for analysis. According to the section, the Central Government may issue directions in writing to any person or officers or any authority to comply.

There could be closure, prohibition of the supply of electricity or operation or process; or stoppage or regulation of the supply of electricity or water or any other service. Section empower the government to make rules to achieve the object of the Act.

Persons carrying on industry, operation, *etc.*, not to allow emission or discharge of environmental pollutants in excess of the standards. Persons handling hazardous substances must comply with procedural safeguards and occupiers must furnish the information to authority.

PENALTY

Whoever Person or Owner/Occupier of companies, factories or whichever source found to be the cause of pollution may be liable for punishment for a term which may extend to five years or with fine which may extend to one lakh rupees or both (Sec 15, 16, 17). If not comply fine of Rs. 5000 per day extra and if not comply for more than one year then imprisonment may extend up to 7 years. Section specify that Head of the department/in-charge of small unit may be liable for punishment if the owner/occupier produce enough evidence of innocence. The CPCB or state boards have power to close or cancel or deny the authorization to run the factory/institution/hospital whichever is causing pollution. No suit, prosecution or other legal procceings shall lie against govt. officer who has exercise power in good faith in pursuance of this Act. An Act to provide for the protection and improvement of environment and for matters connected there with:

Whereas the decisions were taken at the United NationsConference on the Human Environment held at Stockholm in June, 1972, in which India participated, to take appropriate steps for the protection and improvement of human environment; And whereas it is considered necessary further to implement the decisions aforesaid in so far as they relate to the protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property.

PREAMBLE

An Act to provide for the protection and improvement of environment and for matters connected therewith. Whereas decisions were taken at the United Nations Conference on the Human Environment held at Stockholm in June, 1972, in which India participated, to take appropriate steps for the protection and improvement of human environment; And whereas it is considered necessary further to implement the decisions aforesaid in so far as they relate to the protection and improvement of environment and the prevention of hazards to human being, other living creatures, plants and property; Be it enacted by Parliament in the Thirty-seventh Year of the Republic of India as follows.

SHORT TITLE, EXTENT AND COMMENCEMENT

- This Act may be called the Environment (Protection) Act, 1986.
- It extends to the whole of India.
- It shall come into force on such date 1 as the Central Government may, by notification in the Official Gazette, appoint and different dates may be appointed for different provisions of this Act and for different areas.

DEFINITIONS

In this Act, unless the context otherwise requires:

- "Environment" includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property;
- "Environmental pollutant" means any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment;
- "Environmental pollution" means the presence in the environment of any environmental pollutant;
- "Handling", in relation to any substance, means the manufacture, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer or the like of such substance;
- "Hazardous substance" means any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organism, property or the environment;
- "Occupier", in relation to any factory or premises, means a person who has control over the affairs of the factory or the premises and includes in relation to any substance, the person in possession of the substance;
- "Prescribed" means prescribed by rules made under this Act.

MEASURES TO PROTECT AND IMPROVE ENVIRONMENT

Subject to the provisions of this Act, the Central Government shall have the power to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.

In particular, and without prejudice to the generality of the provisions of sub-section (1), such measures may include measures with respect to all or any of the following matters, namely:

- Co-ordination of actions by the State Governments, officers and other authorities
  - Under this Act, or the rules made there under;
  - Under any other law for the time being in force which is relatable to the objects of this Act;
- Planning and execution of a nation-wide programme for the prevention, control and abatement of environmental pollution;
- Laying down standards for the quality of environment in its various aspects;
- Laying down standards for emission or discharge of environmental pollutants from various sources whatsoever: Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the emission or discharge of environmental pollutants from such sources;
- Restriction of areas in which any industries, operations or processes, or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards;
- Laying down procedures and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures for such accidents;
- Laying down procedures and safeguards for the handling of hazardous substances;
- Examination of such manufacturing processes, materials and substances as are likely to cause environmental pollution;
- Carrying out and sponsoring investigations and research relating to problems of environmental pollution;
- Inspection of any premises, plant, equipment, machinery, manufacturing or other processes, materials or substances and giving, by order, of such directions to such authorities, officers or persons as it may consider necessary to take steps for the prevention, control and abatement of environmental pollution;
- Establishment or recognition of environmental laboratories and institutes to carry out the functions entrusted to such environmental laboratories and institutes under this Act;
- Collection and dissemination of information in respect of matters relating to environmental pollution;
- Preparation of manuals, codes or guides relating to the prevention, control and abatement of environmental pollution;
- Such other matters as the Central Government deems necessary or expedient for the purpose of securing the effective implementation of the provisions of this Act.

The Central Government may, if it considers it necessary or expedient so to do for the purposes of this Act, by order, published in the Official Gazette, constitute an authority or authorities by such name or names as may be specified in the order for the purpose of exercising and performing such of the powers and functions (including the power to issue directions under section 5) of the Central Government under this Act and for taking measures with respect to such of the matters referred to in sub-section (2) as may be mentioned in the order and subject to the supervision and control of the Central Government and the provisions of such order, such authority or authorities may exercise the powers or perform the functions or take the measures so mentioned in the order as if such authority or authorities had been empowered by this Act to exercise those powers or perform those functions or take such measures.

APPOINTMENT OF OFFICERS

(1) Without prejudice to the provisions of sub-section (3) of section 3, the Central Government may appoint officers with such designations as it thinks fit for the purposes of this Act and may entrust to them such of the powers and functions under this Act as it may deem fit. (2) The officers appointed under sub-section (1) shall be subject to the general control and direction of the Central Government or, if so directed by that Government, also of the authority or authorities, if any, constituted under sub-section (3) of section 3 or of any other authority or officer.

POWER TO GIVE DIRECTIONS

Notwithstanding anything contained in any other law but subject to the provisions of this Act, the Central Government may, in the exercise of its powers and performance of its functions under this Act, issue directions in writing to any person, officer or any authority and such person, officer or authority shall be bound to comply with such directions.

Explanatione: For the avoidance of doubts, it is hereby declared that the power to issue directions under this section includes the power to direct

- The closure, prohibition or regulation of any industry, operation or process; or
- Stoppage or regulation of the supply of electricity or water or any other service.

REGULATE ENVIRONMENTAL POLLUTION

- The Central Government may, by notification in the Official Gazette, make rules in respect of all or any of the matters referred to in section 3.
- *In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:*
  - The standards of quality of air, water or soil for various areas and purposes;
  - The maximum allowable limits of concentration of various environmental pollutants (including noise) for different areas;

- The procedures and safeguards for the handling of hazardous substances;
- The prohibition and restrictions on the handling of hazardous substances in different areas;
- The prohibition and restrictions on the location of industries and the carrying on of processes and operations in different areas;
- The procedures and safeguards for the prevention of accidents which may cause environmental pollution and for providing for remedial measures for such accidents.

Persons carrying on industry, operation, *etc.* Not to allow emission or discharge of environmental pollutants in excess of the standards.

No person carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted any environmental pollutant in excess of such standards as may be prescribed.

Persons handling hazardous substances to comply with procedural safeguards. No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed

Fernishing of Infomation to Authorities

Where the discharge of any environmental pollutant in excess of the prescribed standards occurs or is apprehended to occur due to any accident or other unforeseen act or event, the person responsible for such discharge and the person in charge of the place at which such discharge occurs, or is apprehended to occur shall be bound to prevent or mitigate the environmental pollution caused as a result of such discharge and shall also forthwith.

- Intimate the fact of such occurrence or apprehension of such occurrence; and
- Be bound, if called upon, to render all assistance, to such authorities or agencies as may be prescribed.

On receipt of information with respect to the fact or apprehension of any occurrence of the nature referred to in sub-section (1), whether through intimation under that sub-section or otherwise, the authorities or agencies referred to in sub-section (1) shall, as early as practicable, cause such remedial measures to be taken as are necessary to prevent or mitigate the environmental pollution.

The expenses, if any, incurred by any authority or agency with respect to the remedial measures referred to in sub-section (2), together with interest (at such reasonable rate as the Government may, by order, fix) from the date when a demand for the expenses is made until it is paid may be recovered by such authority or agency from the person concerned as arrears of land revenue or of public demand.

POWER OF ENTRY AND INSPECTION

Subject to the provisions of this section, any person empowered by the Central Government in this behalf shall have a right to enter, at all reasonable times with such assistance as he considers necessary, any place.

- For the purpose of performing any of the functions of the Central Government entrusted to him;
- For the purpose of determining whether and if so in what manner any such functions are to be performed or whether any provisions of this Act or the rules made there under or any notice, order, direction or authorisation served, made, given or granted under this Act is being or has been complied with;
- For the purpose of examining and testing any equipment, industrial plant, record, register, document or any other material object or for conducting a search of any building in which he has reason to believe that an offence under this Act or the rules made there under has been or is being or is about to be committed and for seizing any such equipment, industrial plant, record, register, document or other material object if he has reasons to believe that it may furnish evidence of the commission of an offence punishable under this Act or the rules made there under or that such seizure is necessary to prevent or mitigate environmental pollution.

Every person carrying on any industry, operation or process or handling any hazardous substance shall be bound to render all assistance to the person empowered by the Central Government under sub-section (1) for carrying out the functions under that sub-section and if he fails to do so without any reasonable cause or excuse, he shall be guilty of an offence under this Act. If any person willfully delays or obstructs any person empowered by the Central Government under sub-section (1) in the performance of his functions, he shall be guilty of an offence under this Act.

The provisions of the Code of Criminal Procedure, 1973 in relation to the State of Jammu and Kashmir, or any area in which that Code is not in force, the provisions of any corresponding law in force in that State or area shall, so far as may be, apply to any search or seizure under this section as they apply to any search or seizure made under the authority of a warrant issued under section 94 of the said Code or, as the case may be, under the corresponding provisions of the said law.

SAMPLE AND PROCEDURE

The Central Government or any officer empowered by it in this behalf, shall have power to take, for the purpose of analysis, samples of air, water, soil or other substance from any factory, premises or other place in such manner as may be prescribed.

The result of any analysis of a sample taken under sub-section (1) shall not be admissible in evidence in any legal proceeding unless the provisions of sub-sections (3) and (4) are complied with.

Subject to the provisions of sub-section (4), the person taking the sample under sub-section (1) shall:

- Serve on the occupier or his agent or person in charge of the place, a notice, then and there, in such form as may be prescribed, of his intention to have it so analysed;

- In the presence of the occupier or his agent or person, collect a sample for analysis;
- Cause the sample to be placed in a container or containers which shall be marked and sealed and shall also be signed both by the person taking the sample and the occupier or his agent or person;
- Send without delay, the container or the containers to the laboratory established or recognised by the Central Government under section 12.

When a sample is taken for analysis under sub-section (1) and the person taking the sample serves on the occupier or his agent or person, a notice under clause (a) of sub-section

Then,

- In a case where the occupier, his agent or person willfully absents himself, the person taking the sample shall collect the sample for analysis to be placed in a container or containers which shall be marked and sealed and shall also be signed by the person taking the sample, and
- In a case where the occupier or his agent or person present at the time of taking the sample refuses to sign the marked and sealed container or containers of the sample as required under clause
- Of sub-section (3), the marked and sealed container or containers shall be signed by the person taking the samples, and the container or containers shall be sent without delay by the person taking the sample for analysis to the laboratory established or recognised under section 12 and such person shall inform the Government Analyst appointed or recognised under section 13 in writing, about the willful absence of the occupier or his agent or person, or, as the case may be, his refusal to sign the container or containers.

POWERS OF GOVERNMENT

Subject to the provisions of this Act, the Central Government, shall have the power to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing controlling and abating environmental pollution.

In particular, and without prejudice to the generality of the provisions of sub-section, such measures may include measures with respect to all or any of the following matters, namely:

- Co-ordination of actions by the State Governments, officers and other authorities
  - Under this Act, or the rules made thereunder, or
  - Under any other law for the time being in force which is relatable to the objects of this Act;
- Planning and execution of a nation-wide programme for the prevention, control and abatement of environmental pollution;

- Laying down standards for the quality of environment in its various aspects;
- Laying down standards for emission or discharge of environmental pollutants from various sources whatsoever:
  Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the emission or discharge of environmental pollutants from such sources;
- Restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards;
- Laying down procedures and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures for such accidents;
- Laying down procedures and safeguards for the handling of hazardous substances;
- Examination of such manufacturing processes, materials and substances as are likely to cause environmental pollution;
- Carrying out and sponsoring investigations and research relating to problems of environmental pollution;
- Inspection of any premises, plant, equipment, machinery, manufacturing or other processes, materials or substances and giving, by order, of such directions to such authorities, officers or persons as it may consider necessary to take steps for the prevention, control and abatement of environmental pollution;
- Establishment or recognition of environmental laboratories and institutes to carry out the functions entrusted to such environmental laboratories and institutes under this Act;
- Collection and dissemination of information in respect of matters relating to environmental pollution;
- preparation of manuals, codes or guides relating to the prevention, control and abatement of environmental pollution;
- Such other matters as the Central Government deems necessary or expedient for the purpose of securing the effective implementation of the provisions of this Act.

The Central Government may, if it considers it necessary or expedient so to do for the purposes of this Act, by order, published in the Official Gazette, constitute an authority or authorities by such name or names as may be specified in the order for the purpose of exercising and performing such of the powers and functions (including the power to issue directions under section 5) of the Central Government under this Act and for taking measures with respect to such of the matters referred to in sub-section as may be mentioned in the order and subject to the supervision and control of the Central Government and the provisions of such order, such authority or authorities may exercise the powers

or perform the functions or take the measures so mentioned in the order as if such authority or authorities had been empowered by this Act to exercise those powers or perform those functions or take such measures.

PREVENTION AND CONTROL

Persons carrying on industry operation, *etc.*,Not to allow emission or discharge of environmental pollutants in excess of the standards. No person carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted any environmental pollutants in excess of such standards as may be prescribed.

Persons handling hazardous substances to comply with procedural safeguards No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed.

FURNISHING OF INFORMATION

Where the discharge of any environmental pollutant in excess of the prescribed standards occurs or is apprehended to occur due to any accident or other unforeseen act or event, the person responsible for such discharge and the person in charge of the place at which such discharge occurs or is apprehended to occur shall be bound to prevent or mitigate the environmental pollution caused as a result of such discharge and shall also forthwith.

- Intimate the fact of such occurrence or apprehension of such occurrence; and
- Be bound, if called upon, to render all assistance, to such authorities or agencies as may be prescribed.

On receipt of information with respect to the fact or apprehension on any occurrence of the nature referred to in sub-section, whether through intimation under that sub-section or otherwise, the authorities or agencies referred to in sub-section shall, as early as practicable, cause such remedial measures to be taken as necessary to prevent or mitigate the environmental pollution.

The expenses, if any, incurred by any authority or agency with respect to the remedial measures referred to in sub-section, together with interest (at such reasonable rate as the Government may, by order, fix) from the date when a demand for the expenses is made until it is paid, may be recovered by such authority or agency from the person concerned as arrears of land revenue or of public demand.

POWERS OF ENTRY AND INSPECTION

Subject to the provisions of this section, any person empowered by the Central Government in this behalf shall have a right to enter, at all reasonable times with such assistance as he considers necessary, any place.

- For the purpose of performing any of the functions of the Central Government entrusted to him;

- For the purpose of determining whether and if so in what manner, any such functions are to be performed or whether any provisions of this Act or the rules made there under notice, order, direction or authorization served, made, given or granted under this Act is being or has been complied with;
- For the purpose of examining and testing any equipment, industrial plant, record, register, document or any other material object or for conducting a search of any building in which he has reason to believe that an offence under this Act or the rules made thereunder has been or is being or is about to be committed and for seizing any such equipment, industrial plant, record, register, document or other material object if he has reason to believe that it may furnish evidence of the commission of an offence punishable under this Act or the rules made thereunder or that such seizure is necessary to prevent or mitigate environmental pollution.

Every person carrying on any industry, operation or process of handling any hazardous substance shall be bound to render all assistance to the person empowered by the Central Government under sub-section (1) for carrying out the functions under that sub-section and if he fails to do so without any reasonable cause or excuse, he shall be guilty of an offence under this Act.

If any person willfully delays or obstructs any persons empowered by the Central Government under sub-section in the performance of his functions, he shall be guilty of an offence under this Act. The provisions of the Code of Criminal Procedure, 1973, or, in relation to the State of Jammu and Kashmir, or an area in which that Code is not in force, the provisions of any corresponding law in force in that State or area shall, so far as may be, apply to any search or seizures under this section as they apply to any search or seizure made under the authority of a warrant issued under section 94 of the said Code or as the case may be, under the corresponding provision of the said law.

Power to take Sample and Procedure

The Central Government or any officer empowered by it in this behalf, shall have power to take, for the purpose of analysis, samples of air, water, soil or other substance from any factory, premises or other place in such manner as may be prescribed.

The result of any analysis of a sample taken under sub-section shall not be admissible in evidence in any legal proceeding unless the provisions of sub-sections (3) and (4) are complied with.

Subject to the provisions of sub-section (4), the person taking the sample under sub-section (1) shall:

- Serve on the occupier or his agent or person in charge of the place, a notice, then and there, in such form as may be prescribed, of his intention to have it so analyzed;
- In the presence of the occupier of his agent or person, collect a sample for analysis;

- Cause the sample to be placed in a container or containers which shall be marked and sealed and shall also be signed both by the person taking the sample and the occupier or his agent or person;
- Send without delay, the container or the containers to the laboratory established or recognized by the Central Government under section 12.

When a sample is taken for analysis under sub-section and the person taking the sample serves on the occupier or his agent or person, a notice under clause (a) of sub-section, then,

- In a case where the occupier, his agent or person wilfully absents himself, the person taking the sample shall collect the sample for analysis to be placed in a container or containers which shall be marked and sealed and shall also be signed by the person taking the sample, and
- In a case where the occupier or his agent or person present at the time of taking the sample refuses to sign the marked and sealed container or containers of the sample as required under clause
- Of sub-section (3), the marked and sealed container or containers shall be signed by the person taking the samples, and the container or containers shall be sent without delay by the person taking the sample for analysis to the laboratory established or recognized under section 12 and such person shall inform the Government Analyst appointed or recognized under section 12 in writing, about the willful absence of the occupier or his agent or person, or, as the case may be, his refusal to sign the container or containers.

ENVIRONMENTAL LABORATORIES

- The Central Government may, by notification in the Official Gazette,
  - Establish one or more environmental laboratories;
  - Recognize one or more laboratories or institutes as environmental laboratories to carry out the functions entrusted to an environmental laboratory under this Act.
- The Central Government may, by notification in the Official Gazette, make rules specifying
  - The functions of the environmental laboratory;
  - The procedure for the submission to the said laboratory of samples of air, water, soil or other substance for analysis or tests, the form of the laboratory report thereon and the fees payable for such report;
  - Such other matters as may be necessary or expedient to enable that laboratory to carry out its functions.

GOVERNMENT ANALYSTS

The Central Government may by notification in the Official Gazette, appoint or recognise such persons as it thinks fit and having the prescribed qualifications

to be Government Analysts for the purpose of analysis of samples of air, water, soil or other substance sent for analysis to any environmental laboratory established or recognised under sub-section (1) of section 12.

REPORTS OF GOVERNMENT ANALYSTS

Any document purporting to be a report signed by a Government analyst may be used as evidence of the facts stated therein in any proceeding under this Act.

Penalty for contravention of the provisions of the act and the rules, orders and directions: Whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued thereunder, shall, in respect of each such failure or contravention, be punishable with imprisonment for a term which may extend to five years with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention. If the failure or contravention referred to in sub-section continues beyond a period of one year after the date of conviction, the offender shall be punishable with imprisonment for a term which may extend to seven years.

OFFENCES BY COMPANIES

Where any offence under this Act has been committed by a company, every person who, at the time the offence was committed, was directly in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act, if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence. (2) Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall also deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation:For the purpose of this section,—

- "Company" means any body corporate and includes a firm or other association of individuals;
- "Director", in relation to a firm, means a partner in the firm.

OFFENCES BY GOVERNMENT DEPARTMENTS

Where an offence under this Act has been committed by any Department of Government, the Head of the Department shall be deemed to be guilty of the

offence and shall be liable to be proceeded against and punished accordingly. Provided that nothing contained in this section shall render such Head of the Department liable to any punishment if he proves that the offence was committed without his knowledge or that he exercise all due diligence to prevent the commission of such offence. Notwithstanding anything contained in sub-section (1), where an offence under this Act has been committed by a Department of Government and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any officer, other than the Head of the Department, such officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

MISCELLANEOUS

PROTECTION OF ACTION

No suit, prosecution or other legal proceeding shall lie against the Government or any officer or other employee of the Government or any authority constituted under this Act or any member, officer or other employee of such authority in respect of anything which is done or intended to be done in good faith in pursuance of this Act or the rules made or orders or directions issued thereunder.

COGNIZANCE OF OFFENCES

No court shall take cognizance of any offence under this Act except on a complaint made by:

- The Central Government or any authority or officer authorised in this behalf by that Government, or
- Any person who has given notice of not less than sixty days, in the manner prescribed, of the alleged offence and of his intention to make a complaint, to the Central Government or the authority or officer authorised as aforesaid.

INFORMATION, REPORTS OR RETURNS

The Central Government may, in relation to its function under this Act, from time to time, require any person, officer, State Government or other authority to furnish to it or any prescribed authority or officer any reports, returns, statistics, accounts and other information and such person, officer, State Government or other authority shall be bound to do so.

MEMBERS, OFFICERS AND EMPLOYEES

All the members of the authority, constituted, if any, under section 3 and all officers and other employees of such authority when acting or purporting to act in pursuance of any provisions of this Act or the rules made or orders or directions issued thereunder shall be deemed to be public servants within the meaning of section 21 of the Indian Penal Code (45 of 1860).

Bar of Jurisdication

No civil court shall have jurisdiction to entertain any suit or proceeding in respect of anything done, action taken or order or direction issued by the Central Government or any other authority or officer in pursuance of any power conferred by or in relation to its or his functions under this Act.

POWERS TO DELEGATE

Without prejudice to the provisions of sub-section (3) of section, the Central Government may, by notification in the Official Gazette, delegate, subject to such conditions and limitations as may be specified in the notifications, such of its powers and functions under this Act [except the powers to constitute an authority under sub-section of section 3 and to make rules under section 25] as it may deem necessary or expedient, to any officer, State Government or other authority.

EFFECT OF OTHER LAWS

Subject to the provisions of sub-section (2), the provisions of this Act and the rules or orders made therein shall have effect notwithstanding anything inconsistent therewith contained in any enactment other than this Act. Where any act or omission constitutes an offence punishable under this Act and also under any other Act then the offender found guilty of such offence shall be liable to be punished under the other Act and not under this Act.

POWER TO MAKE RULES

The Central Government may, by notification in the Official Gazette, make rules for carrying out the purposes of this Act. In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely

- The standards in excess of which environmental pollutants shall not be discharged or emitted under section 7;
- The procedure in accordance with and the safeguards in compliance with which hazardous substances shall be handled or caused to be handled under section 8;
- The authorities or agencies to which intimation of the fact of occurrence or apprehension of occurrence of the discharge of any environmental pollutant in excess of the prescribed standards shall be given and to whom all assistance shall be bound to be rendered under sub-section (1) of section 9;
- The manner in which samples of air, water, soil or other substance for the purpose of analysis shall be taken under sub-section (1) of section 11;
- The form in which notice of intention to have a sample analysed shall be served under clause (a) of sub section (3) of section 11;

- The functions of the environmental laboratories, the procedure for the submission to such laboratories of samples of air, water, soil and other substances for analysis or test; the form of laboratory report; the fees payable for such report and other matters to enable such laboratories to carry out their functions under sub-section (2) of section 12;
- The qualifications of Government Analyst appointed or recognised for the purpose of analysis of samples of air, water, soil or other substances under section 13;
- The manner in which notice of the offence and of the intention to make a complaint to the Central Government shall be given under clause (b) of section 1
- The authority of officer to whom any reports, returns, statistics, accounts and other information shall be furnished under section 20;
- Any other matter which is required to be, or may be, prescribed.

RULES MADE UNDER THIS ACT

Every rule made under this Act shall be laid, as soon as may be after it is made, before each Hose of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule.

- It came into force in the whole of India on 19th November, 1986 vide Notification No. G.S.R. 1198(E) dated 12-11-86 published in the Gazette of India No. 525 dated 12-11-86.
- The Central Government has delegated the powers vested m it under section 5 of the -Act to the State Governments of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnatalca, Kerala, Madhya Predesh, Mizoram, Orissa, Rajasthan, Sikkim and Tamil Nadu subject to the condition that the Central Government may revoke such delegation of Powers in respect of all or any one or more of the State Governments or may itself invoke the provisions of section 5 of the Act, if in the opinion of the Central Government such a course of action is necessary in public interest, (Notification No, S.O. 152 (E) dated 10-2-88 published in Gazette No. 54 of the same date).

These Powers have been delegated to the following State Governments also on the same terms:

- Meghalaya, Punjab and Uttar Pradesh vide Notification No. S.0.389 (E) dated 14-4-88 published in the Gazette No. 205 dated 144-88;

- Maharashtra vide Notification No. S.O. 488(E) dated 17-5-88 published in the Gazette No. 255 dated 17-5-88;
- Goa and Jammu & Kashmir vide Notification No. S.O. 881 (E~ dated 22-9-88; published in the Gazette No. 749 dated 22.9.88.
- West Bengal Manipur vide Notificadon N. S.O. 408 (E) dated 6-6-89; published in the Gazette No. 319 dated 6-6-89;
- Tripura vide Notification No. S.O. 479 (E) dated 25-7-91 published in thc Gazene No. 414 dated 25-7-91.
- For issuing directions see r.4 of Itnviromnent (Protection) Rules, 1986.
- Schedule I lists the standards for emission or discharge of environmental pollutants from the industries, processes or operations and their maximum allowable limits of concentration;
  - Schedule II lists general standards for discharge of effluents and their maximum limits of concentration allowable;
  - Schedule III lists ambient air quality standards in respect of noise and its maximum allowable limits; and
  - Schedule IV lists standards for emission of smoke, vapour, *etc.*, from motor vehicles and maximum allowable limits of their emission.
- Environment (Protection) Rules, 1986
  - Hazardous Wastes (Management and Handling) Rules, 1989;
  - Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989; and
  - Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro organisms, Genetically-engineered organisms or Cells.

Rules and Schedule 11, and relevant provisions of Hazardous Wastes (Management and Handling) Rules, Manufacture, Storage and Import of Hazardous Chemicals Rules and Rules for the Manufacture, Use, Import Export and Storage of hazardous Micro-organisms, Genetically Engineered Organisms or Cells.

- For authorities or agencies see r. 12 of Environment (Protection) Rules, 1986 and Schedule
- The Central Govt. has empowered 60 persons listed in the Table vide S.O. 83 (E) published in the Gazette of India No. 66 dated 16-2-87 and S.O. 63 (E) published in the Gazette of India No. 42 dated 18-1-88.
- In excercise of powers conferred under sub-section (i) of section 11 the Central Government has empowered 60 officers listed in the Table vide S.O. 84. (E) published in the Gazette No. 66 dated 16-2-87 and S.O. 62(E) published in the Gazette No. 42 dated 18-l-88.
- For procedure for taking samples.
- The Central Government has delegated its powers under clause (b) of sub-section (i) of section 12 and section 13 of the Act to the Central Pollution Control Board vide Notification No. S.O. 145 (E) dated 21-2-91 published in the Gazette No. 128 dated 27-2-91.

- The list of laboratories/institutes recognised as environmental laboratories: and the persons recognised as Govt. Analysts is given in the table.
- For qualifications of Govt. Analyst.
- In exercise of powers conferred under clause (a) of section l9, the Central-Government has authorised the officers and authorities listed in the Table (p. 238) vide S.O. 394 (E) published in the Gazette No. 185 dated 164-87, S.O. 237(E) published in the Gazette No. 171 dated 29-3-89 and S.O. 656(E) dated 21-8-89 published in the Gazette No. 519 dated 21-8-89.
- For the procedure for submission of samples to laboratories and the form of laboratory report.

S.O.145(E)

In exercise of the powers conferred under Section 23 of the Environment (Protection) Act, 1986, the Central Government hereby issue the following orders namely:

- The Central Government hereby delegates the powers with respect to grant of recognition to laboratories or institutes as environmental laboratories and to appoint or recognize Analysts as Government Analysts, as conferred by clause (b) of Sub-section (i) of Section 12 and section 13 respectively of the Environment (Protection) Act, 1986 to the Central Pollution Control Board.
- Recognition of private laboratories under clause (b) of sub-section (i) of section 12 of the Environment (Protection)Act, 1986 as well as recognition of their Analysts as Government Analysts under Section 13 of the Environment (Protection) Act, 1986, will continue to be done by the Central Government.
- The laboratories recognized under clause (b) of sub-section (i) of section 12 of the Environment (Protection) Act, 1986 shall be specified as Government/Autonomous/Public Sector Undertaking/Educational Institution/State or Central Pollution Control Board Laboratories.
- The work done by each Laboratories recognized under the Environment (Protection) Act, 1986 shall be included in the Annual Report of the Central Pollution Control Board.
- This notification shall come into force on the date of its publication in the Official Gazette.

2

Federal Environmental Regulation Strategies

Federal environmental statutes and programmes provide much of the framework used to develop, interpret, and enforce state environmental protection laws. For this reason, it is important to acquire a general understanding of federal environmental protection laws as they relate to state law. With the exception of National Environmental Policy and Endangered Species Act, California law preceded and was the basis for the development of federal environmental laws.

UNIFORM FIRE CODE—HAZARDOUS MATERIALS MANAGEMENT PLAN, HAZARDOUS MATERIALS INVENTORY STATEMENT

The Uniform Fire Code (UFC) is published by the Western Fire Chiefs Association. The UFC "prescribes regulations consistent with nationally recognized good practice for the safeguarding... of life and property from the hazards of fire and explosion arising from the storage, handling and use of hazardous substances, materials and devices, and from conditions hazardous to life or property in the use or occupancy of buildings or premises." The State Fire Marshal, part of the Department of Forestry and Fire Protection since 1996, has adopted the Uniform Fire Code, with amendments, as the California Fire Code. Local fire departments are required to adopt local fire codes that are no less stringent than the California Fire Code.

Section 8001.3 of Article 80 of the California Fire Code pertains to hazardous materials permits. Pursuant to section 8001.3.1, a permit is required "to store,

dispense, use or handle hazardous material in excess of" specified quantities. The actual issuance of these permits and compliance with their requirements are outside the scope of the Unified Programme. Permit applicants may be required by a fire chief to prepare a Hazardous

Materials Management Plan (HMMP) and Hazardous Materials Inventory Statement (HMIS); these two documents are included in the Unified Programme. The requirements of the HMMP and HMIS are now essentially the same as those of the business plan. The only enforcement mechanisms for Fire Code violations are those provided in local ordinance—usually infractions or misdemeanors. But see enforcement options under the discussion of business plans, above.

Underground Storage Tanks

The problem of hazardous substances leaking from underground tanks is not confined to California. Leakage from underground storage tanks containing hazardous material has contaminated groundwater and drinking water supplies throughout the nation. One gallon of gasoline can contaminate one million gallons of drinking water to an unsafe level of one part per million. High groundwater and sandy alluvial soil accelerate the corrosion of steel underground tanks and piping. As a result, leaks may occur in some tanks that are less than 10 years old.

More than half the reported leaks occur in the pressurized piping associated with the tanks rather than in the tanks themselves. Gasoline leaking from a hole in a pressure line will do so at a much faster rate than gasoline dripping from a hole in a tank's bottom. Moreover, because gasoline is so temperature sensitive and volatile, a 10,000-gallon tank can easily leak 100 gallons per month without being detected.

The requirements for the UST programme are found in Article 2, Chapter 6.7, Division 20 of the Health and Safety Code. The SWRCB has responsibility for developing regulations that establish statewide standards for the UST programme, which are found in Chapter 16 of Division 3 of Title 23, in the California Code of Regulations. The programme is implemented on the local level by CUPAs. The owner or operator of a UST must obtain a permit from the CUPA prior to commencing operation of a tank. The permit includes conditions regarding design, construction, and installation of new USTs, monitoring, repairs, upgrades, release response, closure, and notification or reporting.

The Role of the State Water Resources Control Board

The State Water Resources Control Board promulgates regulations to implement the standards for underground storage tanks outlined in Health and Safety Code section 25299.3. These regulations govern implementation of safety technologies, monitoring requirements, and reporting. The State Board is also required to develop standardized underground storage tank permit applications to be used by local authorities in monitoring the permit system and to keep

records of all permit applications filed with local authorities. The State Board has an underground tank enforcement unit that investigates violations related to USTs.

Tank Owners Requirements

Health and Safety Code sections 25280 et seq. lists the requirements for owners of tanks:

- Obtain a Permit to Operate and pay a fee to the local agency, *i.e.*, install a leak-detection system on all existing tanks.
- On new tank installations, obtain a Permit to Install and provide secondary containment of the tank and piping.
- Upon abandoning a tank, obtain a Permit to Abandon, clean out the tank, remove it from the ground, and check the ground beneath for evidence of contamination and past leakage.
- No permit is required for pits, ponds, lagoons.

Permits

The local CUPA issues permits and oversees activities pertaining to underground hazardous material storage tanks. Agriculture is exempt from local agency permit requirements.

The three kinds of permits and their requirements are as follows:

- Permit to Operate
  - Installation of a leak-detection system.
  - Compliance schedule for installation of leak-detection system.
  - Inspection of the leak-detection system installation and proper use, monitoring, and maintenance of the system.
- Permit to Install
  - Review of plans for secondary containment of tanks and piping.
  - Inspection of installation to ensure proper construction of the secondary containment system.
- *Permit to Close*: This permit requires the tank to be completely emptied and removed from the ground and the soil around and beneath the tank sampled for contamination.

Leak-Detection Programme

Applicants must file a plan and install a leak-detection system at their facilities. The plan must incorporate one of the monitoring alternatives contained in the regulations.

Requirements include:

- Description of proposed leak-detection system.
- Identification of monitoring alternatives.
- List of proposed equipment.
- Inventory schedule and procedures.
- Tank testing schedule.

- Monitoring of person responsible for leak-detection reporting procedures to be used if leak is detected.
- Name of the person responsible for leak detection reporting procedures to be used if leak is detected.
- Identification of duties to be performed by the owner of the tank and the operator of the facility.

ENFORCEMENT

Civil

Health and Safety Code section 25299 states that an owner or operator of an underground storage tank facility shall be liable for a civil penalty of from $500 to $5,000 per day for any of the following violations:

- Operating the facility's tanks without a Permit to Operate.
- Failing to monitor the tanks as required by the permit.
- Failing to maintain inventory and other records.
- Failing to report leaks.
- Improperly closing/abandoning a tank.
- Improperly repairing a leaking tank.

Criminal

Misdemeanors

Anyone falsifying any monitoring records or knowingly fails to report a leak may be fined from $5,000 to $10,000 per day and/or imprisoned in county jail for not more than one year. Anyone intentionally tampering with leak detection systems leak may be fined from $5,000 to $10,000 per day and/or imprisoned in county jail for not more than one year.

Felonies

Health and Safety Code Section 25284.4 (i): Perjury provision for fraud by underground tank testers

Alternative Penalties

In certain cases, an owner of a tank may be held liable for illegal disposal of hazardous waste under the Hazardous Waste Control Board Law with civil and criminal penalties similar to those described above.

HAZARDOUS WASTE

California's Hazardous Waste Control Act of 1972 was the first comprehensive hazardous waste control law in the United States. It has served as a model for other states as well as for the federal government. The Hazardous Waste Control Law, Health and Safety Code sections 25100 et seq., establishes standards for regulating the generation, handling, processing, storage,

transportation, and disposal of hazardous wastes—a "cradle to grave" scheme. The purpose of the regulations is the management of hazardous waste from the moment it is generated by an individual or a business until it is recycled or discarded. The hazardous waste control programme is administered by the state Department of Toxic Substances Control (DTSC) and by local CUPAs.

Hazardous Material vs. Hazardous Waste

The distinction between hazardous material and hazardous waste is important. Different regulatory schemes have different lists of what constitutes a hazardous material. For example, Health and Safety Code section 25501 provides its own particular definition of hazardous material. Hazardous materials become hazardous waste when the material has been used for its original purpose and is about to be discarded or recycled. California law subjects recyclable materials to many of the same restrictions as hazardous waste.

Hazardous waste is defined as a waste, or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either:

- Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.
- Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or
- Otherwise managed.

Criteria for specific types of hazardous waste are found in the California Code of Regulations at Title 22, sections 66261.10-66261.24. These regulations describe specific testing methods for toxicity, flammability, reactivity, and corrosiveness..

The Manifest System

DTSC is responsible for maintaining and regulating the manifest system mandated by the Hazardous Waste Control Law. The focus of the system is the requirement of a "manifest," a document that tracks the movement and disposal of hazardous waste. Manifest regulations are set forth at California Code of Regulations Title 22, sections 66262.20-66262.23 and 66262.40. The generator prepares the manifest that identifies the generator, the type and amount of waste to be shipped, the designated hauler, and the designated disposal site.

The generator prepares six copies of the manifest. When waste is offered for transportation, the transporter acknowledges receipt of the waste by signing the manifest. The generator retains one signed copy and sends another copy to DTSC within 30 days of shipping the waste. The hauler carries the remaining four copies with him or her at all times during the transportation of the waste. Upon delivery to the disposal site, the owner or operator of the disposal facility inspects the waste to assure that it is accurately described in the manifest and then acknowledges receipt of the waste by signing the manifest.

TREATMENT, STORAGE, AND DISPOSAL FACILITIES (TSDFS)

Facility Permits

The state issues permits only to facilities engaged in the treatment, storage, disposal, or transportation of hazardous wastes. Generators are not required to obtain a permit, but are required to have a U.S., EPA generator ID number and must report to the federal Environmental Protection Agency if they produce more than 1,000 kilograms (2,200 pounds) of hazardous waste within a calendar month. Exceptions are made for hazardous wastes generated onsite and stored for less than 90 days or where the total hazardous waste generated is less than 5,000 gallons or 45,000 pounds. Transfer facilities holding hazardous waste for more than 144 hours and all other off-site facilities holding hazardous waste for any period of time must also hold a valid TSDF permit.

Fees

Disposal fees are assessed on a per-ton basis. Fees are collected by the Board of Equalization, not the Department of Toxic Substances Control.

Generator Responsibilities

A generator is a person or business whose act or process produces a hazardous waste or whose act first causes a hazardous waste to become subject to regulation.

Responsibilities include:

- Filing a hazardous waste notification statement with DTSC prior to generating, treating, storing, or disposing of hazardous waste.
- The generator determines if its waste falls within the definition of "hazardous" and treats it accordingly. The generator must obtain a U.S., EPA Identification Number. Variance procedures are available if the generator believes the waste need not be handled as hazardous waste.
- A generator of extremely hazardous waste must notify DTSC of its intent to dispose it.
- A generator may store hazardous waste at an outside facility for up to 90 days or at an offsite transfer facility for 144 hours without obtaining a facility permit. Extensions of the 90-day rule are available on application to DTSC if unforeseen circumstances cause delay.
- Small generators, defined as generators of less than 100 kilograms (220 pounds) of hazardous waste or less than one kilogram (2.2 pounds) of extremely hazardous waste per month, may store up to 100 kilograms of hazardous waste or one kilogram of extremely hazardous waste indefinitely without a permit.
- Generators must dispose of all hazardous waste at a licensed facility using a registered hazardous-waste hauler for all transportation.
- Generators must use a manifest for all transportation of hazardous waste and:
  - Complete the generator portion (including a description of the waste) and sign the certification.

  - Insure that the transporter signs and dates the manifest upon receipt of the waste.
  - Keep two copies of the manifest (special rules apply regarding transport by ship, rail, *etc.*).
  - Contact the transporter and disposal facility if the copy signed by the disposer is not received within 35 days of shipment.
  - Submit an Exception Report to DTSC if a signed copy from the disposal facility is not received within 45 days of shipment. Maintain records.
- Generators must maintain copies of all manifests for three years, submit biennial reports, keep a copy of all biennial reports and exception reports for three years, and maintain copies of all chemical test reports for three years.
- Generators must insure that hazardous waste is properly packaged and labeled for transport.
- Generators must insure that storage conditions comply with regulations during storage prior to disposal.

Comply with storage and container regulations for Interim Status and Permitted Facilities, including providing for adequate security, containment of spills, alarm systems, *etc.* The date on which accumulation of waste began must be marked and visible on each container to assure compliance with the 90-day rule.

Containers must be marked as containing hazardous waste:

- Generators must comply with regulations regarding preparedness and prevention for fires, spills, accidents, *etc.*, and also with regulations regarding contingency plans for accidents, evacuations, emergency response, *etc.* This may be the same document as the Hazardous Materials Management Plan prepared pursuant to Health and Safety Code Chapter 6.95.
- Generators must comply with training requirements for personnel who handle hazardous waste.
- Generators must recycle all hazardous wastes for which DTSC determines recycling is economically and technologically feasible. A list of such wastes appears at California Code of Regulations Title 22, section 66266.2.
- Generators who produce more than five tons of hazardous waste per year must pay generator fees.

HAZARDOUS-WASTE TRANSPORTERS

Registration

DTSC has the responsibility for the registration of all transporters of hazardous waste in California. All transporters must hold a valid registration permit from DTSC before carrying any hazardous waste. DTSC reviews applications for registration to ensure that:

- All equipment to be used by the transporter for transporting hazardous wastes has passed inspection by the California Highway Patrol (CHP).
- All persons who will operate any hazardous waste transportation equipment have received adequate safety training.
- The transporter has established his or her financial responsibility.
- The hauler has agreed to allow authorized agents of DTSC or the CHP to inspect his or her vehicle, transportation equipment, and records.

Enforcement of Transportation Laws

DTSC shares responsibility for enforcing California's hazardous waste transportation laws and regulations with CHP. DTSC is authorized to inspect company records and, when accompanied by a uniformed police officer, to stop and inspect any vehicle reasonably suspected of transporting hazardous wastes. DTSC may suspend the transporter's registration absent proof of ability to respond to damage. When DTSC determines that a violation has occurred or is about to occur, it may request the city attorney, district attorney, or the attorney general to seek injunctive relief or civil penalties in the California courts.

- *California Highway Patrol*: Under Vehicle Code section 34501(b), CHP has broad authority to promulgate regulations to ensure safety in the transportation of hazardous substances. Pursuant to that authority, CHP has issued extensive regulations regarding:
  - Packaging and labeling of hazardous substances offered for transportation, the placarding of vehicles, the preparation of shipping papers, safety-equipment requirements, and routing restrictions.
  - CHP packaging and labeling requirements extensively reference federal Department of Transportation regulations.
  - *Licensing*: The CHP is responsible for licensing hazardous-waste haulers. No person may transport hazardous waste without first acquiring a license from CHP. The license is non-transferable and may be denied, suspended, or revoked if the hauler is found to be guilty of multiple violations of the hazardous waste transportation laws.
  - *Suspensions*: CHP is also authorized to suspend or revoke any license for the transportation of hazardous materials if it finds that the hauler has been found guilty of multiple violations of the Vehicle Code and that such suspension or revocation is in the public interest. The CHP commissioner is authorized to temporarily suspend any hauler's license when he or she deems such suspension necessary to prevent an imminent and substantial danger to the public health.
- Responsibilities of Transporters
  - Must be registered with DTSC and obtain CHP inspection/approval for all trucks and containers used in transport. There is an exception for small quantities (under five gallons/50 pounds).

- Must comply with all regulations regarding manifests.
- Must ensure that the generator signs, dates, and describes the waste.
- Must complete, sign, and date the transporter section and give a copy to the generator prior to the removal of the waste.
- Must have a copy of the manifest in his or her possession during transportation and must provide a copy to the facility to which the waste is delivered.
- Must obtain the signature and date of transfer of the waste to the licensed facility where it is disposed or to another registered waste hauler upon surrender of the waste.
- Must keep a copy of the manifest for three years.
- Must take immediate and appropriate action regarding spills during transport.

Cleanup Superfund

Pursuant to the Carpenter-Presley-Tanner Hazardous Substance Account Act (the State Superfund), DTSC is responsible for formulating criteria for the selection and priority ranking of hazardous-waste sites for remedial action. For this purpose, DTSC has adopted a modified version of U.S., EPA's hazard ranking system. DTSC has prepared a priority list of sites for cleanup that it updates monthly. In addition to this priority list, DTSC prepares site-specific plans of expenditures for removal and remedial actions to be paid for from the State Superfund.

Whenever DTSC determines that a release of a hazardous waste has occurred or is about to occur, it is authorized to investigate the nature of the release or potential release, to plan and direct appropriate remedial action, and, if no other party has undertaken the appropriate remedial action, to undertake that action itself. It is also authorized to require the property owner to secure the site.

If DTSC determines that a site or release presents an imminent and substantial danger to the public health or the environment, it may immediately order remedial action by the responsible parties, request the attorney general to seek judicial relief, and/or take or contract for necessary remedial actions. The attorney general has jurisdiction to recover all costs expended by the DTSC.

If the local district attorney has brought an action under the HWCL pursuant to Chapter 6.5 against any person for violating the provisions of that chapter or any rule, regulation, or order and the Department has spent money from the state account for immediate corrective action in response to a release or threatened release, the state account may be made a party to that action for the purpose of recovering such costs.

Enforcement

If DTSC finds any violation of the HWCL or its rules or regulations, or if it finds that the owner or operator of the facility has misrepresented or omitted

any significant fact in its permit application or in any other information submitted to the Department, it may suspend or revoke the facility's permit.

Alternatively, if DTSC or the CUPA director finds a violation of HWCL or its regulations, he or she may issue an administrative order against the owner or operator of the facility specifying a schedule for compliance. If corrective action is not taken or if it is determined that immediate action is necessary to prevent an imminent and substantial danger to the public health or environment, DTSC is authorized to take action itself. If the director finds any violation of HWCL or its regulations, DTSC may request the local city attorney, district attorney, or the attorney general to file suit for injunctive relief or civil penalties. To the extent that criminal violations are involved, the inherent prosecutorial authority of the district attorney allows for independent criminal prosecution of any violations without regard to the above-listed requests from the DTSC. Legislation passed in 1990 creates dual criminal jurisdiction in both the district attorney and the city attorney. Coordination between district attorneys and city attorneys is critical to avoid double-jeopardy problems.

Violations

Criminal Violations: Health and Safety Code Section 25190: Any violation of Chapter 6.5 of the Health and Safety Code or any regulation adopted under Chapter 6.5 (including all registration, certification, and manifesting requirements identified above) is a misdemeanor. A second conviction is punishable by up to 24 months in state prison and a fine of $5,000 to $25,000.

Health and Safety Code Section 25191: Covers transporter registration, vehicle certification, and manifesting requirements. Any owner or lessee of a vehicle in which waste is transported, or any person authorizing transportation who knowingly violates specified provisions, shall be fined $2,000 to $50,000 for each day of violation and/or serve up to 24 months in prison.

Health and Safety Code Section 25191(c): Covers transporting or authorizing transportation in an uncertified vehicle and carrying or authorizing the carrying of hazardous waste without a manifest. Any person who knowingly violates specified provisions shall be fined up to $500 for each day of violation and/or serve six months to one year in prison.

Health and Safety Code Section 25191(d): Treatment or storage without a permit or at an unauthorized point. Any person who knowingly violates specified provisions shall be fined $2,000 to $50,000 and/or serve up to 24 months in prison. Second convictions shall be fined $5,000 to $50,000 and/or serve up to 24 months in prison—GBI enhancements.

Health and Safety Code Section 25189.5 (Felony): Where one knows or should have known of unlawful treatment, storage, transportation, or disposal, punishment is imprisonment for up to 36 months and a fine of between $5,000 and $100,000 for each day of violation—GBI enhancements. (*People v. Martin* (1989) 211 Cal.App.3d 699; *People v. Taylor* (1992) 7 Cal.App.4th 677 [lack of funds is not a defence to disposal].)

Note: Each day after an unreported illegal disposal is considered a separate offence until notice is given to DTSC. For a case upholding a similar statute against a Penal Code section 654 challenge, see *People v. Djekich* (1991) 229 Cal.App.3d 1213.

Health and Safety Code Section 25189.6 (Felony): Any person who knowingly or with reckless disregard of the risk treats, handles, transports, disposes, or stores hazardous waste in a manner that causes unreasonable risk of fire, explosion, *etc.*, may be punished by a fine of not less than $5,000 up to $250,000 per day and 16, 24, or 36 months in prison. There is an enhancement for knowingly placing another in imminent danger that is punishable by three, six, or nine years in prison. This section may be used in illegal drug laboratory situations.

This is one of the few areas where there is a lot of California law on criminal cases. See *People. v. Sangani* (1994) 22 Cal.App.4th 1120; *People v. Hale* (1994) 29 Cal.App.4th 730; *People v. Todd Shipyards Corp*. (1987) 192 Cal.App.3d Supp. 20; and *People v. Matthews* (1992) 7 Cal.App.4th 1052.

Health and Safety Code Section 25189.7 (Felony): This section provides that anyone who knew or should have known that he or she burned or caused the incineration of hazardous waste at an environmental facility may be fined up to $100,000 and imprisoned for one, two, or three years—GBI enhancement.

Civil Violations—Civil violations may be brought by the district attorney when referred by the DTSC.

Health and Safety Code Section 25189(a): Intentional or negligent false statements on an application, manifest, *etc.*, may be fined up to $25,000 for each day of each separate violation.

Health and Safety Code Section 25189(b): Intentional or negligent violation of any provision of Chapter 6.5 of the Health and Safety Code or any regulation adopted pursuant to it relating to registration, certification, and manifesting as described above may be fined up to $25,000 for each day of violation.

Health and Safety Code Section 25189(c): Intentional disposal or causing the disposal at an unauthorized point according to Chapter 6.5 of the Health and Safety Code may be fined from $1,000 to $25,000. Each day the waste remains deposited with the violator's knowledge constitutes a separate violation.

Health and Safety Code Section 25189.2(a)—Strict Liability: Any false statement on an application or manifest may be fined up to $25,000.

Health and Safety Code Section 25189.2(b)—Strict Liability: Any violation of Chapter 6.5 of the Health and Safety Code or any regulation promulgated under it may be fined up to $25,000.

Health and Safety Code Section 25189.2(c)—Strict Liability: Disposal or causing the disposal of hazardous waste at an unauthorized point may be fined up to $25,000.

THE CALIFORNIA FISH AND GAME CODE

Fish and Game Code Section 2080—Endangered Species

No person shall import, export, or take, possess, purchase, or sell within this state any species, or any part or product thereof that has been determined to be an endangered or threatened species, or attempt any of those acts. The term "take" is defined at Fish and Game Code section 86 as "hunt, pursue, catch, capture, or kill, or attempt to do the same."

Fish and Game Code Section 4500—Marine Mammals

It is unlawful to take any marine mammal except in accordance with provisions of the Federal Marine Mammal Protection Act. "Marine mammals" include sea otters, whales, dolphins, porpoises, seals, and sea lions.

Fish and Game Code Section 4700—Protected Animals

It is unlawful to take or possess at any time fully protected mammals or parts thereof (except where the Fish and Game Commission authorized the collection of those species for necessary scientific research). Fully protected mammals include the Morrow Bay Kangaroo Rat, Bighorn Sheep, Northern Elephant Seal, Guadalupe Fur Seal, Ring-Tailed Cat, Pacific Right Whale, Salt-Marsh Harvest Mouse, Southern Sea Otter, and Wolverine. For mountain lion protection, see Fish and Game Code section 4800.

Fish and Game Code Section 5650

Elements

This is the "granddaddy" of environmental statutes, originally enacted in the 1870s.

It states that it is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this state any of the following:

- Any petroleum, acid, coal, or oil tar, lampblack, aniline, asphalt, bitumen, residuary product of petroleum, or carbonaceous material or substance.
- Any refuse, liquid or solid, from any refinery, gas house, tannery, distillery, chemical works, mill, or factory of any kind.
- Any sawdust, shavings, slabs, or edgings.
- Any factory refuse, lime, or slag.
- Any cocculus indicus.
- Any substance or material deleterious to fish, plant life, or bird life.

Criminal Penalties

- Fish and Game Code Section 12002: Violations of subdivision (a) or (b) are misdemeanors punishable by a $2,000 fine and one year in jail. Violations of subdivision (c) are misdemeanors punishable by a $5,000 fine and six months in jail.

- Fish and Game Code Section 12011: In addition to punishment provided by Fish and Game Code section 12002, violations of section 5650(a) or (b) subject a defendant to an additional fine of not more than $10 per gallon or pound of material discharged. The amount of the fine shall be reduced for every gallon or pound that is recovered and is properly disposed of by the defendant.

Defendant is also responsible for an amount equal to the reasonable costs incurred by the state or local agency for cleanup and abatement and to fully mitigate all actual damages to fish, plant, or animal life and habitat.

Civil Penalties

- *Fish and Game Code Section 5650.1*: This section allows for civil penalties of up to $25,000 per violation. This penalty shall be imposed for each separate violation and is in addition to any other civil penalty imposed by law. It allows for obtaining a TRO, preliminary injunction, or permanent injunction without having to allege or prove irreparable damage or an inadequate remedy at law. Penalties collected shall be apportioned 50 per cent to the county treasurer to be deposited in the county Fish and Wildlife Propagation Fund and 50 per cent to the state Fish and Game Preservation Fund.

Laws and Cases

Section 5650 violations are strict-liability offences requiring no proof of either intent or criminal negligence. The discharge of silt could constitute a deleterious substance within the meaning of section 5650(f). In addition, the court rejected the defendant's argument that for a substance to be deleterious it must cause a permanent annihilation or displacement of fish or wildlife. Instead, it concluded that so long as a material, because of its nature or quantity, produces a harmful effect on fish, plant life, or bird life when it is deposited, then it is deleterious.

Silt or sediment under certain conditions or certain quantities will constitute a material harmful to fish. "Fish" is defined in section 45 as wild fish, mollusks, or crustaceans, invertebrates or amphibians, including any part, spawn, or ova. "Waters of the state" includes virtually every watercourse in the state.

Fish and Game Code Section 5652

Elements

It is unlawful to deposit, permit to pass into, or place where it can pass into waters of the state, or abandon, dispose of, or throw away within 150 feet of the high water mark of the waters of the state, any cans, bottles, garbage, motor vehicle or parts thereof, rubbish, or the viscera or carcass of any dead mammal or the carcass of any dead bird.

Rebuttable Presumption

This section creates a rebuttable presumption that the last registered owner of any motor vehicle found in violation of the section is responsible for the abandonment and thereby liable for the cost of removal and disposition of the vehicle.

Criminal Penalties

A violation of this section is a misdemeanor, per Fish and Game Code section 12002(a), with a penalty of a $1,000 fine and six months in jail.

Fish and Game Code Section 1602

Elements

Unlawful Diversion: It is unlawful for any person to substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake or use any material from the stream beds without first notifying the Department of such activity.

Unlawful Activity: It is unlawful for any person to commence any activity affected by this section until the Department of Fish and Game has found it will not substantially adversely affect fish or wildlife resources or until the Department's proposals have been incorporated into the project. Failure to Abide by Terms of Section 1602 Agreement. It is unlawful for any person to engage in a project or activity affected by this section unless such project or activity is conducted in accordance with the Department of Fish and Game's proposals.

Criminal Penalties

Fish and Game Code section 12002 makes a first violation a misdemeanor with a penalty of six months in jail and a $1,000 fine. Fish and Game Code section 12007 makes a second or subsequent violation a misdemeanor with a penalty of one year in jail and a fine of $5,000.

Case Law Issues

Meaning of "Substantial": In *Rutherford v. State of* California (1987) 188 Cal.App.3d 1267, 1279, the term "substantial" was defined to include the commonly understood meaning as characterizing something as ample or of considerable amount, quantity, or size. The court held the use of this term was not unconstitutionally vague. As stated in *People v. Weaver* (1983) 147 Cal.App.3d Supp. 23, 36, "substantial" is a relative term, and its meaning must be gauged by the circumstances.

Definition of "Stream": The first case to tackle the definition of a stream within the meaning of this section is *Miller and Lux v. Madera Canal and Irrigation Co.* (1909) 155 Cal. 59, 78, overruled in part by Peabody v. City of Vallejo (1935) 2 Cal.2d 352:

Whether high or low, the entire volume at any time constitutes the land over which its current flows must be regarded as its channel; so that when swollen by rains and melting snows it extends and flows over the bottom in its course, that is its flood channel, and when by drought it is reduced to its minimum, that is its low water channel. The court in *Weaver* used the following definition: A water course having a source and terminus, banks, and channel, through which waters flow, at least periodically... A stream does not lose its character as a water course even though it may break up and disappear. A continuous flow of water is not necessary to constitute a stream and its stream waters. Indeed a wash... "is a water course in the legal sense although dry except in the winter and spring and very possibly at intervals even in those seasons." In *Rutherford,* the court gave a definition similar to that in *Weaver*; however, the court seemed to restrict the definition to that area extending between the ordinary high-water mark and low-water mark.

Black's Law Dictionary defines a "water course" as a natural stream fed from permanent or natural sources. There must be a stream, usually flowing in a particular direction, though it need not flow continuously. It may sometimes be dry. It must flow in a definite channel, having a bed and banks, and usually discharges itself into some other stream or body of water.

Legislative Intent: The purpose of Fish and Game Code sections 1601-1603 is set forth in section 1600:

[T]he protection and conservation of the fish and wildlife resources of this state are of utmost public interest. Fish and wildlife are the property of the people.... In *Weaver*, the court noted that the state acts as trustee of all waters for the benefit of the people of the state. (*Weaver*, 147 Cal.App.3d Supp. at 29.)

THE CALIFORNIA PENAL CODE

Several sections under Chapter 10 of the Penal Code, "Crimes Against the Public Health and Safety," address environmental violations.

Penal Code Section 374

It provides general definitions of "littering" and "waste matter."

Penal Code Section 374.2

It provides for prosecution of persons who discharge harmful substances into public sewer facilities. It is unlawful to discharge:

[a]ny substance capable of causing substantial damage or harm to the operation of a public sewer sanitary facility, or to deposit in commercial quantities any other substance, into a manhole, cleanout, or other sanitary sewer facility, not intended for use as a point of deposit for sewage, which is connected to a public sanitary sewer system, without possessing a written authorization. First-time violations result in a maximum fine of $25,000 and/or one year imprisonment in the county jail. Second or subsequent violations result in a fine of not less that $5,000 AND imprisonment in either the county jail or state prison for specified periods.

Penal Code Section 374.7

Provides for a misdemeanor fine of up to $1,000 for a: [p]erson who litters [o]r dumps any waste matter into any bay, lagoon, channel, river, creek, slough, canal, lake or reservoir or any other stream or body of water, or upon a bank, beach, or shore within 150 feet of the high water mark of any stream or body of water. Similarly, under Fish and Game Code section 5652, it is unlawful to dispose of cans, bottles, garbage, motor vehicles and parts, or viscera or carcasses of dead mammals or birds within 150 feet of the high-water mark of any body of the waters of the state or where it can pass into the waters of the state.

Penal Code Section 374.8—Deposit of Hazardous Substances

The deposit of a hazardous substance onto public or private property or into the waters of the state is punishable by a maximum fine of $10,000 and/or a defined prison term. Exception: The deposit occurred as a result of an emergency that the person promptly reported to the appropriate regulatory authority. This is a strict-liability offence. "Hazardous substance" includes any material or waste that would be harmful to human health and safety or to the environment if released, any substance for which the manufacturer is required to prepare an MSDS, and radioactive substances.

Penal Code Section 387—The California Corporate Criminal Liability Act of 1989

Where a corporation or a "manager" of a corporation has actual knowledge of a serious concealed danger and fails to inform the Division of Occupational Safety and Health in the Department of Industrial Relations or its employees, the corporation or "manager" is subject to penalties. The corporation is liable for a maximum fine of $1 million. The individual manager is subject to a fine and/or imprisonment. Exception: Where the corporation or manager in good-faith belief of compliance with this section notifies a government agency other than the Division of Occupational Safety and Health, no penalties apply.

PESTICIDES

Pesticides are regulated through the California Department of Pesticide Regulation (DPR). The laws are found in the Food and Agricultural Code. The Department supervises county agriculture departments. Pesticides and other chemicals used in agriculture are regulated as either "economic poisons" or "restricted materials."

Economic Poison

An "economic poison" is any substance intended to prevent, repel, destroy, or mitigate the damage from insects, rodents, predatory animals, bacteria, fungi, or weeds capable of infesting or harming vegetation, humans, or animals. The cornerstone of economic-poison regulation is the requirement that every

manufacturer, importer, or dealer, with very limited exceptions, register the substance with the DPR and file a statement about the kinds of economic poisons to be manufactured or sold. Each registrant must also include, with each separate economic-poison container, approved labeling that includes printed instructions for its use.

Restricted Material

A substance is a "restricted material" if it is listed as such by the DPR after investigation and public hearing. A restricted material is listed after consideration of hazards to applicators and farmworkers, hazards to the animals and the environment from direct application or drift into other areas, and hazards to public health. Use is limited to situations where it is "reasonably certain" that no injury will result or where no non-restricted material is "equally effective and practical." A user of a restricted material is required to have a permit from the local county agricultural commissioner.

Required Licenses

- Pesticide Dealers.
- Pest Control Operators (those who suggest use of pesticides)
- Pest Control Advisors (those who suggest use of pesticides via a written recommendation)

Local Grower Permits

Farmers (usually called growers) must obtain a permit for listed restricted materials. Possessing or using such a material without a permit or in violation of permit conditions is prohibited.

Pesticide-Residue Restrictions

For each crop/commodity, there is a pesticide-residue limit set by federal regulation.

Worker-Safety Regulations

These specify safety equipment, training, medical monitoring, and reentry intervals following pesticide application.

Penalties

Up to $50,000 fine and state prison or county jail for intentional or negligent violations that could have created a hazard to human health or the environment. Violations of use restrictions are wobblers. There is a maximum $5,000 fine and six-month sentence in county jail for the first violation and a $10,000 fine and a six-month sentence for subsequent violations. The attorney general has civil penalty authority. The district attorney must rely on Business and Professions Code section 17200 or request delegation or coprosecution from the attorney general's office.

LOCAL ORDINANCES

Uniform Fire Code

Every fire jurisdiction (fire district, city, or county) has the authority to adopt its own fire code. Most adopt all or part of the Uniform Fire Code (UFC), which was initially developed by the Western Fire Chiefs Association and is updated every three years. The UFC must be adopted by local ordinance or fire district, and the adopting ordinance will provide penalties (usually misdemeanors). The UFC has many restrictions on the manner in which hazardous materials are stored (Article 80) and requires permits from fire chiefs for many activities (such as storing hazardous materials) (Article 4). Warning—some of the violation sections are very poorly worded.

Uniform Building Code

The Uniform Building Code (UBC) has been adopted by local jurisdictions in a manner similar to the UFC. The UBC classifies buildings into different "occupancies" according to their use and has specific building specifications for each type of occupancy (*e.g.*, firewalls, sprinklers, exits, *etc.*). For example, semiconductor fabrication is an H-6 occupancy that has many requirements not met by standard office buildings (which are a B-2 occupancy). All building activities, construction, and remodeling require building permits. If structural modifications or new equipment are required, the local building department may have to approve them.

Miscellaneous Uniform Codes

City and county building departments typically enforce other uniform codes, *e.g.*, Uniform Electrical Code, Plumbing Code, and Mechanical Code. Illegal business activities often violate many of the provisions of these codes. Violations are usually misdemeanors.

Business Licenses

Most cities and counties require business licenses. Violations are designated by the adopting ordinance and are usually infractions or misdemeanors.

Planning/Zoning Restrictions

Zoning ordinances regulate types of business activities within a city or county. For example, an area may be zoned "light industrial" or "residential," and individual parcels within that area must conform to the particular zone. Even if a business corrects all of its hazardous-waste violations, it would be prudent to check with the local Planning Department (other possible names include "Community Development Department") to determine whether its presence is in conformity with the zoning ordinance. But even if not in conformity, the business may not be in violation if it has been granted a variance or a non-conforming use exception. Violations are usually infractions or misdemeanors.

Note: CEQA mitigation measures may be incorporated into the site plan or improvement plan, so enforcement of these conditions may be available through planning laws.

THE FEDERAL ENVIRONMENTAL PROTECTION AGENCY (U.S., EPA)

There are numerous agencies of the federal government such as the Department of Transportation, Department of Agriculture, Food and Drug Administration, and the Occupational Safety and Health Administration that have tangential authority over the environment. But primary responsibility for the nation's environment rests with the Environmental Protection Agency (U.S., EPA). The U.S., EPA is the only major federal regulatory agency that was created not by an act of Congress, but rather by a Presidential Executive Order. As such, the U.S., EPA is not an independent regulatory agency, but is purely a creature of the Executive Branch.

The U.S., EPA is among the most highly decentralized agencies in the federal government, operating through 10 regional offices. The regional office for the western states is in San Francisco. Generally, U.S., EPA headquarters in Washington, D.C. sets policy and promulgates rules, while the regional offices implement U.S., EPA's programmes.

The regional offices pass on to the states the policies and requirements that are issued in Washington, D.C. The regional offices enter formal agreements with each state that include criteria for enforcement and for other conditions of financial assistance. Each regional office has a great deal of autonomy, especially in enforcement and permitting decisions. Where state programmes do not meet federal standards or where the states have chosen not to assume responsibility, U.S., EPA regional offices may assume enforcement authority. Where states have implemented their own programmes (as in California), U.S., EPA enforcement activity (at least as to administrative and civil enforcement) is fairly limited. US EPA has peace officer investigators in the Criminal Investigation Division.EPA CID one of only three of the 63 federal agencies with peace officers who have jurisdiction beyond their regulatory programme and therefore can investigate and arrest for any federal crime.

THE FEDERAL-STATE RELATIONSHIP

While federal statutes have established national standards for the transportation, emission, discharge, and the disposal of harmful substances, implementation and enforcement of many of the large programmes has been delegated by the U.S., EPA to the states. In turn, the states apply national standards to sources within their borders through permit programmes that control the release of pollutants into the environment. Thus, while most implementation and enforcement occurs at the state or local level, the U.S., EPA maintains an overarching role with respect to the states by establishing federal standards and approving state programmes.

In a few exceptions, states can set stricter standards than those required by federal law. Some of the programmes that have been delegated (this term is used in a general sense, some of the programmes use other terms) by the U.S., EPA to the states are the emissions standards for hazardous air pollutants (HAPs), Prevention of Significant Deterioration (PSD) Permits under the CAA, the Water Quality Standards and the National Pollution Discharge Elimination System (NPDES) Programmes under the CWA, the Hazardous Waste Programme under RCRA, and the Drinking Water and Underground Injection Control (UIC) Programmes under the SDWA.

CALIFORNIA ENVIRONMENTAL LAWS

The summary that follows in the remainder of this chapter briefly describes many of California's environmental laws, including those that are analogous to the federal statutes and those that are unique to California.

The California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) (Public Resources Code sections 21000 et seq.) is the California analog to NEPA. CEQA requires government projects and government-approved projects to be planned to avoid significant adverse environmental effects.

CEQA requires that prior to approval by a state or local agency of a project, an Environmental Impact Report (EIR) must be prepared to identify the significant effects of a project on the environment, the alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided. (Pub. Res. Code § 21002.1.) If no significant environmental effects are foreseen, a "negative declaration" (Neg Dec) briefly describing the proposed project and the reasons why an EIR should not be required may be submitted.

Designation of a Lead Agency

If two or more agencies are involved in implementing or approving a proposed project, one will be designated the "lead" agency. The lead agency will normally be the one with general governmental powers, such as a city or county, rather than an agency with a single limited purpose, such as an air-pollution-control district.

The lead agency has the primary responsibility for approving or carrying out a project, decides whether an EIR or Negative Declaration will be necessary, and prepares the document. Other involved agencies are designated either "responsible" or "trustee" agencies. These agencies consult with and provide input for the decisions of the lead agency.

Public Notice

The CEQA statute and its implementing regulations, title 22 of the California Administrative Code sections 15000 et seq., provide detailed procedures for the environmental review. The procedures include notice to the public and an

opportunity for public comment. The agency is required to respond to all public comments and to implement all feasible mitigation measures. But the agency retains discretion to approve a project despite adverse environmental impacts that cannot be mitigated or avoided if the agency finds that there are overriding considerations justifying the project.

Enforcement

CEQA is enforced by private litigation and by the Attorney General's Office. There is no specific statutory authority for enforcement by district attorneys. Legal challenges to projects alleging violations of CEQA must show that either the agency failed to follow the required procedures in its environmental review or that the project approval constituted an abuse of discretion. In general, the courts require strict adherence to CEQA's procedures but defer to the agency's balancing of the benefits of a project against any adverse environmental impacts disclosed by the EIR.

AIR POLLUTION

The California Air Resources Act, Health and Safety Code sections 39000 et seq., contains provisions required by the federal Clean Air Act as well as additional provisions to improve and protect the state's air quality. The Act provides for the establishment and enforcement of air quality standards and emission limitations. directs the State Air Resources Board (ARB) to divide the state into air basins of similar meteorological and geographical characteristics and to adopt ambient air-quality standards for each basin considering human health, aesthetic value, interference with visibility, and economic effects. Investigation and regulation of sources and types of pollution occur at both the state and local levels.

Responsibility at the State Level

The State Air Resources Board (ARB) is responsible for developing the state implementation plan required by the federal CAA. It also has general oversight powers to ensure pollution control by establishing state ambient air quality standards and by setting emission standards for mobile sources (vehicles). While primary responsibility for the regulation of stationary sources rests with the local air pollution control districts, the state ARB monitors air quality, adopts test procedures, conducts research, and regulates sandblasting material, various types of engines, motor vehicle emissions (including fuels), and emissions of various consumer products such as paint and hairspray. The ARB also enforces air related asbestos regulations in certain counties that do not have their programmes.

Responsibility at the Local Level

Local Air Pollution Control Districts (APCDs) usually encompass a single county. But several county districts have merged into regional districts. These

consolidated districts now cover the San Francisco Bay Area, the South Coast Air Basin, and the San Joaquin Valley. The APCDs have primary responsibility for the implementation of basin-wide plans by regulating stationary sources within their boundaries, such as industrial facilities and fixed equipment. Each APCD has a permit system for new and existing stationary sources to insure that emissions sources do not prevent the attainment or maintenance of air quality standards.

Enforcement

Air-Pollution Law for these particular enforcement provisions.

WATER POLLUTION

The Porter-Cologne Water Quality Control Act, California Water Code sections 13300-13999 and Title 23 of the California Administrative Code, is analogous to the federal Clean Water Act (CWA) in that it regulates discharges that may affect the quality of the state's waters. The California Act is broader in scope than the federal CWA, however, in that it includes groundwater, while the CWA regulates only surface waters. The Porter-Cologne Act is implemented by the State Water Resources Control Board and nine Regional Water Quality Control Boards (RWQCBs) that are responsible for planning, permitting, and enforcement. The State Board formulates state policies for water-quality control and implements the permit system required by the CWA.

The State and Regional Water Boards have broad authority to take a variety of enforcement actions under the Porter-Cologne Water Quality Control Act; the Toxic Pits Cleanup Act of 1984; Chapters 6.67, 6.7, and 6.75 of Division 20 of the Health and Safety Code regarding underground and aboveground tanks; Health and Safety Code section 25356.1; and Chapter 6 of Division 3 of the Harbours and Navigation Code.

Examples of enforcement actions include:

- Violation of an effluent limit, receiving water limit, or discharge prohibition contained in an order or Water Quality Control Plan (Basin Plan) adopted by the State Water Board or a Regional Water Board;
- An unauthorized spill, leak, fill, or other discharge;
- Failure to perform an action required by the State Water Board or a Regional Water Board, such as submittal of a self-monitoring or technical report or completion of a cleanup task by a specified deadline.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) is responsible for developing and implementing a statewide water-quality policy. (Water Code §§ 13140-13142.) The SWRCB also oversees the activities of the Regional Water Quality Control Boards. The SWRCB also licenses operators of local wastewater treatment plants, has an Underground Storage Tank Enforcement Unit, and has an Office of Statewide Enforcement.

Regional Water Quality Control Boards

Under the Porter-Cologne Act, the Regional Water Quality Control Boards have primary responsibility for the day-to-day administration of the laws and regulations protecting California's surface and groundwater. Each Regional Board must develop a regional water-quality plan that establishes water-quality objectives for the region and provides a framework for all administrative actions taken by the board. Each Regional Board has a person assigned as the Enforcement Manager who coordinates enforcement issues for that Regional Board.

The Permit System

National Pollution Discharge Elimination System (NPDES) permits are issued by the State or Regional Boards and are required for all point source pollution discharges into California's surface waters. Point source discharges are defined as planned non-agricultural waste discharges from man made conveyance systems.

The permit system in California is essentially the same as the federal permit system under the NPDES. Before proceeding with any waste discharge that could affect the quality of the groundwater or surface waters of the state, the potential discharger must first report to and receive a permit from the local Regional Water Quality Control Board. As of 2000, California has approximately 2,250 active NPDES permits protecting the state's water resources from industrial and municipal waste discharges.

For discharges onto land that may affect water quality, Waste Discharge Requirements (WDRs) are issued by the State and Regional Boards to regulate waste-disposal impoundments and land disposal for liquid and solid wastes. The permitting system addresses many types of waste discharges, including municipal, industrial, and commercial sources. As of 2000, California has approximately 3,670 active WDRs protecting its groundwater resources.

Storm Water Programme

Discharges of storm water associated with industrial activities require compliance with the General Industrial Activities Storm Water Permit (part of the NPDES system). Requirements include submission of a Notice of Intent for coverage under the general permit, a Storm Water Pollution Prevention Plan (SWPPP), implementation of the SWPPP, and annual reports.

Hazardous-Waste Facilities

In addition to administering the state's discharge permit system, the Regional Boards participate in the administration of the hazardous-waste-facility permit system. The Regional Boards are responsible for classifying all current and proposed hazardous-waste facilities within their regions in accordance with the classification system adopted by the State Board.

Administrative Enforcement

Regional Water Quality Control Boards have authority to inspect any facility discharging or proposing to discharge pollutants into the state waters and to require the owners of those facilities to prepare technical or monitoring programme reports. If the Regional Board discovers any discharge or proposed discharge in violation of the water-quality laws and regulations, it may, after notice and a hearing, issue an administrative cease-and-desist order directing the offending party to comply with the applicable titles and regulations. Where appropriate, the Board may also issue a cleanup and abatement order. The Regional Board may itself undertake cleanup, abatement, and remedial work if it deems such work necessary to prevent substantial pollution, nuisance, or injury to the waters of the state.

The Board is authorized to seek reimbursement of any costs incurred in such work from the responsible parties through suit in state court. (Id.) If the Regional Board establishes that a party has failed to file a discharge report before discharging a pollutant, or has failed to abide by any requirements or orders issued by the Board, or has caused a discharge creating a condition of pollution or nuisance, the Board is authorized to administratively impose civil fines up to specified maximums. Alternatively, the Regional Boards may request the attorney general to seek injunctive relief in state court. District attorneys are limited to bringing criminal actions or civil actions for unfair competition.

Criminal Enforcement

Water Code Section 13387 Cases

- *Constitutional Challenges*: *People v. Appel* (1996) 51 Cal.App.4th 495, 503-505: No ex post facto defence allowed where defendant's actions took place prior to EPA's formal determination of jurisdiction over the waters on defendant's property because the statute regarding jurisdiction existed prior to defendant's actions. Challenge based on vagueness refuted as defendant refused to cooperate with the federal and state agencies' investigations, so he may not later complain that he did not know that he was in violation.
- *Intent*: *People v. Ramsey* (2000) 79 Cal.App.4th 621, 632-633: Knowledge that a material discharged into navigable waters is a "pollutant" is not an element of the offence set forth in section 13387. Mistake or lack of knowledge that the material was a pollutant is not a defence as discharging a pollutant into navigable waters is not a specific-intent crime.
- *Defence of Necessity*: *People v. Buena Vista Mines, Inc*. (1998) 60 Cal.App.4th 1198, 1202-1203: Requirements of necessity defence not present because the holding pond was inadequately sized to hold the contaminated water, and defendant did not exhaust all reasonable alternatives prior to pumping the contaminated water into the creek.

- *Felony*: *People v. Buena Vista Mines, Inc*. (1996) 48 Cal.App.4th 1030, 1033-1034: Violation of section 13387(c) is a felony (statute wording was unclear). Note the statute was amended in 2002 to clarify that imprisonment is "in the state prison."
- *Pre-emption*: *Appel*, 51 Cal.App.4th at 505: The Federal Water Pollution Control Act does not pre-empt state criminal conviction under this section for violations of the Federal Act.
- *Relationship to Federal Law*: *Buena Vista Mines, Inc.,* 48 Cal.App.4th at 1034: As the Porter-Cologne Water Quality Act refers to the Federal Water Pollution Control Act, federal authority is used to interpret the Act.

Penalties

Criminal — Misdemeanors

The following violations are misdemeanors, *i.e.*, fine of up to $1,000 for each day of violation and up to six months in jail unless otherwise stated.

CAVEAT: Water Code Section 13271(d) provides use immunity for notification in all other criminal prosecutions. The State Board may grant use immunity to anyone who is subpoenaed to testify at its hearings. (See Water Code Sections 1105-1106.)

- *Water Code Section 13265(a)*: Discharge without report or requirements (prior notice is required).
- *Water Code Section 13265(b)*: Discharge of hazardous waste without report or requirements. Note: This may also be chargeable under Health and Safety Code section 25189.5.
- *Water Code Section 13525.5*: Recycling without requirements in violation of Water Code section 13524.
- *Water Code Section 13526*: Recycling without required permit.

The following reporting violations are misdemeanors, *i.e.*, fine of up to $500 and up to six months in jail, except as otherwise stated.

- *Water Code Section 13261(a)*: Failure to file report of waste discharge after demand.
- *Water Code Section 13261(b)*: Failure to file or falsification of report of discharge of hazardous waste (up to $1,000 fine per day).
- *Water Code Section 13268(a)*: Failure to furnish or falsification of technical or monitoring reports (up to $1,000 fine per day).
- *Water Code Section 13268(b)*: Failure to furnish or falsification of technical or monitoring reports of hazardous waste (up to $1,000 fine per day).
- *Water Code Section 13271(c)*: Failure to report discharge of hazardous substances in greater than reportable quantities (fine up to $20,000 and up to one year in jail).

- *Water Code Section 13272(c)*: Failure to report discharges of oil ($500-5,000 fine per violation and up to one year in jail).
- *Water Code Section 13387(b)*: Falsification of reports of discharge to waters of U.S., or violation of any other discharge, dredge, or fill material permit requirements.
- *Water Code Section 13522.6*: Failure to file recycling report.

Criminal — Felonies

- *Water Code Section 13387*: Violation of Clean Water Act programme requirements ($5,000 to $25,000 fine for each day of violation and up to one year in jail; $5,000 to $50,000 fine for each day of intentional violation and up to three years in jail).
- *Health and Safety Code Section 25284.4 (i)*: Perjury provision for fraud by underground tank testers.

Civil

Up to $6,000 fine per day (unless otherwise stated). No district attorney authority, but a district attorney can charge violation as an unfair business practice pursuant to Business and Professions Code Section 17200 and other provisions such as the Fish and Game Code.

- *Water Code Section 13265(b)*: Discharge of hazardous waste without report or requirements (up to $5,000 fine per day).
- *Water Code Section 13385*: Violation of Clean Water Act requirements (up to $25,000 fine [in lieu of Water Code section 13350]).
- *Water Code Section 13350(a)(3)*: Unpermitted discharge of oil (up to $15,000 fine for each day of violation).
- *Water Code Section 13350(b)*: Unpermitted discharge of hazardous waste that causes or threatens to cause pollution or nuisance—strict liability (up to $15,000 fine for each day of violation).
- *Water Code Section 13261(b)*: Failure to file or falsification of a report of hazardous-waste discharge (up to $25,000 fine per day).
- *Water Code Section 13268(b)*: Failure to furnish or falsification of report of technical or monitoring programmes relating to hazardous waste (up to $25,000 fine per day).
- *Water Code Section 13350(a)(1)*: Violation of cease-and-desist order (up to $15,000 fine per day).
- *Water Code Section 13350(a)(2)*: Discharges in violation of waste discharge requirements, orders, or prohibitions that create condition of pollution or nuisance (up to $15,000 fine per day).
- *Water Code Section 13385*: Violation of orders implementing Clean Water Act (up to $15,000 fine per day, up to $25,000 fine per day [in lieu of Water Code section 13350]).

Injunctions

No district attorney authority (but remember Business and Professions Code section 17200):

- *Water Code Section 13262*: Enjoin discharge pending compliance with Water Code sections 13260 and 13264(a).
- *Water Code Section 13386*: Compel compliance with Clean Water Act requirements.
- *Water Code Section 13525*: Enjoin recycling in violation of Water Code section 13524.
- *Water Code Section 13262*: To compel report of waste discharge.
- *Water Code Section 13522.7*: To compel recycling report.
- *Water Code Section 13304*: Enjoin violations of cleanup and abatement order.
- *Water Code Section 13331*: Enjoin violation of cease-and-desist order.
- *Water Code Section 13340*: Compel abatement of pollution or nuisance in emergency.

Reimbursement

Water Code section 13304(c)—Reimbursement of costs under cleanup and abatement authority. Also, section 13305(f) provides for reimbursement of costs under cleanup and abatement authority for non-operating business or industrial facilities.

Proposition 65

This initiative is codified at Health and Safety Code sections 25249.5 et seq. There are two separate parts to the act: one deals with requirements for warning labels to the public, the other with discharges to drinking water. The act prohibits businesses from knowingly discharging into water listed carcinogens or mutagens (substances that cause genetic alteration) without first giving a warning. The specific carcinogens and mutagens are listed in the California Code of Regulations Title 22, section 12000. Provision is made for civil penalties of up to $2,500 per day for each violation. There is a significant amount of case law regarding Proposition 65. It is suggested that prosecutors contact the Attorney General's Office or the state Office of Environmental Health Hazard Assessment for more information. There is a provision for a private cause of action, but notice is required to be given to the local district attorney and the Attorney General. This is why your office may receive "Notices of Intent to Sue" under the provisions of Proposition 65 from private counsel.

Local Agencies—The Unified Programme

The Unified Hazardous Waste and Hazardous Materials Management Regulatory Programme (Unified Programme) provides for local implementation of the following six regulatory programmes:

- The Spill Prevention Control and Countermeasure Plan of the Aboveground Storage Tank programme (SPCC)
- The Hazardous Materials Release Response Plan and Inventory programme (HMRRP) (Business Plan)
- The California Accidental Release Prevention programme (CalARP)
- The Uniform Fire Code Hazardous Materials Management Plan and Inventory Statement (HMMP/HMIS)
- The Underground Storage Tank programme (UST)
- The Hazardous Waste Generator and Onsite Hazardous Waste Treatment programme

The local implementing agencies are known as CUPAs (certified unified programme agencies) or PAs (participating agencies).

Aboveground Storage Tanks

According to current laws, The Aboveground Storage Tank (AST) programme, is to be implemented by the SWRCB and the RWQCBs. The program's requirements are found in Chapter 6.67 of Division 20 of the Health and Safety Code. "In general, the [AST programme] requires owners or operators of aboveground petroleum storage tanks to file a storage statement, pay a fee... and implement measures to prevent spills." The owner or operator of an aboveground storage tank facility that has a petroleum storage capacity of more than 660 gallons in a single tank, or a total storage capacity of more than 1,320 gallons in more than one tank, is generally required by Health and Safety Code Section 25270.5 to prepare a Spill Prevention Control and Countermeasure Plan (SPCC) plan. The specific requirements for a SPCC are laid out in the Code of Federal Regulations Title 40, Section 112.7. However, funding and positions for this programme were cut in 2002. There may be legislation to transfer this programme to the CUPAs but as of this writing (2007) that has not yet occurred.

The Attorney General's Office may bring civil actions against violators of Chapter 6.67 (including violators of SPCC requirements). It may seek to enjoin violators and may seek civil penalties of up to $5,000 per day for a first offence, up to $10,000 per day for repeat violations.

Hazardous Materials Inventory and Reporting Requirements

Experience has shown that prevention mechanisms are the most cost effective methods of reducing hazardous material incidents. Implementation of state and federal hazardous material planning laws and regulations can be effective in minimizing releases of hazardous materials. Proper enforcement is critical to the implementation of the hazardous material regulatory programme and to ensure appropriate protection of public health and safety and the environment. Chapter 6.95 of the Health and Safety Code contains significant planning requirements for control of hazardous materials.

Every "person" who "handles" (defined terms) more than a specified quantity of hazardous materials must prepare a business plan, which includes a chemical

inventory (including a site map), an emergency response plan and procedures, and information on the business's hazardous materials training plan for employees. The requirements for business plans are found in Health and Safety Code Sections 25500 et seq. These regulations are found in Chapter 4 of Division 2 of Title 19 of the California Code of Regulations.

The several unique elements that include:

- The most comprehensive statutory definition of "hazardous materials":
  - "Hazardous material" means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety if released into the workplace or environment.
  - "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing would be injurious to the health and safety of persons or harmful if released into the workplace or the environment.
- A definition of "business" that includes "an employer" and government.
- A definition of "handler" to assist in defining the businesses covered.
- A comprehensive definition of "release."
- Definition of "threatened release"—important for emergency-notification prosecution.
- Requirements to immediately report significant releases or potential releases of hazardous materials to the State Office of Emergency Services and to the local CUPA.

Required Planning Elements

Each business that handles any one hazardous material in an amount that is equal to or greater than 500 pounds, 55 gallons, or 200 cubic feet of gas must develop a business plan and submit it to the local unified programme agency. This plan must include an inventory of hazardous materials and cover emergency response, pre-empt planning, training, and evacuation.

Note: This plan may be the same document used to satisfy the contingency plan requirement of the hazardous waste law. The Uniform Fire Code also requires a "plan." The business plans and inventories of hazardous materials are held by the administering agencies and are available for review by the general public.

Handlers of acutely hazardous materials (using U.S., EPA's definition of extremely hazardous substances found in 42 U.S.C. section 11002(a)(2)) may be required to develop Risk Management and Prevention Programmes (RMPPs) upon request from local CUPAs. These risk prevention programmes may be required following an evaluation of the potential hazard presented by a specific facility to public health and safety or the environment. The quantities of extremely hazardous materials, the methods and processes involved, and the results of a hazard analysis will be used to determine the necessity for an RMPP.

Trade secrets have minimal protection from emergency responders needing the data for emergency response or medical personnel needing specific chemical data for specific medical treatment of patients.

Acutely Hazardous Materials

An owner or operator of a new or modified facility that will be used for the handling of acutely hazardous materials must prepare an RMPP.

Reporting Requirements

Anyone required to file a plan is also required to report releases or threatened releases of hazardous materials to the administering agency.

Enforcement

Civil Liability

Businesses violating aspects of business plan development, review, or submission, or failing to yield inspection authority, or failing to provide adequate and updated chemical inventory data are civilly liable to the administering city or county for up to $2,000 per day of violation.

Costs of any necessary emergency response and the cost of cleanup and disposal may also be recovered. Following reasonable notice, a defendant that knowingly violates the elements in Chapter 6.95 may be civilly liable for up to $5,000 per day of violation. Civil actions may be brought by the district attorney, city attorney, or attorney general. Injunctions, restraining orders, and other appropriate orders shall be issued without proof of irreparable damage or that the remedy at law is inadequate.

Criminal Liability

Failure to notify of a significant release of hazardous materials is a misdemeanor punishable by a $25,000 fine for each day and one year in jail. Second offences are wobblers. Full costs of the emergency response, cleanup, and disposal shall also be recovered.

Knowing failure to file a business plan is a misdemeanor punishable by a $1,000 fine and one year in jail. Interference with authorized representatives of an administering agency carries misdemeanor liability. Health and Safety Code section 25515.2 deals with apportionment of criminal and civil penalties. Prosecutors receive 50 per cent of the penalties; $200 of every civil or criminal penalty must be sent to a state training fund.

Rewards—Persons Providing Information

Health and Safety Code section 25517 allows for the payment of up to $5,000 for information that materially contributes to the imposition of civil penalties or the conviction of a person or business.

California Accidental Release Prevention (CalARP)

CalARP is California's programme to implement the federal Accidental Release Prevention programme (ARP) with certain additional provisions specific to California. CalARP requires businesses that handle more than a threshold quantity of any of a list of extremely hazardous substances to prepare a Risk Management Plan (RMP) in order to analyze "potential accident factors that are present and the mitigation measures that can be implemented to reduce this accident potential."

The requirements for CalARP are found in Article 2 of Chapter 6.95 of Division 20 of the Health and Safety Code. The state Office of Emergency Services has responsibility for developing regulations that establish statewide standards for CalARP. These regulations are found in Chapter 4.5 of Division 2 of Title 19 of the California Code of Regulations.

Violators of CalARP's requirements are subject to a variety of civil penalties. If these penalties are recovered from the violator, a statute prohibits criminal prosecution of the violator for the same offence, and any civil action pending against a violator must be dismissed upon filing of a criminal complaint. A first-time violator may be held liable for up to $10,000 per day of violation and any costs incurred for emergency response or cleanup resulting from the violation. A person who commits a violation after reasonable notice is liable for up to $25,000 per day.

Criminal misdemeanor penalties apply to anyone convicted of knowingly falsifying, destroying, altering, or concealing documents used for compliance with CalARP, including fines of up to $25,000 per day of violation and/or imprisonment up to one year in county jail in addition to any costs incurred for emergency response or cleanup resulting from the violation. Second or subsequent convictions may be charged as misdemeanors or felonies.

3

Tools for Pollution Control and Abatement Policy

Environment Policy for industry in India, till recently, had focussed mainly on pollution control through end-of-pipe treatment, which itself is wasteful whereby pollutants are often transferred from one media to another media through the various treatment processes. Huge quantities of resources and energy are thus consumed during such treatment processes. With due recognition to the future raw material and energy scenario, the impact that the industry and its products have on the natural resource base and the environmental quality and the necessary thrust being given to the industrial growth in the country, the Ministry of Environment and Forests has formulated comprehensive policies for promoting sustainable development.

It is against this background that the Ministry of Environment and Forests issued a comprehensive Policy Statement for abatement of pollution and development of the National Conservation Strategy. Recently, MoEF has also prepared the Environment Action Programme. The statement has made a welcome attempt to shift the emphasis of policy from definition of objectives to practical questions of actual implementation. The salient features of the policy framework are discussed here.

TAXES ON COMPLEMENTS AND SUBSIDIES FOR SUBSTITUTES

Subsidies for products, which are eco-friendly, *e.g.*, organic manures and organic pesticides can discourage use of chemical fertilizers and chemical

pesticides. Similarly taxes on automobiles based on their weight or pollution generating capacity can result in the conservation of energy. There is also scope for using the tax/subsidy instrument for correcting existing price distortions. At present prices of items such as irrigation water, electricity for farmers, fertilizers are under priced due to political and other reasons.

Underpricing of these goods does not provide any incentive to the users to conserve the scarce resources. Economic pricing of these items will reduce excess demands, encourage conservation and give signals to the users about the social scarcities of these goods.

- *Fiscal incentives*: Fiscal incentives for improving environmental quality include rebates on excise duty/customs duty/sales tax on machinery and equipment used for pollution abatement or adoption of clean technologies, accelerated depreciation allowances to encourage adoption of clean technologies or to erect abatement plans, soft loans/ subsidies for setting up common effluent treatment plants and recycling and conservation activities.
- *Eco certification of products and environmental audit*: This method involves labeling ofenvironment friendly products. This scheme operates on a national basis and provides accredition and labelling for household and other consumer products, which meet certain environmental criteria along with quality requirements of the Nations Standards for that product.

The specific objectives of the scheme are as follows:

- To provide an incentive for manufacturers and importers to reduce adverse environmental impact of products.
- To reward genuine initiatives by companies to reduce adverse environmental impact of their products.
- To assist consumers to become environmentally responsible in their daily lives by providing information to take account of environmental factors in their purchase decisions.
- To encourage citizens to purchase products which have less harmful environmental impacts.
- Ultimately to improve the quality of the environment and to encourage the sustainable management of resources

Other Supportive Measures

In many countries adoption of clean technologies is mandatory for new firms. Existing firms are often required to use abatement technologies within specified periods. Development of pollution-free technologies can be encouraged by providing government support for basic research in this area, and by grants and patent policies to the investors. Public good characteristics of R & D and inventions favour government support for these activities.

Administrative regulation can also take the form of a zoning cum incentive scheme designed to internalize the externalities. For example, an industrial

complex consisting of sugar mills, distilleries, paper mills using bagasse as raw material, and farms, which can use wastewater discharged from these factories, can internalize the externalities. The Government can also evolve location policies for polluting industries in a region to facilitate collective abatement efforts. It can also invest in public infrastructure for pollution abatement, *e.g.*, common treatment plants for effluent discharges for small firms and municipal wastes where individual abatement plants are not economically viable.

The Government can also take a number of measures to strengthen the legal systems in the interest of improving environmental quality. This can be achieved in many ways. It can define property rights for environmental resources, wherever they are feasible. It can create markets for tradeable permits for uniformly dispersed pollutants such as greenhouse gases and water pollutants in a large river basin. It can enforce legal liability or administer a performance bond scheme for large firms, which use hazardous materials.

ENVIRONMENTAL POLICY RESPONSES AND DIRECTIONS

The environmental policy instruments applied in the region are mainly command-and-control policies and strategic environmental planning (ESCAP, 1995). Legislation, regulatory standards, and environmental planning procedures related to public works, particularly environmental impact assessments, are the most common instruments of environmental management. Serious efforts are also being made by industries and research institutes to develop new environmentally friendly technologies and to incorporate environmental considerations into production processes.

Umbrella environmental legislation and comprehensive environmental policies are commonly found in the region. Good examples are found in China (see Box 3.8) and Malaysia. In Malaysia, the Malaysian Environmental Quality Act (EQA) provides a framework for regulating most forms of pollution and enhancing environmental quality and management. The sectoral acts under the EQA of Malaysia include a Water Enactment act (control of river pollution); a Street, Drainage, and Building Act (control of effluent discharges into rivers); a Local Government act (control of pollution of streams within areas under local authorities); guidelines for air pollution control measures; and a motor vehicles act (control of smoke and gas emissions) (Malaysia, 1992 and 1993).

Another comprehensive policy has been implemented in Singapore. The Singapore Green Plan of 1992 set in place a mechanism to establish a city with high standards of public health, clean air, clean water, and clean land by the year 2000.

The plan also addresses environmental education, environmental technology, resource conservation, clean technology, nature conservation, and environmental noise. It further calls for reducing carbon dioxide emissions, improving energy efficiency, and keeping daily garbage production at one kilogram per person (Singapore, 1993).

Appropriate policies and associated programmes and projects have been implemented to combat land degradation in the region. These include watershed management, soil and water conservation, sand dune stabilization, reclamation of waterlogged and saline land, forest and range management, and replenishment of soil fertility in croplands by use of green manures and cultivation of appropriate crops. In Nepal, for example, various watershed management projects operate in critically affected or degraded areas, such as the Kulekhani and Phewa Tal watersheds. Considerable success has been achieved in reducing the extent of land degradation in targetted areas. Involvement of the local communities at every stage in the projects' implementations ensured sustainability of the measures introduced (ESCAP, 1995).

Integrated watershed management programmes in many other countries, including India, Pakistan, Bangladesh, and Bhutan, have been instrumental in rehabilitating degraded land and preventing further degradation. In India, 86 million hectares are affected by degradation, 26 million of which are in highly critical areas being addressed on a priority basis under 35 centrally sponsored projects (UNEP/UNDP/FAO, 1994). More than 30,000 hectares of shifting and semi-stable sand dunes have been stabilized (ESCAP, 1995). In Pakistan, too, rehabilitation of desertified lands through plantations and fixation of mobile sand dunes by shelter belts and checker barrier fences has been successful (ESCAP, 1995).

MARKET-BASED ENVIRONMENTAL POLICY INSTRUMENTS

In environmental law and policy, market-based instruments (MBIs) are policy instruments that usemarkets, price, and other economic variables to provide incentives for polluters to reduce or eliminate negative environmental externalities MBIs seek to address the market failure of externalities (such aspollution) by incorporating the external cost of production or consumption activities through taxes or charges on processes or products, or by creating property rights and facilitating the establishment of a proxy market for the use of environmental services. Market-based instruments are also referred to as economic instruments, price-based instruments, new environmental policy instruments (NEPIs) or 'new instruments of environmental policy.

Examples include environmentally related taxes, charges and subsidies, emissions trading and other tradeable permit systems, deposit-refund systems, environmental labeling laws, licenses, and economic property rights. For instance, theEuropean Union Emission Trading Scheme is an example of a market-based instrument to reduce greenhouse gas emissions.

Market-based instruments differ from other policy instruments such as voluntary agreements (actors voluntarily agree to take action) and regulatory instruments (sometimes called "command-and-control"; public authorities mandate the performance to be achieved or the technologies to be used). However, implementing an MBI also commonly requires some form of

regulation. Market based instruments can be implemented in a systematic manner, across an economy or region, across economic sectors, or by environmental medium (*e.g.*, water). Individual MBIs are instances of environmental pricing reform.

According to Kete (2002), "policymaking appears to be in transition towards more market-oriented instruments, but it remains an open-ended experiment whether we shall successfully execute a long-term s*ocial* transition that involves the private sector and the state in new relationships implied by the pollution prevention and economic instruments rhetoric."

HISTORY

For example, although the use of new environmental policy instruments only grew significantly in Britain in the 1990, British Prime Minister David Lloyd-George may have introduced the first market-based instrument of environmental policy in the UK when a Fuel tax was levied in 1909 during his ministry.

TRANSFERABLE PERMITS

A market-based transferable permit sets a maximum level of pollution (a 'cap'), but is likely to achieve that level at a lower cost than other means, and, importantly, may reduce below that level due to technological innovation.

When using a transferable-permit system, it is very important to accurately measure the initial problem and also how it changes over time. This is because it can be expensive to make adjustments (either in terms of compensation or through undermining the property rights of the permits). Permits' effectiveness can also be affected by things like market liquidity, the quality of the property right, and existing market power. Another important aspect of transferable permits is whether they are auctioned or allocated via grandfathering.

An argument against permits is that formalising emission rights is effectively giving people a license to pollute, which is believed to be socially unacceptable. However, although valuing adverse environmental impacts may be controversial, the acceptable cost of preventing these impacts is implicit in all regulatory decisions.

TAXES

A market-based tax approach determines a maximum cost for control measures. This gives polluters an incentive to reduce pollution at a lower cost than the tax rate. There is no cap; the quantity of pollution reduced depends on the chosen tax rate.

A tax approach is more flexible than permits, as the tax rate can be adjusted until it creates the most effective incentive. Taxes also have lower compliance costs than permits. However, taxes are less effective at achieving reductions in target quantities than permits. Using a tax potentially enables a double dividend, by using the revenue generated by the tax to reduce other distortionary taxes through revenue recycling. There can also be conflict between objectives with a tax: less pollution means less revenue.

MARKET-BASED VS COMMAND AND CONTROL

An alternate approach to environmental regulation is a command and control approach. This is much more prescriptive than market-based instruments. Command and control regulatory instruments would be emission standards, process/equipment specifications, limits on input/output/discharges, requirements to disclose information, and audits. Command and control approaches have been criticised for restricting technology, as there is no incentive for firms to innovate.

Market-based instruments do not prescribe that firms use specific technologies, or that all firms reduce their emissions by the same amount, which allows firms greater flexibility in their approaches to pollution management. However, command and control approaches may be beneficial as a starting point, when regulators are faced with a significant problem yet have too little information to support a market-based instrument. Command and control approaches can also be preferred when regulators are faced with a thin market, where the limited potential trading pools mean the gains of a market-based instrument would not exceed the costs (a key requirement for a successful market-based approach).

Market-based instruments may also be inappropriate in dealing with emissions with local impacts, as trading would be restricted to within that region. They may also be inappropriate for emissions with global impacts, as international cooperation may be difficult to attain.

THE USE OF ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL POLICY

The proposal to impose taxes on pollution is far from new. It was already put forward at the turn of the century by the famous British economist Professor Arthur Cecil Pigou. Reflecting on the famous London fogs, Pigou observed that pollution imposed unco vered costs on third parties which were not included in ordinary market transactions.

His proposal was to tax pollution by means of a so-called extemality tax in order to internalise in ordinary market transactions the damages caused by pollution. While P igou was a founder of welfare economics in many ways and thus an important source of inspiration for the subsequent welfare state, the external tax was at his time regarded as a rather academic approach to the control of pollution, and did not gain any pr actical significance (Pigou, 1920; Collard, 1981; Aslanbeigi, 1987).

In the early 1970s the externality tax experienced a revival both in terms of an evolving branch of micro-economic theory that explored the implications of such taxes, but also more practicany as some countries (for instance Japan and the Netherlands) beg an to apply economic instruments in practice (Baumol and Oates, 1975; 1979). In the Scandinavian countries pollution taxation was regarded with scepticisrn, apart from by a few economists. The predominantly

social democratic dominated governments and poli cy-makers regarded taxation of pollution as a way in which industries could continue to pollute if only they paid the price. Consequently the policy-instruments employed for environmental policy in the Scandinavian countries were mainly of a traditional r egulatory nature for nearly two decades (Johnson and Brown, 1976; Andersen, 1994a).

It was the Brundtland report which put economic instruments on the agenda again (World Commission, 1987). With its plea for a sustainable development, the Brundtland report recommended the increased use of economic instruments. At the same time the failur es of regulatory policies made policy-makers search for new and more effective policy-instruments. Especially the non-point sources of pollution, such as nitrogen and acid rain, made clear the limits of the command-and-control type of regulations. Economi c instruments were the key to the integration of environmental considerations into other policy-areas, and this integration was the key to a sustainable development.

Since the late 1980s, government reports in many OECD countries have announced an increased use of econormc instruments (Pearce, 1989; VROM, 1989, Lalonde, 1990). In the European Union the fifth action programme for the environment recommends an increased use of environmental taxes, and in 1991 OECD, in accordance with its 1975 'polluter-pays' principle, recommended its member countries to consider the possibilities of introducing more environmental taxes - again (CEC, 1992; OECD, 1991).

These announcements have not been followed by a similar range of action. Although the use of economic instruments (excl. subsidies) has increased in several OECD countries from 1987 to 1994. It has been a rather modest increase when one takes the limited use of economic instruments in 1987 into consideration. The update on the eight countries surveyed in 1987 showed that the number of economic instruments in use had increased by only about 20 new instruments - from about 80 to about 100 (OECD, 1994a: 107). Although the use in other OECD countries had also been mapped, and more economic instruments have been on the agenda of several governments, the modest increase reflects the political differences related to the introduction of such instruments. The Nordic countries have become forerunners in the use of economic instruments (OECD, 1994a: 183). Four Nordic countries have imposed C02-taxes, and a number of other economic instruments have been put into operation (OECD/IEA, 1994). The changed attitud e towards the use of economic instruments in Scandinavia is related to the growing distrust of traditonal regulatory instruments.

However, the increased use of green taxes can also be explained by the fiscal crisis of the Scandinavian welfare states. New and more legitimate sources of tax income were needed, as traditional income taxes began to exceed the legitimate 50 per cent level. Both Sweden and Denmark introduced tax reforms in the early 1990s, which substituted income taxes by so-called green taxe s to different degrees. In this process of securing new sources of income for the welfare state, some of the initial principles of environmental taxation were

lost. This was due partly to the fiscal focus, partly to the decision-making process, in which economic and political interests got a say over the final design of environmental taxes.

This paper will try to explain some of the political factors at work in the process of designing economic regulations. These processes are after all not so different from the processes of the instrument choices.

ARGUMENTS FOR USING ECONOMIC INSTRUMENTS

Before discussing the political system and its ability to agree on the use of pollution taxes, it seems appropriate to give a very brief summary of the arguments for using economic instruments (readers familiar with the properties of economic instruments can proceed to the next section immediately).

The top-down approach inherent in command-and-control policies gives the regulated few incentives to improve their performance on their own initiative. The advantage of economic instruments is that they force producers and consumers to take enviromnental concerns into account and to minimise their use - and waste - of energy and other resources as much as possible.

There are two main types of economic instruments: either taxes or traceable pollution permits. There are several variations of each; taxes may, in particular, take the form of either input/resource taxes process taxes, emission taxes or product taxes. Tra deable pollution permits have mainly been used in the US, and are not treated directly in this paper, although they enjoy many of the same advantages as pollution taxes.

The advantages of economic instruments are in particular:

- They do not prescnbe specific technologies or solutions, but leave it to the target groups to decide whether they would prefer to control their output of emissions to change their input of raw materials and energy or to do a mixture of both;
- They are better suited to deal with non-point sources of pollution that cannot be controlled by permits, but where there are proxies to be taxed;
- They ensure that control of pollution takes place where the marginal costs are lowest, thus ensuring substantial cost savings - probably by a factor 2-3;
- Contrary to a fixed license they give a constant incentive to reduce emissions, and are as such a much more dynamic instrument;
- Because of these dynamics they cause more innovations and force the development of new and cleaner technologies;
- Finally economic instruments will generate revenue, sometimes in substantial amounts; revenue which can be used for environmental or other purposes.

Economists have advocated economic instruments as a more or less pure alternative to commond-and-control regulations. In practice economic instruments are employed within a broader mix of regulatory instruments and in an institutional setting that is some what more complex than in the partial

analysis. Most importantly, economic instruments are not decided by a single policymaker who controls all information necessary and can anticipate all possible reactions. Economic instruments have to be approved by a political system where the bargaining processes are rather different from the principles that rule blackboard economics.

Wilson's Regulation Theory

How do the costs and benefits of public regulations affect the way in which interests are articulated? How can we explain the emergence of environmental regulations? What is the impact on the choice of policy-instruments ofthe costs and benefits of regula tions?

To answer these and other related questions, Wilson's regulation theory (1980) is helpful. Contrary to earlier regulation theories which claimed that public agencies and their regulations were subject to 'capture' by the regulated interests, Wilson introd uced a more sophisticated theory about the costs and benefits of regulations. It deals better with the wave of hew social regulations' - from automobile safety to pollution control - that have emerged since the late 1960s, and which were not demanded by t he regulated parties. Wilson's theory has been sumarised in the two-by-two matrix shown in figure. It shows how there are basically four different types of public regulations, according to whether the costs and benefits of regulations are either spread or concentrated. Client regulation: In a classical regulatoty situation the costs of regulation are born by the tax payers, and thus spread, while the benefits, often in terms of subsidies, are concentrated on a smaller group of the constituency. A typical example of clie nt regulation is agricultural policy.

Client regulations are usually passed only after extensive negotiations with those concerned, but without much public debate. The general public does not care too much about this year's intervention price for wheat, f or instance, while the farmers care quite a lot, and are likely to negotiate very actively in the decision-making process.

Majority regulation: In the case of majority regulation consensus seeking lasts longer and affects more groups in society. In these cases both the costs of regulations and the benefits are spread, which gives no certain interest groups particularly strong incentives to promote regulations. A good example of majority regulation are the social reforms of the 1930s. It took quite a long time to build up consensus about these reforms.

Interest group regulation: In the case of interest group rezulation both the costs of intervention and the benefrts are concentrated on rather narrow groups, who will have strong incentives to influence the decision-making process, while the general publi c displays little concern. It means that both the costs and the benefits are borne by limited groups, rather than by society as such. Examples of interest group regulations are the regulation of harbour tariffs (state harbours versus municipal harbours) o r railroad tariffs. Wilson also mentions labour market regulations as an example of interest group regulations.

Entrepreneurial regulation: When costs are concentrated and benefits are spread, one would normally not expect regulations to be passed. Those who will benefit from regulations have only very general and therefore limited personal interest in lobbying for them, while those who have to bear the costs will indeed have rather strong incentives to seek to prevent regulahons from being imposed. However, there are several examples of regulations which fall within this sphere such as safety, work place and envir onmental regulations. Indeed it is the existence of these socalled 'new social regulations' that contradict the classical assumption that regulahons are passed only in the interest of the regulated.

According to Wilson such regulations depend on the exist ence of 'entrepreneurs', *i.e.*, ideal interests organised for the purpose of such regulations, and who act more or less as 'watch-dogs'. They lobby to place such regulations on the agenda of policymakers and seek to outweigh the influence of groups who have interests in avoiding regulations. Their success depends to a large degree on the support that they can obtain from non-affected third parties, such as the media, influential writers, *etc.*

One could argue that many environmental regulations offer long-term benefits to the regulated, for instance in terms of a more optimal and efficient resource rnanagement. It is indeed difficult to estimate a priori whether a specific regulation will entai l benefits or costs. According to Wilson it is, however, the costs and benefits as perceived by the regulated that will influence their behaviour during the decision-making process. The most important difference between economics and politics is that wher eas economics is based on the assumption that preferences are given, politics must take into account the efforts made to change preferences (Wilson, 1980: 363).

The Impact on the Choice of Policy-Instruments

Entrepreneuial regulations arise only after pressure from policy-entrepreneurs. However, when it comes to the design of policies and in partticular the choice of policy-instruments, those who will have to bear the costs of intervention often have stronger incentives to lobby against particular instruments than do entrepreneurs. So if they cannot prevent a regulation, they will seek to influence the design of regulations and the choice of policy-instruments so as to limit their costs.

The basic asymmetry of interests is paralled by an asymmetry of information. The potentially regulated can provide policy-makers with very specific and detailed information, which cannot be balanced by information from policy-entrepreneurs. Furthermore, o ften policy-entrepreneurs do not care too much about the specific policy-desicion or choice of instrument as long as the general aims agreed upon are in accordance with their demands for regulation.

In the case of environmental policy, the policy-entrepreneurs are mainly concerned that something is done, but they have less interest in the specific design of policies or the choice of instruments. This is mainly a complicated

technical and legal issue that is sorted out between officials, experts and the affected interests. More recently evironmental policy-entrepreneurs have displayed increased concern about the choice of policy-instruments, but they still lack vital information.

They can demand the u se of more economic instruments, such as a CO_2-tax but they can only seldom provide policy-makers with information about the way in which it should be designed or about its potential impact. Target groups have such information and since policy-makers need to estimate the possible impacts of a taxation scheme, they depend to a high degree on the informanon provided by the target groups.

Economic instruments enjoy a high degree of public support. Polls have showed that pollution taxes are the sort of taxes that people would like to see more of. In november 1991 more than 80 per cent of the Danes were in favour of more green taxes, and eve n after the recent tax reform that introduced a number of new green taxes, more than 50 per cent of those polled were in favour of such instruments. Also among the target groups economic instruments enjoy support. Most industrialists prefer more market-or iented policy-instruments to command-and-control policies, athough they also stress that such instruments should preferably be introduced at a European or global scale. But there is a very important difference between supporting the use of economic or more rnarket oriented instruments in general, and the attitude towards specific environmental taxes.

One could wonder if not the rather strong public support for green taxe s is due to the fact that people somehow expect that the polluters are someone different from themselves - and they find it fair to demand from 'those polluting' that they pay the clean-up costs.

Directors of industries may declare themselves in favour of economic instruments, but when it comes to specific taxes, whether on chlorine or on packaging the affected industries are strictly against thern, and have strong incentives to be so.

By the target groups economic policy-instruments are perceived as imposing much higher costs than usual command-and-control types of regulations. The regulated anticipate the pollution tax bills that they have to pay and ask for either normative regulatio ns or voluntary agreements, which are considered less costly.

The efficiency argument that pollution taxes assure that abatement takes place where the marginal costs of abatement are lowest, while norms require equivalent across-the-board measures regardless of differences in costs have not convinced the target grou ps. Neither have more empirical studies that, on the basis of historical data, confrm the difference between the use of economic instruments and the used of norms.

That norms or voluntary agreements may impose rather high costs too is not taken into account. One could speculate whether the target groups expect rules and voluntary agreements to be less strictly applied than economic instruments.

Indeed there is a dif ference in the degree of compliance demanded by local environmental officers controlling norms and standards, and the degree of compliance demanded by tax and customs authorities responsible for the collection of green taxes. Environmental regulations are fundamentally different from classical welfare regulations, which are distributive, and which allocate subsidies to specific groups. Environmental regulations require a change in behaviour, and as such they are much more distorting to the regulated than are subsidy schemes or social transfer payments. Thus, the target groups believe that they have strong incentives to lobby against economic instruments and to propose the use of other policy-instruments.

Those in favour of environmental regulations will, on the other hand, be less concemed about the choice of instrument if only the target group complies with the general target. Therefore one can usually persuade them to accept the use of other, but often less effective, instruments.

Impact on the Economic Instrument Design

If policy-entrepreneurs still push very hard for the use of economic instruments, the next step for target aroups can be to lobby for exemptions. In countries where CO_2-taxes have been introduced they have been followed by substantial exemptions. Although exemptions and adaptations can hardly be avoided, it is also safe to say that most of the present exemptions are not rationally justified. They a re to a large extent the result of pressures exerted by those subject to taxation. While in Sweden about 25 per cent ofthe CO_2-emissions are exempted, it is about 66 per cent in Denmark. This difference reflects the more conflictual decision-making proces s in Denmark, where the CO_2-tax was passed by a narrow socalled ‘green majority in Parlimnent against the policy of the past government. The green majority was anxious not to create any unexpected side-effects in terms of causing the direct closure of par ticular companies - thus creating the so-called “pastry-master syndrome”. Pastry-masters pay relatively much higher CO_2-taxes than smoke-stack industries.

The tax rate in itself is a difficult issue and can often become subject to negotiations too. According to conventional economic theory, the pollution tax should reflect the external costs imposed on third parties by market transactions. This ideal approa ch requires meticulous valuation - inded Pigou, as founder of the externality tax, tried to estimate the costs imposed by air pollution in terms of extra laundry costs, additional artificial light and building damages. But as Weizsacker has pointed out, m ost of the present green charges and taxes cover only rather local external costs (Weizsacker, 1989).

Extemalities at the regional or global level are difficult to quantify. Even more disputed is the valuation of extemalities imposed on future generations, ie. intertemporal extemalities - such as climate changes (Brornley, 1990).

Even if we follow the more conservative environmental economists and simply neglect the intertemporal externalities and just try to make an accurate estimate of extemalities at the regional or global level it would imply green

taxes of a magnitude much di fferent from the one that we know today. But there is no reason to fix a discount rate when calculating the benefit that future generations would have from, for instance, pure groundwater. Fixing a discount rate would imply that the consumption of future generations should be discounted as compared to the consumption of present generations. Intertemporal extemalities are at the core of the problem of a sustainable development. As Pearce (1989) has pointed out, a sustainable development means that the pres ent generation should leave to future generations a stock of natural capital equivalent to what it took over, and sustain its consumption only on the dividend.

Whereas the methods for contingent valuation are still in their infancy, there are alternative approaches to the fixing of environmental taxes in accordance with these criteria. More than 20 years ago, Baumol and Oates (1971) recognised the difficulties a ssociated with contingent valuation and proposed to set targets first instead, and then impose sufficiently high taxes so as to assure the targeted reductions. Such targets can be fixed on the basis of the carrying capacity of the environrnent, and thus r eflect a sustainability criteria.

In the CO_2-case it is disputable what the external costs actually are, but the Baurnol and Oates approach would imply CO_2-taxes sufficienly high to assure about a 60 per cent reduction of greenhouse gas emissions, so as to stabilise global warming. Even w ithout a closer examination it is safe to express doubts whether any of the Nordic CO_2-taxes have reached a level sufficiently high to match this reduction target. The current issue in Denmark is whether a six-doubling of the existing CO_2-tax on industrie s should be approved - so as to assure an additional 5 (five) per cent reduction in CO_2-emissions.

In most cases pollution taxes are bound to become substantially lower than the external effects imposed on third parties. They are often fixed on the basis of more pragmatic considerarions and in particular to avoid negative side-effects on the competitiv eness of domestic industries. As a result, there is a strong bias towards the taxation of households, rather than of industnes and farmers. Households are a target group poorly organised to lobby for their interests.

But even when attempts are made to establish a link between green taxes and environmental targets, as in the recent Danish effort to introduce complementary environmental taxes on industries it appears that environmental targets are often set in a rather arbitrary way. It remains as such an open question why, for instance, the Danish pesticide plan from l987 requires a 50 per cent reduction of pesticide use, rather than a 30 or 70 per cent reduction. So far, little justification has been presented for thi s target, which appears to be the outcome of a genuine political process.

Wilson's regrulatuon theory explains two phenomena. Firstly, it explains why policy-instruments that are perceived as especially costly, such as economic instruments, are only seldom adopted. And secondly, it explains why economic instruments, when adapte d, are usually biased in the interests of the regulated. In both cases, the reason is the interest and information asymmetries between policy-entrepreneurs and target groups.

Bureaucratic Interests

The prediction in Wilson's regulation theory that the benefits of pollution control are so diffuse that policy-entrepreneurs care less about the choice of instrument can be confirmed if we look at the environmental organisations. Economic instruments have not been in great demand by green pressure groups, and they have mainly responded to proposals put forward by others, notably by economists. Actually, economists have been more or less alone in advocating the use of economic instruments since Pigou's day's.

Environmentalists usually regard economic or market-like instruments with great scepticism and prefer standards or fixed guidelines that are perceived as being more environmentany friendly. In the process leading up to the Rio Summit, NGO's were sceptical towards the use of economic instruments. Only in the last two or three years have environmentalists slowly changed their attitude towards economic instruments, which they are prepared to accept if they are followed by extensive supplementary regulations. In this process most of the potentilly administrative and efficiency advantages of economic instruments have been neglected.

Environmentalists have not been the main policy-entrepreneurs behind the increased use of economic instruments in the Scandinavian countries. It is rather fiscal motives that have been the driving force, and one should look to financial and tax ministries rather than to environmental ministries to find the entrepreneurs designing the economic instruments that are being put into operation. For welfare states under fiscal strain, environmental taxes present a substantial asset. Not only are such taxes legit imate in the population, but such taxes can also produce considerable incomes. To a considerable degree, this factor explains the more profound use of pollution taxes in Scandinavia. There has simply been greater fiscal pressure than in many other Europea n countries, allowing pollution taxes to take a more important position.

This does not imply that the pollution taxes introduced are void, nor that they do not have any regulatory impact. But the fiscal entrepreneurs have caused a certain bias in the design of economic instruments. To understand this bias one needs to understand the interests of the various ministries usually involved in the designing of economic instruments.

Finance ministries prefer environmental taxes that produce a relatively stable and predictable income, and thus not taxes which are too effective in decreasing pollution (and income). Finance ministries do not like the idea about earmarking the revenue for environmental purposes, since it would hamper their budget control. Finance ministries are also worried about the effects of environmental taxes on the balance of payments and thus on industrial competitiveness. They are therefore attentive to industrial allegations about the impact of such taxes, and more likely to impose pollution taxes on households. Finally, fmance ministries are concerned about a too sudden and dramatic introduction of new environmental taxes since it is relatively impossible to predict their impacts in the classical econometric models used. The Weizsacker proposal to reduce

income taxes for an eight-doubling of energy taxes would be quite a nightmare for any finance ministry since such a sudden shift in the tax base would erode it s capacity to analyze the national economy.

Tax ministries prefer administrative simplicity and feasibility. While many environmental problems are complex and require a creative tax design that might not even produce an income, tax ministries prefer simple taxes that can be imposed and collected at points easy to identify and control. They are therefore suspicious of the long lists of environmental taxes that would be necessary to control the diverse number of pollution sources. When enviromnental ministries have produced complex and inventive tax schemes, tax rmnistries have often turned them down arguing that they could collect the same amount of revenue in a much simpler way! Furthermore, tax rnmistries often think that they have built a carefully balanced tax system over many years, and having reached this stage of perfection they do, from the point of view of taxation, not see the need for changes - a view that finds support in conventional taxation theories. They are suspicious of the gradual introduction of environmental taxes that often ref lect particular environmental events or the need for specific revenues, and they require a logical and more systematic design of environmental taxes.

The interests of environmental rninistries must be mentioned as well, although their interests are somewhat more in line with the externality taxation principles. Environmental ministries are keen on reaching the environmental targets set, but the use of economic imstruments as regulatory means is in their view just one method of assuring implementation. Traditionally, environmental ministries have not cared much about the costs of intervention. Getting control of revenues from economic instruments presents an alternative, and often equally attractive, approach. If such instruments can be used to increase the budget of the environmental ministry, it will have more funding for its remaining pollution control programmes. Furthermore, the use of economic ins truments serves to raise the significance and power of environmental mimstries within governments.

They increase the bargaining power of the environmental ministries in relations to the traditionally more powerfull economic ministries. In sum, if the most optimal pollution taxes cannnot be passer for instance because of opposition from finance and tax ministries or from target groups, environmental ministries can still see their interest in going along with less efficient measures.

Despite these rather negative remarks about the impact of bureaucratic interests, it is worth remembering that the interests of the treasury may also help promote environmental taxes. In the European Union (the former European Community) the Directorate-G eneral for Taxation has been among the supporters of the CO2-tax, since such taxes at the European level fit very well into the agenda of the Directorate-General - an ultimate harmonisation of all taxes. Unfortunately it is also this perspective that has triggered UK opposition.

THE ROLE OF ENVIRONMENTAL ECONOMISTS

Until the late 1980s economists were quite alone in advocating the use of economic imstruments - in a way they still are. Although environmental

economists are eager to see economic instruments applied, they are seldom good advisors when it comes to the a ctual design of such instruments. They have too little information, and therefore their possible role as policy-entrepreneurs is often limited.

Most, but not all, environmental economists have no background in the natural sciences, and often they know too little about the complex nature of the environmental problems to be addressed and 'internalised' by means of the pollution tax. For instance, t his has led environmental economists to advocate a fertilizer-tax on nitrogen-input - a typical textbook example of a pollution tax. On the basis of scientific evidence, there are good reasons to believe, however, that an input-output tax (based on a nitr ogen-balance) would be more efficient since it improves the incentive to utilise manure (leaching from manure is higher than from fertlisers) (Hansen, 1991).

Environmental economics is first of all a theoretical discipline, and the strict conditions in partial equilibrium economics are not likely to apply in practice. Even though Baumol and Oates maintain that environmental economics was not meant to be 'theor y for the same of theory', they treat economic instruments in a partial analysis, without taking, institutional or environmental aspects into account. The pollution tax was meant to be a complete alternative to command-and-control regulations.

Most environmental economists have few ideas about the possible interplay between economic instruments and other regulations. As a result, economic instruments are often added 'at the margin' of other regulations. In this way several policy-instruments are used to address the same issues, and the administrative advantages of economic instruments are not achieved. In some cases the interplay may even be counterproductive, neutralising the incentives accruing from economic imstruments.

Impact and Bias

Economic instruments may be on the agenda of many governments, but as the above mentioned factors indicate, it is a difficult exercise to reach agreement on green taxes that are effective in controlling pollution. The fact that a potentially effective policy-instrument is designed or used poorly, could lead to negative conclusions about its use. This paper argues, however, that we need to understand better the processes at work in order to escape such pitfalls

Economic instruments are after all a potentially very dynamic instrument. Even if such instruments have been applied differently from textbook principles and with a certain bias in their design, we already know about several experiences where economic instruments have been a superior way in which to deal with excess environmental loads.

The Japanese SO2-levy introduced in 1974 was designed mainly to raise funds from smoke-stack industries to pensions for officially recognised pollution victims. The rate of the levy was fixed in accordance with the need for revenue, and initially the levy was rather low. However, the levy was extremely effective

in reducing SO2-emissions so that 10 years later Japan had the lowest SO2-emissions per capita in the industrialised countries (Tsuru and Weidner, 1985; Imura, 1989).

Denmark's energy taxes have been introduced partly to protect the sale of natural gas from the North Sea and partly to generate revenue for the treasury. Industies have been exempted, but households have been subject to the highest implicit CO2-taxation within OECD. Combined with other policy-instrnments, notably research programmes and subsidies for insulation of buildings, this led to a 45 per cent decrease in the use of energy for heating from 1972 to 1989 (Energy ministeriet, 1990; Andersen, 1994c).

The Dutch water quality charges were introduced in accordance with a century-old tradition for user payment in water management, with only very vague ideas about their impact on discharges. Still, from their introduction in 1971 they led to a national reduction of about 80 per cent in organic discharges over a 10-year period (Bressers, 1988; Schuurman 1988). Similiar, although not quite as impressive results were achieved in France, where a comparable system was introduced (Andersen, 1994a).

Experiences like these and others are evidence that economic instruments can be quite powerful and dynamic tools, although there is also evidence of environmental taxes with little or no impact on behaviour. On the basis of existing reviews of environment al taxes in different countries. it seems as if there are more examples of poorly designed economic instruments, than of successfull ones.

POLICY STATEMENT FOR ABATEMENT OF POLLUTION

The overall policy objective is to integrate environmental considerations into decision making at all levels.

The policy aims at:

- Prevention of pollution at source
- Encouraging, developing and applying the best available practicable technical solutions"
- Ensuring that the polluter pays for the pollution and control arrangements

Focusing on the protection of the heavily polluted areas and river stretches and - Involvement of the public in decision making

NATIONAL CONSERVATION STRATEGY AND POLICY STATEMENT ON ENVIRONMENT AND DEVELOPMENT

It has been set out with the following priorities:

- Conservation of natural resources - Land and Water \
- Prevention and control of atmospheric pollution including noise pollution
- Industrial Development by using a mix of promotional and regulatory steps

ENVIRONMENT ACTION PROGRAMME

It sets out the following priority areas:

- Control of industrial and related pollution with emphasis on reduction and/or management of wastes particularly hazardous wastes.
- Tackling urban environmental issues
- Strengthening scientific understanding of environmental issues as well as establishing a structure for training at different levels, orientating and creating environmental awareness, focusing on resource assessment/conservation, water management problems, *etc.*

In all these policies, emphasis is on prevention of pollution and conservation of natural resources which will enable Indian Industry to compete in the international market.

INITIATIVES TAKEN FOR POLLUTION PREVENTION

Coupled with the shift in policy with more emphasis on prevention of pollution, the government has also introduced a number of schemes which will motivate the entrepreneurs to take up steps to curb pollution.

A review of the schemes which have so far been introduced in India for pollution abatement is given here.

FISCAL INCENTIVES FOR POLLUTION CONTROL

The economic incentives which have been introduced include:

Water Cess Act 1977

The act provides for a 25 per cent rebate on the cess payable if the person or local authority concerned installs a plant for treatment of sewage or trade effluent. It is instrument for pollution abatement.

Effluent Charges

Effluent charges based on nature and volume of effluents released are being considered. The scope of charges will be extended to air emissions and solid wastes.

These charges may generate initiatives towards optional releases and encourage new/advanced technology adaptations in the production processes.

Credit and Loan at Reduced Rate of interest

The World Bank assisted Industrial Pollution Prevention Project is targeted at introducing Cleaner Technologies in industrial units. Under the investment component of the Project, the World Bank line of credit is available to industrial units for undertaking appropriate measures for Pollution abatement, with a focus on Waste Minimisation and adoption of Cleaner Production methodologies.

Customs or Excise Duties and Sales Tax Rebate

The customs duty on some specified pollution control equipment has been reduced to a concessional rate of 35 per cent. The countervailing duty has also been eliminated for such items and auxiliary duty has been reduced to 5 per cent. Since March 1992, a rebate of over 5 per cent has been allowed on excise duty of over 5 per cent. In addition to the rebate on customs and excise duties levied by the Central Government, certain states too have offered concessions on Sales Tax for specified pollution control equipment.

Depreciation Allowance

There is provision for allowing the deduction of a certain percentage of written down actual cost of capital assets, net of any subsidies and concessions from gross profit in computing the base for levy of corporate tax. A notification issued in February, 1983 introduced for the first time a higher rate of depreciation for pollution control equipment as compared to 25 per cent applicable for the general plant and machinery. This 30 per cent was gradually increased to 100 per cent in 1993-94 budget.

Investment Allowance

A provision is available in the Income Tax Act under which a companv can deduct upto 25 per cent of the actual cost of some specified new assets for computation of taxable profit. This allowance was raised to 35 per cent for pollution control equipment.

Tax Benefits through Contributions towards Natural Resource Conservation

A provision has been made in the income Tax Act which allows deduction of contribution made by tax payers to any institution engaged in the conservation of natural resources while computing taxable income.

Exemption From Tax On Capital

The Income Tax act also provides for exemption of capital gains arising from transfer of building, land, machinery, *etc.*, for establishing business in a new place to reduce industrial congestion.

STRENGTHENING OF EMISSION STANDARDS

In order to promote resource conservation by industry, rules related to standards for consumption of water by polluting industries (example Chemicals, Pulp and Paper, Fertilizers, Tanneries, Sugar and Distilleries and Metallurgical industries) have been notified. To promote the shift from pollution control to pollution prevention regime, rules related to load based standards instead of concentration based standards have been notified for a limited number of industries *viz.* Refineries, Smelters, manufacturing of Inorganic Acids, Coke ovens, Aluminium Plants, Glass manufacture and some synthetic fibres.

ECOLABELLING

Eco-labelling scheme by Government of India supports Cleaner Production Policies as there is a strong emphasis on Cleaner manufacturing process for grant of eco-labels.

SCHEME FOR ADOPTION OF CLEANER TECHNOLOGIES IN SMALL SCALE INDUSTRIES

The main aim of the scheme is to promote the development and adoption of Clean technologies and best practices and techniques including waste reuse and recycling for SSI's to realise economic and environmental benefits.

The scheme provides financial assistance for undertaking Waste Minimisation assessments and Demonstration projects in selected sectors, preparation of sector specific manuals on Waste Minimisation/Demonstration projects undertaken, creation of data base on the availability of clean technology or present status of clean technologies used in the industries, identification and diffusion of clean technology to the industry and conducting training and awareness programme among small scale industries regarding pollution prevention and cleaner production

POLICY INSTRUMENTS

Various instruments are used by regulators to induce consumers and producers to undertake a level of activity (be it pollution control, fishing, reforestation, *etc.*) that coincides with the level that maximizes social welfare. These include the imposition of standards, the use of economic and financial instruments, *etc.* A large portion of the literature in environmental economics is devoted to comparing the relative merits of these various instruments. In order to choose among these instruments, a number of criteria are being selected. Considered below are some of the criteria that are implicitly or explicitly used to guide the choice of instruments.

The policy instruments are designed to internalize the external cost of pollution, making the polluter pay, and at the same time minimize the cost of a given level of abatement under given conditions with regard to tastes, production and abatement costs, *etc.* These include Command and Control (CAC), Market Based Instruments (MBI) and Price instruments such as various forms of charges, subsidies, deposit refund systems and liabilities which fix prices and let the agents respond through quantity adjustment, or quantity instruments like tradable permits which fix emission quantities and allow agents to clear the pollution through price adjustments. We begin our discussion with Property Rights followed by the Command and Control policies for pollution control.

PROPERTY RIGHTS

Property rights are important for the well-functioning of a market. Without property rights, even the most ordinary market transactions are difficult. Property

rights make big difference in whether a market will allocate goods and bads efficiently. This can be understood with a simple example. Consider two people, a polluter and a victim. The conventional view of the problem is that the polluter is the source of the problem and that blame must fall on the polluter's shoulders. However, leaving aside any preconceptions of right and wrong, the victim could also be blamed for being next to the polluter. Without the victim, the pollution would not be a problem. Morally, it seems that responsibility for cleaning up the pollution should fall on the factory.

This issue can be solved through the allocation of property rights. As we know consumers and producers make decisions on the basis of the private costs and benefits they are facing. Social costs and benefits may differ from the private costs and benefits faced by consumers and producers. Often Private agents base their decision on private costs as opposed to social costs because they do not have to support in any way the external costs associated with their consumption and production activities. Similarly they base their decision on private benefits as opposed to social benefits because they cannot extract a payment from the recipients of the external benefits.

What Happens in the Absence of Property Rights

The next step in our analysis is the following: why do consumers and producers not have to pay for the external costs their activities generate? Similarly, why can they not extract payment from those enjoying the external benefits? The answer to these questions lies in the absence of property rights. Since many aspects of the environment *e.g.*, a typical fishery or forest do not belong to any private parties, there is no one to compensate for using these goods. The price of using the environment, a public good, or an open access resource is effectively nil. If these goods were to belong to private parties, a price would have to be paid for using these resources. The simple solution to externalities would therefore appear to be to privatize property rights.

The Polluter or the Victim: Who should have the Rights

The next issue to be addressed is as to whom should private property rights be allocated? To those generating the external costs (such as the polluters), or to those whose welfare is adversely affected by the external costs (such as those whose health is damaged by the pollution)? Is it possible to allocate the property rights to ensure that the social optimum will be reached? As noted earlier, Ronald Coase (1960) showed that in the absence of transaction costs, the social optimum could be reached (*e.g.*, the optimal level of pollution, the optimal amount of trees cut, of land protected, of reforestation, of environmental protection, *etc.*) whether property rights are initially allocated to polluters or to those suffering from the pollution. This result has come to be known as the Coase theorem. It is demonstrated below with the help of a specific example.

Suppose a plant is discharging pollution into a lake, and that the water of the lake is used for consumption and for irrigation by a community living by the

lake. Suppose that the benefit for the plant to discharge its pollution in the lake is $1000 (for example, this may mean that it would cost $1000 for the plant to stop discharging in the lake by reducing its pollution or by discharging in some other location). Suppose that the benefit for the community of using the lake is $1200 (for example, this may mean that if the community had to stop using the water of the lake, it would have to pay $1200 to obtain water from some other sources). Given these values, the social optimum in this case requires that the lake be used by the community for consumption and irrigation purposes since it is in this use that the lake creates the largest value. In what follows, we will show that if we allow negotiation between the plant owner and the community, the lake will be used for consumption and irrigation by the community irrespective of who owns the property right over the lake.

First suppose that the property right is allocated to the polluter. Since it would cost $1000 for the plant to stop using the lake to discharge its pollution, the plant would accept any compensation above $1000 to stop discharging in the lake. On the other hand, it costs $1200 for the community not to use the water of the lake. The community would be willing to pay up to $1200 to be able to use the water from the lake and still be better off. Since the community is willing to pay more than what the plant would require to stop its discharges, there is room for negotiation. Negotiation will result in the community compensating the polluter to induce him to stop polluting the lake. The lake will be therefore be used for consumption and irrigation by the community. The optimum is therefore reached even if the property rights are allocated to the polluter.

Suppose on the other hand that the lake belongs to the community. Since it would cost $1200 for the community to stop using the lake, the community would accept compensation greater than $1200 to stop using the water of the lake. However, the plant would be willing to pay at most $1000 to obtain the right to discharge in the lake. There is in this case no possibility for negotiation and the lake will be used for consumption and irrigation by the community.

THE PROBLEMS WITH ALLOCATION OF PROPERTY RIGHTS

As we have seen, the optimum is reached no matter whoever is allocated the property right. For this result to be obtained however, certain important conditions needs to be satisfied. The conditions are as follows first, it must be possible to define property rights precisely. Secondly, this property right must be enforceable, and transferable. Indeed, the property right is of no meaning if abuse of the property right by a third party cannot be prevented. Thirdly, parties to the transaction must be well defined.

This may be particularly difficult when today's actions affect future generations, by definition, these cannot be part of current negotiation. Fourth, those owning the property rights must be able to capture all values associated with the environmental asset they own. In the forestry sector for example, this is generally a problem since the property right is typically defined solely over the wood value of the forest, and not over the entire value of the forest, which

goes beyond simply its wood value. Finally, transaction costs must be small. When the number of polluters and polluters is large, this condition will likely not be satisfied.

For all the above reasons, the conditions under which the allocation of private property rights may restore social efficiency restrict the applicability of property rights in practice. Hence it is necessary to look at other ways of achieving the social optimal solution.

Command and Control Regulation

A review of the evolution of environmental policies in developed countries such as the USA, UK, France, and Germany, the Netherlands and in many developing countries including India, shows that historically governments have tended to rely on direct regulation or the command and control (CAC) type policies for pollution control. Although it can take many forms, the basic concept of command and control is for the regulator to specify the steps individual polluters must take to solve a pollution problem.

The essence of command and control is that the regulator collects the information necessary to decide the physical actions to control pollution, the regulator then commands the polluter to take specific physical actions to control the pollution. The regulator is generally quite specific as to what steps needs to be taken.

FORMS OF COMMAND AND CONTROL

Command–and–control regulations can take many forms. By means of regulation, the regulator commands a desired behaviour, typically by imposing a limit on the amount of emissions that a polluter can produce. These limits are generally called emissions standards. The regulator then controls and enforces compliance with the desired behaviour. Under this regime, the incentives for pollution control take the form of penalties or sanctions that the polluter is faced with if it does not comply with the command. For instance, the clean Air Act requires the EPA (Environment Protection Authority) to determine the minimum pollution control "performance" of new sources of pollution. Command and control may also be combined with significant fines and penalties associated with non - compliance.

The Pros and Cons of Command and Control

There are several pros and cons of command and control. Command and Control regulation are more flexible in regulating complex environmental processes and thus much greater certainty in how much pollution will result from regulations.

The disadvantage in command and control is that the informational cost is high. The regulator often needs to rely on information from the polluter, either in terms of emissions or costs of control, because of this; the polluter has an incentive to distort information provided to the regulator.

Due to the drawbacks in the CAC type of regulation we can observe a gradual shift from the CAC type of regulation towards regulation based on use of economic instruments. In India the Policy Statement for Abatement of Pollution dated 26 February 1992 aims at giving 'industries and consumers clear signals about the cost of using environmental and natural resources'. It expects that 'market-oriented price mechanisms will influence behaviour to avoid excessive use of natural resources.

THE NORMATIVE THEORY OF EXTERNALITIES AND MARKET BASED INSTRUMENTS (MBI)

The Pigouvian Prescription

Since 1981 there has been a gradual shift from the CAC type of regulation towards regulation based on use of economic instruments. The Normative theory of externalities, which lays the foundation for use of MBI's in pollution control goes back to the pioneer work of Pigou (1920). According to his analysis the social optimum and the private optimum differ because while the former is based on the condition of equality between marginal social cost and marginal social benefit, the latter is based on the condition of equality between marginal private cost and marginal private benefit. The divergences between social and private benefits or costs are what economists call externalities. Pigou recommended taxes on activities generating negative externalities and subsidies on activities generating positive externalities as means of internalizing externalities and bringing the choice of the firm in line with what it would have been had it faced the true social cost (benefit) of production.

Determination of the Pigouvian tax, even in a simple model, involves information about the marginal rate of substitution between income and the pollutant for different individuals and the effect of an additional unit of waste discharge on the level of pollution.

Also, the marginal product has to be evaluated at the social optimum point. When there is no pollution control, the firms may be discharging wastes beyond the levels consistent with a social optimum. Hence, it becomes difficult to derive the shape of damage function empirically.

The market structure and type of regulation will also influence the responses of the firms. If for example, producers' prices are administered on the basis of retention price formula and if a firm's capacity utilization exceeds the target level then the firm has no disincentive to incur costs in creating and operating as abatement plant.

Even for a profit-maximizing firm in a competitive market, the level of pollution abatement will depend on the nature of institutional mechanisms for monitoring and enforcing pollution control measures. Hence these problems make the task of deciding the level of tax and assessing the effect of the tax on pollution abatement in an industry difficult.

Pollution Taxes or Pollution Permits, which is Better

As an alternative to the Pigouvian tax, an environmental protection agency can issue tradable pollution permits, equal in aggregate amount to a socially optimal level of pollution, and allow the firms to bid for them. Robert and Spence (1976) recommended a mixture of marketable permits supplemented by an effluent fee and a subsidy when the regulator is uncertain about the marginal abatement cost function of polluters. The scheme is as follows: The regulator issues a number of marketable emission permits and the market determines the equilibrium price of permit.

The polluters are allowed to generate emissions without permits or in excess of the amounts allowed by their permit holdings, but they have to pay charges at the rate of f per unit of excess emissions. The polluter gets a subsidy at the rate of s for their unused permits. The rates should satisfy the condition s←p←f, where p is the permit price. The mixed system 'produces levels of the effluents, conditional on costs, that reproduce exactly the effluents that would occur if (1) the polluting firms were merged (and made cleanup decisions centrally) and (2) they faced a piece wise linear penalty function of the form P(X) = sx + p Max (x–1, 0), where x is the level of emission and 1 is the quantity of permit.

Second Best Approaches Involving Mix of Regulation and MBI's

The Command and Control (CAC) policies in the form of direct regulation: bans, setting of standards, *etc.*, have increasingly come under criticism on the ground that they are sub-optimal in terms of social welfare maximization, *i.e.*, they do not in generally yield production-pollution-abatement outcomes which equate the social marginal benefit to abatement with its social marginal cost.

Economists since the time of Pigou have come up with various designs of market based policy instruments which can satisfy the social welfare maximizing condition as demonstrated earlier. However these properties of MBIs have typically been demonstrated under highly simplified assumptions with regard to information on the tastes of consumers, damage functions (abatement benefits) and the production and abatement costs of firm.

Alternative Economic Instruments

As the knowledge about the links between emissions, effluents and the solid wastes generated and the environmental effects on health, crops, assets and ecosystem are very limited, economists have developed methodologies to measure the benefits of goods such as clean air or water that are not sold in markets. Cropper and Oates (1992) classify these methods into two broad categories: (a) indirect methods, which attempt to infer from actual choices, such as choosing where to live, the value people place on environmental goods' and (b) direct questioning approaches, which ask people to make trade offs between environmental and other goods in a survey context. In developing countries like India, the problem of valuation of benefits from environmental

protection is very difficult not only because of the non-existence of markets for most environmental resources also because of many imperfections in the markets for factors and intermediate inputs. There is, therefore, a growing consensus that economic instruments such as charges or permits should be combined with direct regulation measures like standards.

There are a number of alternative economic instruments which are designed to internalize the external costs of pollution, making the polluter pay, and at the same time minimize the cost of a given level of abatement under given conditions with regard to tastes, production and abatement costs, *etc.* These include price instruments such as various forms of charges, subsidies, deposit refund systems and liabilities which fix prices and let the agents respond through quantity adjustments, or quantity instruments like tradeable permits which fix emission quantities and allow agents to clear the pollution market through price adjustments.

- Direct Economic Instruments
- Indirect Economic Instruments

The Direct Economic Instruments are:

- Pollution Taxes/Charges
- User Charges.
- Marketable Pollution Permits
- Deposit Refund Systems
- Performance Bond
- Strict liability for pollution

The Indirect Economic Instruments are:

- Product Tax/Charge
- Input Tax/Charge
- Taxes on complements and subsidies for substitutes
- Fiscal incentives
- Eco certification of products and environmental audit

The Direct economic instruments are preferred when the costs of observing, measuring and monitoring pollution levels are not high. Interplant variations in effluent/emission levels due to differences in plant vintages, processes, raw materials and energy used and temporal variations, both in quantity and quality of pollution, as well as their damage intensities, raise the costs of measurement and monitoring.

- *Pollution Taxes/Charges*: It is suggested that the polluters should be taxed for the privilege of polluting so that they will want to pollute less. According to Pigou, a tax or charge on a pollutant at the point, where the marginal social cost of pollution equals the marginal damage from pollution, will result in an optimal level of pollution. Thus the charge/tax can force the polluter to pay for the external costs of pollution and to incorporate the added taxes into their business decisions. It also provides incentives for business to develop and adopt improved pollution control technologies.

- *User Charges*: User charges are commonly used for the disposal of water wastes and solid wastes. Water user charges generally follow a two-part tariff structure;
  (a) A flat rate independent of volume of wastewater and
  (b) A charge per unit of wastewater discharged. User charges for disposal of household solid wastes and industrial wastes follow a similar pattern. For household wastes the charge is based on the pollution load. In some countries the user charge is not based on the pollution load but is tied to property tax, the reason being administrative convenience. However, many countries have initiated or are in the process of introducing charges, which vary with the type of waste.
- *Marketable Pollution Permits*: Under this system when the pollution happens to be uniformly dispersed, an environmental authority sets target for a region in terms of a particular air pollutant. The targets are translated into X number of pollution permits. These permits are allocated among the existing enterprises on the historical pattern of emissions ('grand fathering') or the permits may be auctioned. These permits are tradable and the prices of permit p, is determined in the market for the pollutant. Polluters with abatement costs below the permit price have an incentive to undertake abatement. The emission reductions by terms with low abatement costs are certified by the environmental certificates (ERCs). These ERCs can be sold to other polluting firms whose abatement costs are higher than the permit price.
- *Deposit Refund Systems*: In this system the potential injurers are subjected to a tax (deposit) in the amount of the potential damage and receive a subsidy (refund) equally large in terms of present value, if certain conditions are met, for example, proof that a product is returned to a specified place or that a specified type of damage has not occurred.
- *Performance Bond*: A production oriented deposit refund system is known as performance bond. The potential entrant in this activity has to deposit an amount equal to the expected restoration costs and the deposit would be refunded when the site is restored in such a way as to meet environmental standards. This scheme is applicable to new chemicals whose environmental effects are known. The producers of the new chemical bear the cost of risk.
- *Strict liability for pollution*: Liability as a policy instrument for damages is recognized in common law. This scheme holds promise in situations where information about potential damage is scarce, the discharges are stochastic, monitoring is difficult and the polluter has financial capability to pay the necessary compensation in the event of damage. As the imposition of such liability shifts the cost of risk to the polluter, he has an incentive to engage in preventive measures. Like a Pigouvian tax, strict liability internalizes the external costs.

The Indirect economic instruments are:

- *Product Tax/Charge*: If output and pollutant are joint products, *i.e.*, there is a proportional relation between the two, then the environmental objective can be achieved either by a tax on the pollutant or on the output. In many industries, pollution per unit of output varies from firm to firm depending on the vintage of the plant, the process used, the fuel input used and location of the plant. Thus an output tax does not distinguish between a 'clean' plant and a polluting plant. As an incentive for a firm to use clean technology or to erect and operate an abatement plant, the firm may be given rebate/exemption from the tax.
- *Input Tax/Charge*: An input tax is a tax on water consumption or a tax on the quantity of energy used or a tax on any input whose use generates pollution. It is easier to measure and monitor than a direct tax on pollution. Along with input tax, exemptions may be given to firms with clean technologies and rebates may be given to plants, which undertake pollution abatement. A gasoline tax is a good instrument for dealing with environment problems related to the burning of gasoline, such as the emission of air pollutants. This tax can provide significant energy-security benefits by reducing a country's demand for the import of crude oil. Almost all European Countries have fuel taxes. The tax rates vary depending on pollution generating characteristics of different fuels. Taxes minerals, water and other scarce inputs can encourage conservation.

4

Enforcement of International Environmental Law

"International environmental law" comprises those substantive procedural and institutional rules of international law which have as their primary objective the protection of the environment.

Under international law, a distinction is often made between 'hard' and 'soft' law. Hard international law generally refers to agreements or principle that is directly enforceable by a national or international body. Soft international law refers to agreements or principles that are meant to influence individual nations to respect certain norms or incorporate them into national law. Although these agreements sometimes oblige countries to adopt implementing legislation, they are not usually enforceable on their in a court.

Thus, the enforcement of international law is a complex and often political process. Besides the jurisdictional problem (wiz, who may bring a suit, which international forum has subject matter of jurisdiction.*etc.*) these are other hurdles. "First, the environmental harm must be large and notorious for a country to notice. Second, for a country to harm a stake in the outcome of the subject matter, some harm may come to cross the borders of the violating country into the country that is suing.

Finally, even in the Tran boundary harm does exist, the issue of causation, especially in the environmental field, is often impossible to prove with any certainty." The, International law thus, remains largely unenforceable. One may ask: what is the purpose of international environmental law- is it a mortal statement, a deterrence, or a socializing tool?

Nevertheless, International law and institutions serve as the principle framework for international co-operation and collaboration between members of the international community in their effort to protect the local, regional and global environmental law are widely accepted.

This acceptance is evidenced in a number of ways, such as international agreements, national legislation, domestic and international judicial decisions and scholarly writing. Environmentalists at "Earth Summit plus Five" (1997) gave a call to create a "World Environment Court" to solve the international environmental disputes.

INTERNATIONAL LAW AND POSITION OF INDIA

In the world community of nations sovereign states conduct their relations on a body of norms, treaties and other standards of conduct that together from the foundation of modern international law. International law has been applied frequently to relatively routine relations between states. To understand the nature of international law an insight into the dynamic nature of law becomes essential.

Any law, national or international is a set of rules, combination of expectations and practices that help to govern human behaviour. According to Rourke (1993) certain features determine the dynamic nature of law. Firstly, all legal systems are dynamic, continually evolving systems. Second, no legal system is perfect. Even in law abiding societies, rules are broken and the guilty sometimes escape punishment.

Third, law both reflects and directs a society. In other words, law often mirror the norms of a society. We legalize what we do in practice. People began wearing clothes long before there were laws against public nudity. Law, however, can also lead a society to change its behaviour by enacting philosophical principles into required standards of conduct.

In the United States, Laws and court decisions requiring the racial desegregation of schools and other public facilities preceded and facilitated the easing, although not the end, of racial bigotry. Fourth, law depends on a mixture of voluntary compliance and coercing to maintain order. Sometimes we may obey the law because we are afraid that if we do not we will be caught and punished. More often, people are law abiding because they agree with the law or recognize that laws are necessary to regulate society.

Thus, law is a process of evolution and growth. It evolves and advances from primitive nature to more sophisticated level in a political system.

Meaning of International Law

International law in its modern form is the result of the great political transformation that marked the transition from Middle Ages to the modern period of history. The development of a territorial state led to formation of the supreme authority, within the territory of the state.

When this transformations was consummated in the 16th century the political world consisted of a number of states that within their respective territories were legally speaking, completely independent of each other (Moregenthau, 1973).

For an atmosphere of peace and order, in relation, among such sovereign entities it was inevitable that certain rules of law should govern these relations, and if anarchy and violence are not the order of the day, legal rules must determine the mutual rights and obligations in such situations and these core of rules came to be known as international law. Oppenheim (1905) an authority spoke of it as the name for a treaty of customary and conventional rules which are considered legally binding by civilized state in their intercourse with each other.

Fennwich 1920 defines it as the body of rules accepted by the general community of nations as defining their rights and the means of procedure by which those rights may be protected or violations of them redressed.

Jessup (1948) wrote that International law is generally defined as law applicable to relations between states Ellery C. Stowell (1931) explained that International law embodies certain rules relating to human relations throughout the world, which are generally observed by mankind and enforced primarily though the agency of the government of the independent communities into which humanity is degraded.

Y. Korovin (1962) a communist thinker defines contemporary international law as the international code of peaceful existence.

How International Law is Made

In a domestic political system the law is made through a constitution, a legislative body, as well as judicial decisions which establish guidelines and precedents for later decisions by courts. At times customary or common law also forms part of the sources of law along with settlement of disputes sometimes on the basis of equity.

Modern international law differs from the domestic law in its sources.

Articles 38 of the Statute of the International Court of Justice indentifies the sources of international law as follows:

- International conventions (treaties), whether general or particular, establishing rules expressly recongnized states.
- International custom, as evidence of a general practice accepted as law.
- The general principles of law recognized by civilized nations.
- Subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publications of the various nations, as subsidiary means for the determines of the rules of law (plamer and Perkins, 1976).

The treaties and decisions regulate relatins between states arising from variety of communications, exchange of goods and services and international organizations where nations cooperate for mutuality of interests. The general principle of law are those that are common to municipal legal systems of various

nations. The judicial decisions were rendered by Permanent Court of Arbitration, permanent Court of International Justice, the International Court of Justice, and military tribunal such as Neuremberg and Tokyo trials. Juristic opinions of Grotius, Openheim, Briery have also contributed in the evolution of international law. Some students of international law add a fifth course the pronouncements of international representative assemblies like the U.N. General Assembly.

These diverse sources imply that international law making is decentralized. There is no single institutional or intellectual source of law, besides, it remains uncodifed today which creates problems in its interpretations. Due to the unclear nature of the law, states try to interpret it in a manner so as to suit their national interest. Yet decentralization does not mean non existence of the law. Despite some inconsistencies the law exists.

Effectiveness of International Law

One of the charges leveled against the credibility of international law is that it exists only in theory and not in practice. In the first place the violation of law does not mean absence of law. International law is effective in many areas (Chiu 1987) Failure to flowed it does not disprove its existence, *e.g*., every domestic political system has a code of law for discipline and orderly society yet crimes, thefts, robberies and other such cases are always reported. Does that mean there is no law.

International law is most effective in functional international relation. Which ideal with routine, procedural, communications and trade matters termed as low politics interaction. But international law is least effective in high politics interaction which involved government try to interpret international law in a manner so as to justify their actions rather than alter their actions to conform to the law. In the ultimate analysis even in areas of high politics it is gradually becoming effective. The law does influence political decisions. It was Iraq's violation of international norms that triggered such as adverse reaction in the world and was demonstrated in the total solidarity in the U.N against Iraq. Virtually all countries condemned Iraq's invasion of Kuwait and disagreed with its declaration that Kuwait was a province of Iraq. Almost all states honoured the UN sanctions and a number of them sent military contingents too. In the end law had to be enforced. Iraq had detained hundreds of foreign hostage in violation of international law.

This set off an intense reaction by the world community against Iraq and it eventually announced that all hostages were free to leave. However, the effectiveness of international law like all legal systems, will be most effective when people demand that everyone, citizens and leaders alike, abide by its principles (Falk, 1989).

Limitations of International Law

Popular hopes and political declarations of goals have created certain illusions about peace through world law. Generally considered, legal and constitutional

law applied in the domestic society are also applicable to international relationship and a world state is envisaged. It has been assumed that international law emerged from primitive society to creation of a state to the final establishment of an international order.

This concept is considered invalid n the present context. While domestic law is imposed by the group that holds monopoly of organized force, international law owes its existence and operation to two factors, decentralized character of identical and complementary interests of individual states and the distribution of power among them. Where there is neither, there is no international law. International law is based on necessity and mutual consent.

International law is voluntary, Only those nations who obey are party to the agreement or treaty. Some nations conclude agreements among themselves and include it in the sphere of international law. Governments generally refrain from accepting the restraining influence that international law might have upon their foreign relations use it to promote their national interests and yet evade any legal obligation that might have upon their foreign relations, use it to promote their national interests and yet evade any legal obligation that might be detrimental to their interests. Thus, international law becomes a tool in their hands for furthering national interests. The basic reason for this is the decentralized nature of international law which accounts for lack of precision and continues to sap its strength.

India is an open country with a vidorous press and a strong judiciary which has delivered some highly creative judgement to protect fundamental rights. Yet even these and other Indian institutions with substantive powers to safeguard the rights of India's citizens have failed to provide effective protection to the hundreds, if not thousands, of Indian citizens who have died after torture and ill treatment. The victims have been ordinary men and women, even children, some of them picked up on the flimsiest of criminal charges, and have come from nearly every state during the past decade. At least 459 of them have, since 1985, been deprived, in custody, of the most basic human right of all the right to life.

One welcomes the Indian Government's reiteration in June 1992 that India firmly believes in human rights. However, time and again government official have refused to acknowledge that the problem of torture exists.

No administration has shown the political will to bring about change we believe the government must act urgently to create an effective institutional framework to prevent Human Rights and related abuses. Officials charges with carrying this out it is felt must be given full assistance at every level of government.

CONSTITUTIONAL AND LEGISLATIVE MEASURES

Stockholm Declaration of 1972 was perhaps the first major attempt to conserve and protect the human environment at the international level. As a

consequence of this Declaration, the States were required to adopt legislative measures to protect and improve the environment. Accordingly, Indian Parliament inserted two Articles, *i.e.*,, 48A and 51A in the Constitution of India in 1976, Article 48A of the Constitution rightly directs that the State shall endeavour to protect and improve the environment and safeguard forests and wildlife of the country. Similarly, clause (g) of Article 51A imposes a duty on every citizen of India, to protect and improve the natural environment including forests, lakes, river, and wildlife and to have compassion for living creatures.

The cumulative effect of Articles 48A and 51A (g) seems to be that the 'State' as well as the 'citizens' both are now under constitutional obligation to conserve, perceive, protect and improve the environment. Every generation owes a duty to all succeeding generations to develop and conserve the natural resources of the nation in the best possible way. The phrase 'protect and improve' appearing in both the Articles 48A and 51A (g) seems to contemplate an affirmative government action to improve the quality of environment and not just to preserve the environment in its degraded form. Apart from the constitutional mandate to protect and improve the environment, there are a plenty of legislations on the subject but more relevant enactments for our purpose are the Water (Prevention and Control of Pollution) Act, 1974; the Water (Prevention and Control of Pollution) Cess Act, 1977; the Air (Prevention and Control of Pollution) Act, 1981; the Environment (Protection) Act, 1986; Public Liability Insurance Act, 1991; the National Environment Tribunal Act, 1995 and the National Environment Appellate Authority Act, 1997; the Wildlife (Protection) Act, 1972; the Forest (Conservation) Act, 1980. The Water Act provides for the prevention and control of water pollution and the maintaining or resorting of the wholesomeness of water.

The Act prohibits any poisonous, noxious or polluting matter from entering into any stream or well. The Act provides for the formation of Central Pollution Control Board and the State Pollution Control Board. The new industries are required to obtain prior approval of such Boards before discharging any trade effluent, sewages into water bodies. No person, without the previous consent of the Boards shall bring into use new or altered outlet for the discharge of sewage or trade effluent into a stream or well or sewer or on land. The consent of the Boards shall also be required for continuing an existing discharge of sewage or trade effluent into a stream or well or sewer or land.

In the Ganga Water Pollution case, the owners of some tanneries near Kanpur were discharging their effluents from their factories in Ganga without setting up primary treatment plants. The Supreme Court held that the financial capacity of the tanneries should be considered as irrelevant while requiring them to establish primary treatment plants. The Court directed to stop the running of these tanneries and also not to let out trade effluents from the tanneries either directly or indirectly into the river Ganga without subjecting the trade effluents to a permanent process by setting up primary treatment plants as approved by the State Pollution Control Board.

The Water (Prevention and Control of Pollution) Cess Act, 1977 aims to provide levy and collection of a cess on water consumed by persons carrying certain industries and local authorities to augment the resources of the Central Board and the State Boards constituted for the prevention and control of water pollution. The object is to realise money from those whose activities lead to pollution and who must bear the expenses of the maintaining and running of such Boards. The industries may obtain a rebate as to the extent of 25 per cent if they set up treatment plant of sewage or trade effluent.

The Air Act has been designed to prevent, control and abatement of air pollution. The major sources of air pollution are industries, automobiles, domestic fires, *etc.* The air pollution adversely affects heart and lung and reacts with hemoglobin in the blood. According to Roggar Mustress, the American Scientist, air pollution causes mental tension which leads to increase in crimes in the society. The Air Act defines an air pollutant as any 'solid, liquid or gaseous substance including noise present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.' The Act provides that no person shall without the previous consent of the State Board establish or operate any industrial plant in an air-pollution control area. The Central Pollution Control Board and the State Pollution Control Board constituted under the Water Act shall also perform the power and functions under the Air Act. The main function of the Boards under the Air Act is to improve the quality of air and to prevent, control and abate air pollution in the country. The permission granted by the Board may be conditional one wherein stipulations are made in respect of raising of stack height and to provide various control equipments and monitoring equipments.

It is expressly provided that persons carrying on industry shall not allow emission of air pollutant in excess of standards laid down by the Board. In Delhi, the public transport system including buses and taxies are operating on a single fuel CNG mode on the directions given by the Supreme Court. Initially, there was a lot of resistance from bus and taxi operators. But now they themselves realise that the use of CNG is not only environment friendly but also economical. Noise has been taken as air pollutant within the meaning of Air Act. Sound becomes noise when it causes annoyance or irritates. There are many sources of noise pollution like factories, vehicles, reckless use of loudspeakers in marriages, religious ceremonies, religious places, *etc.* Use of crackers on festivals, winning of teams in the games, and other such occasions causes not only noise pollution but also air pollution. The Air Act prevents and controls both these pollutions.

The Environment (Protection) Act, 1986 was enacted to provide for the protection and improvement of the quality of environment and preventing, controlling and abating environmental pollution. The Act came into existence as a direct consequence of the Bhopal Gas Tragedy. The term 'environment' has been defined to include water, air and land, and the inter-relationship which exists among and between water, air and land and human beings, other living

creatures, plants, micro-organism and property. The definition is wide enough to include within its purview all living creatures including plants and micro-organism and their relationship with water, air and land.

The Act has given vast powers to the Central Government to take measures with respect of planning and execution of a nation-wide programme for prevention, control and abatement of environmental pollution. It empowers the Government to lay down standards for the quality of environment, emission or discharge of environmental pollutants; to regulate industrial locations; to prescribe procedure for managing hazardous substances, to establish safeguards for preventing accidents; and to collect and disseminate information regarding environmental pollution. Any contravention of the provisions of the Act, rules, orders or directions made thereunder is punishable with imprisonment for a term which may extend to five years or with fine upto one lakh rupees or with both. The Act is an 'umbrella' legislation designed to provide a frame work for Central Government coordination of the activities of various Central and State authorities established under previous laws, such as the Water Act and the Air Act. The Parliament passed the Public Liability Insurance Act, 1991 to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith.

The Act provides for mandatory public liability insurance for installations handling any hazardous substance to provide minimum relief to the victims (other than workers) through the mechanism of collector's decision. Such an insurance will be based on the principle of 'no fault' liability as it is limited to only relief on a limited scale. Such insurance apart from safeguarding the interests of the victims of accidents would also provide cover and enable the industry to discharge its liability to settle large claims arising out of major accidents. However, availability of immediate relief under this law would not prevent the victims to go to Courts for claiming large compensation. The National Environment Tribunal Act, 1995 was enacted to provide for strict liability for damages arising out of any accident occurring while handling any hazardous substance. The Act provides for establishment of a National Environment Tribunal for effective and expeditious disposal of cases arising from such accident. It imposes liability on the owner of an enterprise to pay compensation in case of death or. Injury to any person; or damage to any property or environment resulted from an accident. The accident must have occurred while handling any hazardous substance.

A claimant may also make an application before the Tribunal for such relief as is provided in the Public Liability Insurance Act, 1991. The National Environment Appellate Authority Act, 1997 has been enacted to provide for the establishment of a National Environment Appellate Authority to hear appeals with respect to restriction of areas in which any industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguard under the Environment (Protection) Act, 1986. After the establishment of the Authority,

no Civil Court or other authority shall have jurisdiction to entertain an appeal on matters on which the Authority is so empowered under the Act. It is evident that this Act has been made with objective to provide speedy justice on environmental issues.

The Wild Life (Protection) Act, 1972 was enacted with a view to provide for the protection of wild animals, birds and plants. The Act prohibits hunting of animals and birds as specified in the schedules. The Act also prohibits picking, uprooting, damaging, destroying, *etc.*, any specified plant from any forest. The Act provides for State Wildlife Advisory Board to advise the State Government in formulation of the policy for protection and conservation of the wildlife and specified plants; and in selection of areas to be declared as Sanctuaries, National parks, *etc.* The Act is administered by a Director of Wildlife Preservation with Assistant Directors; and a Chief Wildlife Warden with other Wardens and their staff. The Forest (Conservation) Act, 1986 was passed with a view to check deforestation of forests.

The Act provides that no destruction of forests or use of forestland for non-forest purposes can be permitted without the previous approval of the Central Government. The conservation of forests includes not only preservation and protection of existing forests but also re-afforestation. Reafforestation should go on to replace the vanishing forests. It is a continuous and integrated process. The Act is intended to save a laudable purpose and it must be enforced strictly for the benefit of the general public. It is evidently clear that there is no dearth of legislations on environment protection in India. But the enforcement of these legislations has been far from satisfactory. What is needed is the effective and efficient enforcement of the constitutional mandate and the other environmental legislations.

5

Perspectives on Environmental Law and Human Rights

Human rights and environmental law have traditionally been envisaged as two distinct, independent spheres of rights. Towards the last quarter of the 20th century, however, the perception arose that the cause of protection of the environment could be promoted by setting it in the framework of human rights, which had by then been firmly established as a matter of international law and practice. Because of the many complex issues that arise when these two seemingly distinct spheres interact, it is to be expected that there are different views on how to approach 'human rights and the environment'.

- The *first* approach is one where environmental protection is described as a possible means of fulfilling human rights standards. Here, environmental law is conceptualized as 'giving a protection that would help ensure the well-being of future generations as well as the survival of those who depend immediately upon natural resources for their livelihood.' Here, the end is fulfilling human rights, and the route is through environmental law.
- The *second* approach places the two spheres in inverted positions – it states that 'the legal protection of human rights is an effective means to achieving the ends of conservation and environmental protection.' The second approach therefore highlights the presently existing human rights as a route to environmental protection. The focus is on the existing human right. In this context, there exists a raging debate on whether one should recognize an actual and independent right to a

satisfactory environment as a legally enforceable right. This would obviously shift the emphasis onto the environment and away from the human rights. These are the subtle distinctions between the two ways in which this approach can be taken.

- A *third* approach to the question of 'human rights and the environment' is to deny the existence of any formal connection between the two at all. According to this approach, there is no requirement for an 'environmental human right.' The argument goes that, since the Stockholm Conference in 1972, international environmental law has developed to such extents that even the domestic environments of states has been internationalized. In light of the breadth of environmental law and policy, and the manner in which it intrudes into every aspect of environmental protection in an international sense and notwithstanding the concept of state sovereignty, it is argued that it is unnecessary to have a separate human right to a decent environment. This view militates against the confusion of the two distinct spheres of human rights law and environmental law. However, there are many who oppose this view. They argue that there is in fact a benefit to bringing environmental law under the ambit of human rights. Environmental law has in many parts of the world, be it at the international or domestic level, suffered from the problem of standing. Because of this barrier, it is often difficult for individuals or groups to challenge infringements of environmental law, treaties or directives, as the case may be.

There has been a great deal of debate on the theoretical soundness of the idea of a human right or rights to a satisfactory environment. For one thing, there can occasionally be a conflict, or tension, between the established human rights and the protection of the environment *per se*.

There are circumstances where the full enjoyment of the rights to life, to healthy living and to ones culture can lead to the depletion of natural resources and environmental degradation. Nevertheless, clearly there is a *prima facie* rhetorical and moral advantage in making the environment a human rights issue. There has been a simultaneous increase in 'legal claims for both human rights and environmental goods,' which is a clear reflection of the link between 'human' and the 'environment' and the dependence of human life on the environment.

THE CONTRIBUTION OF THE SUPREME COURT OF INDIA

The Constitution (Forty Second Amendment) Act 1976 explicitly incorporated environmental protection and improvement as part of State policy through the insertion of Article 48A. Article 51A (g) imposed a similar responsibility on every citizen "to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for all living creatures."

One of the main objections to an independent right or rights to the environment lies in the difficulty of definition. It is in this regard that the Indian Supreme Court has made a significant contribution. When a claim is brought under a particular article of the Constitution, this allows an adjudicating body such as the Supreme Court to find a breach of this article, without the need for a definition of an environmental right as such. All that the Court needs to do is what it must in any event do; namely, define the Constitutional right before it.

Accordingly, a Court prepared to find a risk to life, or damage to health, on the facts before it, would set a standard of environmental quality in defining the right litigated. This is well illustrated by the cases that have come before the Supreme Court, in particular in relation to the broad meaning given to the Right to Life under Article 21 of the Constitution. The right to life has been used in a diversified manner in India. It includes, *inter alia,* the right to survive as a species, quality of life, the right to live with dignity and the right to livelihood.

However, it is a negative right, and not a positive, self-executory right, such as is available, for example, under the Constitution of the Phillipines. Section 16, Article II of the 1987 Phillipine Constitution states: 'The State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature'. This right along with Right to Health (section 15) ascertains a balanced and healthful ecology. In contrast, Article 21 of the Indian Constitution states: 'No person shall be deprived of his life or personal liberty except according to procedures established by law.' The Supreme Court expanded this negative right in two ways. *Firstly*, any law affecting personal liberty should be reasonable, fair and just. *Secondly*, the Court recognised several unarticulated liberties that were implied by Article 21. It is by this second method that the Supreme Court interpreted the right to life and personal liberty to include the right to the environment.

Rural Litigation and Entitlement Kendra v. *State of U.P.* was one of the earliest cases where the Supreme Court dealt with issues relating to environment and ecological balance. The expanded concept of the right to life under the Indian Constitution was further elaborated on in *Francis Coralie Mullin* v. *Union Territory of Delhi* where the Supreme Court set out a list of positive obligations on the State, as part of its duty correlative to the right to life. The importance of this case lies in the willingness on the part of the Court to be assertive in adopting an expanded understanding of human rights.

It is only through such an understanding that claims involving the environment can be accommodated within the broad rubric of human rights. The link between environmental quality and the right to life was further addressed by a constitution bench of the Supreme Court in the *Charan Lal Sahu*. Similarly, in *Subash Kumar*, the Court observed that 'right to life guaranteed by article 21 includes the right of enjoyment of pollution-free water and air for full enjoyment of life.'

Through this case, the Court recognised the right to a wholesome environment as part of the fundamental right to life. This case also indicated that the municipalities and a large number of other concerned governmental agencies

could no longer rest content with unimplemented measures for the abatement and prevention of pollution. They may be compelled to take positive measures to improve the environment.

The Supreme Court has used the right to life as a basis for emphasizing the need to take drastic steps to combat air and water pollution. It has directed the closure or relocation of industries and ordered that evacuated land be used for the needs of the community. The courts have taken a serious view of unscientific and uncontrolled quarrying and mining, issued orders for the maintenance of ecology around coastal areas, shifting of hazardous and heavy industries and in restraining tanneries from discharging effluents.

Another expansion of the right to life is the right to livelihood (article 41), which is a directive principle of state policy. This extension can check government actions in relation to an environmental impact that has threatened to dislocate the poor and disrupt their lifestyles.

A strong connection between the right to livelihood and the right to life in the context of environmental rights has thus been established over the years. Especially in the context of the rights of indigenous people being evicted by development projects, the Court has been guided by the positive obligations contained in article 48A and 51A(g), and has ordered adequate compensation and rehabilitation of the evictees.

Matters involving the degradation of the environment have often come to the Court in the form of petitions filed in the public interest. This mode of litigation has gained momentum due to the lenient view adopted by the Court towards concepts such as *locus standi* and the 'proof of injury' approach of common law. This has facilitated espousal of the claims of those who would have otherwise gone unrepresented. It is interesting to note that, unlike Indian courts, the Bangladeshi and Pakistani courts apply an 'aggrieved person' test, which means a right or recognised interest that is direct and personal to the complainant.

Sustainable Development

Awareness of the major challenges emerging both as regards development and with reference to the environment has made possible a consensus on the concept of "sustainable and environmentally sound development" which the "Earth Summit", meeting in Rio in 1992, endeavoured to focus by defining an ambitious programme of action, Agenda 21, clarified by a Declaration of 27 principles solemnly adopted on that occasion. We can also refer to the content of the Declaration on International Economic Cooperation adopted by the General Assembly in May 1990, which clearly recognizes that "Economic development must be environmentally sound and sustainable."

The concept of sustainable development contains three basic components or principles. *First* among these is the precautionary principle, whereby the state must *anticipate, prevent* and *attack* the cause of environmental degradation. The Rio Declaration affirms the principle by stating that where ever "there are

threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." Most of the cases of the 1990's deal with the definition of the principle.

In 1996, the Supreme Court stated that environmental measures, adopted by the State Government and the statutory authorities, must *anticipate, prevent and attack* the causes of environmental degradation. Following the definition provided in the Rio Declaration, the Court stated that where there are threats of serious and irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The Supreme Court has accepted the principle and applied it on several occasions. In the *Taj Trapezium Case*, applying the precautionary approach the Supreme Court ordered a number of industries in the area surrounding the Taj Mahal to relocate or introduce pollution abatement measures in order to protect the Taj from deterioration and damage.

An interesting comment on the precautionary principle by the Supreme Court of Pakistan is worthy of mention here. The Court in *Shehla Zia v. WAPDA* commented: "The precautionary policy is to first consider the welfare and the safety of the human beings and the environment and then to pick up a policy and execute the plan which is more suited to obviate the possible dangers or make such alternate precautionary measures which may ensure safety. To stick to a particular plan on the basis of old studies or inconclusive research cannot be said to be a policy of prudence or precaution."

The second component of the doctrine of sustainable development is the principle of '*polluter pays'*. The principle states that the polluter not only has an obligation to make good the loss but shall bear the cost of rehabilitating the environment to its original state. In operation, this principle is usually visible alongside the precautionary principle.

A Native American proverb states that "*we do not inherit the planet from our ancestors but borrow it from our children*", this is the next significant component of sustainable development – the principle of intergenerational equity. The Brundtland Commission defined sustainable development as development '*which meets the needs of the present without compromising the ability of the future generations to meet their own needs*.' The principle envisages that each generation should be required to conserve the diversity of the natural and cultural resource base, so that it does not unduly restrict the options available to future generations in solving their problems and satisfying their own values, and should also be entitled to diversity comparable to that enjoyed by previous generations.

This principle is called "conservation of options." *Secondly*, each generation should be required to maintain the quality of the planet so that it is passed on in no worse condition than that in which it was received, and should also be entitled to planetary quality comparable to that enjoyed by previous generations. This is the principle of "conservation of quality." *Thirdly*, each generation should provide its members with equitable rights of access to the legacy of past generations

and should conserve this access for future generations. This is the principle of "conservation of access." Another important aspect of the right to life is the application of public trust doctrine to protect and preserve public land. This doctrine serves two purposes: it mandates affirmative state action for effective management of resources and empowers the citizens to question ineffective management of natural resources.

Public trust is being increasingly related to sustainable development, the precautionary principle and bio-diversity protection. Moreover, not only can it be used to protect the public from poor application of planning law or environmental impact assessment, it also has an intergenerational dimension. When the Supreme Court has applied the public trust doctrine, it has considered it not only as an international law concept, but also as one which is well established in our domestic legal system. Its successful application in India shows that this doctrine can be used to remove difficulties in resolving tribal land disputes and cases concerning development projects planned by the government.

In *M.C. Mehta v. Kamal Nath and Others,* the court added that '[it] would be equally appropriate in controversies involving air pollution, the dissemination of pesticides, the location of rights of ways for utilities, and strip mining of wetland filling on private lands in a state where governmental permits are required.' In both *M.I. Builders Pvt. Ltd* and *Th. Majra Singh,* the court reconfirmed that the public trust doctrine 'has grown from article 21 of the constitution and has become part of the Indian legal thought process for quite a long time.'

The importance of Democratic and individual Participation

A development strategy which does not take into account the human, social and cultural dimension could have only adverse repercussions on the environment. A national development strategy is viable from the economic, social and ecological standpoint only if it gains the active adherence of the various social strata of the population. The United Nations Conference on Environment and Development was of the view that that one of the fundamental prerequisites for the achievement of sustainable development was broad public participation in decision-making.

Furthermore, the Conference recognized, in the specific context of environment, "the need for new forms of participation" and "the need of individuals, groups and organizations to participate in environmental impact assessment procedures and to know about and participate in (pertinent) decisions." The Conference implicitly linked the notion of real participation in the right of access to information by noting that "Individuals, groups and organizations should have access to information relevant to environment and development held by national authorities, including information on products and activities that have or are likely to have a significant impact on the environment, and information on environmental protection measures". The link between participation and information can also be found in Principle 10 of the Declaration of Rio.

THE HUMAN RIGHT TO A HEALTHY ENVIRONMENT

THE INTERNATIONAL COURT OF JUSTICE

Of the fifteen cases currently pending before the International Court of Justice (ICJ) in The Hague, five arise out of cross-boundary river disputes or challenges to maritime navigation. A threat by Lebanon's environment minister to take Israel to the ICJ over a large oil spill caused by Israel Air Force's bombing a power station in 2006 does not appear to have materialised. This leaves *Pulp Mills on the River Uruguay (Argentina v Uruguay)*, which is generally considered to be the first predominantly environmental suit to reach the ICJ. Although the Court set up a specialised Chamber for Environmental Matters in 2003, it remains idle, most probably because only Signatory States have standing to litigate before the ICJ and many environmental issues are seen as being too urgent to be left to its lengthy and cumbersome schedule.

The World Trade Organisation

From an environmental standpoint, the WTO's dispute settlement procedure is an improvement on the GATT panels which preceded it. Under the old GATT rules, in the *Tuna/Dolphin* cases, the extraterritorial impact of U.S., environmental legislation against importing tuna caught in ways harmful to dolphins was declared a restriction on trade.

By contrast, the WTO's Dispute Settlement Body (DSB) and its Appellate Body, both established in 1994, have given extraterritorial effect to environmental legislation. The DSB is made up of all the WTO's members and serves as a mediation forum. Parties may ask the DSB to convene an *ad hoc* panel, decisions of which become binding once adopted by the DSB. Appeals on legal issues arising from these decisions go to the Appellate Body. Environmental and natural resources disputes before the DSB include:

(i) *European Communities: Measures affecting asbestos and asbestos-containing products* (2001), was a case brought by Canada against France. Both the panel and the Appellate Body rejected Canada's challenge to France's import ban on asbestos and asbestos-containing products.

Under Article III of GATT, requiring countries to grant equivalent treatment to like products, the DSB panel held that France wrongly discriminated between asbestos and asbestos substitutes ("like products") and that health risks were not a relevant factor in considering product likeness. However, it upheld France's right under Article XX(b) "to protect animal, human, plant life or health."

On appeal, the Appellate Body upheld the decision but went further than the DSB panel, reversing the finding that health risks were not a proper consideration in determining product likeness. WTO members are thus permitted to protect human health and safety at the level of protection they deem appropriate.

(ii) *United States: Import Prohibition of Certain Shrimp and Shrimp Products* (1998, 2001), the "shrimp-turtle" case. India, Malaysia, Pakistan, Thailand and the Philippines challenged the extraterritorial application of U.S., endangered species legislation which required Turtle Excluder Devices to be used wherever there was a likelihood that shrimp harvesting would adversely affect sea turtles. The Appellate Body ruled that governments have every right to protect human, animal or plant life and health and to take measures to conserve exhaustible resources. The U.S., lost the case before the DSB panel because it applied its import measures in a discriminatory manner.

In a two-step analysis, the Appellate Body ruled that Article XX of GATT permits exceptions to trade rules for certain environmental reasons and the U.S., measure met the provisional requirements of Article XX. It held that regulations must relate "to the conservation of exhaustible natural resources," and that living resources: "are just as 'finite' as petroleum, iron ore and other non-living resources." The Appellate Body invoked CITES in concluding that turtles constitute exhaustible resources. Where the U.S., domestic legislation failed to meet WTO requirements was in applying "a rigid and unbending standard" which unjustifiably discriminated against exporting WTO members and failed to take into account different conditions in the territories of other Member States. The U.S., had earlier entered into negotiations and concluded a multilateral agreement with several Latin American Member States, allowing a phased implementation of measures to protect sea turtles. The Appellate Body held that the U.S., government's unwillingness to negotiate similarly with other members was discriminatory and unjustifiable under the chapeau of Article XX.

The importance of this case from the standpoint of international environmental law lies as much in what the Appellate Body did not decide as in what it decided. It expressly held:

"In reaching these conclusions, we wish to underscore what we have *not* decided in this appeal. We have *not* decided that the protection and preservation of the environment is of no significance to the Members of the WTO. Clearly, it is. We have *not* decided that the sovereign nations that are Members of the WTO cannot adopt effective measures to protect endangered species, such as sea turtles. Clearly, they can and should. And we have *not* decided that sovereign states should not act together bilaterally, plurilaterally or multilaterally, either within the WTO or in other international fora, to protect endangered species or to otherwise protect the environment. Clearly, they should and do."

In a procedural development of potential future importance for progressive lawyers and NGOs such as Greenpeace and Friends Of the Earth, the Appellate Body also noted that WTO panels may accept "*amicus briefs*" (friends of the court submissions) from NGOs or other interested parties.

(iii) *United States: Standards for Reformulated and Conventional Gasoline* (1996). Venezuela and Brazil challenged the extraterritorial impact of legislation that imposed stricter requirements on imported gasoline than on domestic U.S., producers. This case affirmed the right of the US to adopt the highest standards to protect its air quality so long as it did not discriminate against foreign imports. The US lost the case because it discriminated against the petitioners.

A significant feature of this case was the relative speed with which it was conducted and ultimately resolved. Venezuela submitted its complaint only days after the WTO and its dispute settlement procedure came into existence. 12 months later the Dispute Resolution panel completed its final report, also in relation to Brazil, which had joined the case and filed its own complaint in April 1995. The U.S., appealed the panel's report and the DSB adopted the Appellate Body's report in May 1996, only 14 months after the originating complaint was filed. The agreed period for implementing the resolution was 15 months after its adoption (August 1997); the parties' negotiations continued under monitoring by the DSB; the U.S., submitted status reports on the progress of implementation and a new, non-discriminatory regulation came into force in the U.S., on schedule in August 1997.

Permanent Court of Arbitration

Environmental and natural resources disputes have come before the Permanent Court of Arbitration (PCA). For example, in *Barbados v. Trinidad and Tobago* (11 April 2006), pursuant to Annex VII of the U.N. Convention on the Law of the Sea (UNCLOS), in February 2004 Barbados referred its dispute with Trinidad and Tobago over kingfishery rights to the PCA, asking the Arbitral Tribunal to delimit the Exclusive Economic Zone and Continental Shelf between the two island states. After exchanges of pleadings, eight days of hearings were held in October 2005 and the Tribunal delivered its unanimous 116 page award in April 2006.

This was the first natural resources case heard by the PCA dealing with a maritime boundary dispute under the UNCLOS Arbitration clause, which the parties chose in preference to Convention's own International Tribunal on the Law Of the Sea procedure (ITLOS).

INTERNATIONAL TRIBUNAL ON THE LAW OF THE SEA (ITLOS)

In the *Southern Bluefin Tuna* cases, Australia and New Zealand brought separate challenges to Japan's unilateral fishing programme. All three countries are parties to the 1993 Convention for the Conservation of Southern Bluefin Tuna but they could not agree on a total allowable catch (TAC). ITLOS issued provisional measures asking all parties to revert to the quotas in force before the dispute arose and urging the precautionary principle, in the absence of scientific certainty. Eventually, however, the Tribunal decided it lacked jurisdiction on the merits, leaving the parties no option but to resume negotiations

among themselves pursuant to the Convention. The negotiations were ultimately successful but the inability of the Tribunal to resolve the matter highlights the limitations of litigation in certain environmental disputes.

Kyoto Compliance Committee

Kyoto's Compliance Committee was set up in 2006 and has been described as "[t]he most elaborate procedure devised to date" under an international environmental agreement. It has most of the attributes of a judicial procedure, establishing conditions for admissibility of complaints, procedural guarantees, an appeals procedure and possible consequences for a finding of non-compliance. "All in all," writes Professor Klabbers, "the result is an elaborate, complex structure, which gives the impression of a judicial organ dressed in political (or bureaucratic) garb." The Committee's work to date has consisted largely of receiving reports by signatory states and issuing rebukes to those states that have failed to file their reports in a timely fashion.

However, it demonstrated that it can serve as more than a monitoring body when in 2008 it suspended Greece from trading carbon credits due to that country's failure to reliably observe and measure GHG emissions. Greece was ordered to develop a new system of measuring emissions and submit it to the panel within three months, after which Greece's continued compliance would be supervised by a team of international experts. As a result, Greece prepared a report how on it will ensure future compliance with its obligations, the Compliance Committee has approved the report, and Greece is again in compliance with the Protocol.

One role for environmental lawyers and NGOs in monitoring compliance under Kyoto is shown by the action taken by Friends of the Earth International, Friends of the Earth Canada and the Climate Justice Programme in submitting a complaint against Canada for failing to submit its report on demonstrable progress as required by Kyoto. Their complaint was filed with the UNFCCC Secretariat in Bonn in October 2006 and similar action to that taken against Greece was considered by the Committee. However, following a hearing at which the Canadian government made representations, no further action was deemed necessary.

How not to win a Multifaceted Dispute Resolution – Avoiding the MOX Paradigm

If the Kyoto and ITLOS procedures are complex, then "complexity" hardly begins to describe the proceedings involving Ireland's challenge to the discharge of radioactive liquids into the Irish Sea from the UK's Sellafield MOX (mixed oxide fuel) plant.

As Professor Romano has noted:

- "Since it is quite common for a particular dispute to touch on more than one treaty (and environmental disputes, being multifaceted, are particularly prone to do so), and because a given act of a state may

violate obligations under more than one treaty … exogenous dispute settlement clauses and institutions provide for a much larger array of means to which states, perhaps unsurprisingly, increasingly resort."

The MOX case exemplifies this tendency as this jurisdictional dispute has involved lengthy legal international and regional proceedings before a variety of legal fora:

(i) *The OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic:* The Irish Government, concerned about radioactive discharges from Sellafield started proceedings in June 2001 and the OSPAR Tribunal issued its award in July 2003. Ireland lost its bid for access to certain data withheld by the UK as the Tribunal deemed it was not "environmental information." However, the Tribunal held that Ireland has a right under the OSPAR Convention to access to information on the marine environment and that the UK has an obligation to provide such information.

(ii) *The PCA Arbitral Tribunal procedures under Annex VII of UNCLOS:* In October 2001, following the UK's decision to proceed with its plans for the MOX Nuclear Plant, Ireland also took the UK before a PCA Arbitral Tribunal under UNCLOS. This action related *inter alia* to the inadequacy of the environmental impact assessment for the Project. The PCA hearings began in June 2003. However, the E.U. Commission intervened to assert that the case was more appropriate to matters of E.U. competence rather than UNCLOS, so the Artibral Tribunal postponed hearing of Ireland's substantive case to permit resolution of the E.U.'s claim of jurisdiction.

The UNCLOS Tribunal agreed to hear Ireland's application for provisional measures pending hearing of the substantive case, and on 24 June 2003, issued a Provisional Measures Order which made provision for a review by Ireland and the UK of the mechanisms for inter-Governmental notification and co-operation. This Order has led to increased cooperation between Ireland and the UK on nuclear related matters.

(iii) *The European Court of Justice:* Meanwhile, the European Court held that Ireland, by instituting proceedings against the UK under UNCLOS, had failed to fulfill its obligations under Community law. The May 2006 Judgement also established that certain provisions of UNCLOS form part of the E.C. legal order and that the European Court of Justice has jurisdiction to determine disputes on their interpretation and application.

Eight years after international legal action was initiated, it is not clear today whether it has reached a satisfactory conclusion. The best that can be said is that the parties are now sharing information and, according to the Irish government's Department of Environment, Heritage and Local Government, the two governments are continuing to seek to resolve their disagreements by diplomatic means with the assistance of the good offices of the European Commission.

The British government now acknowledges that Ireland is a major stakeholder with a right to consultation in relation to decisions to be taken by Britain's Nuclear Decommissioning Authority, Committee on Radioactive Waste Management and the UK Energy Review. However, the case highlights the danger that obstructionist tactics, forum shopping and jurisdictional disputes can waste precious time and expense while the important central issue – the risk of radiation pollution to marine life and island populations – gets lost at sea.

REGIONAL TRADE AGREEMENTS

Some regional trade agreements, such as NAFTA, contain their own arbitration provisions. U.S., companies have used these to challenge certain Mexican and Canadian environmental measures. In most cases, domestic regulations have been upheld but in two the measures were held to be protectionist rather than truly environmental in nature:

(i) In *Metalclad Corporation v. United Mexican States*, ICSID (2001), before the World Bank's International Centre for the Settlement of Investment Disputes (ICSID), a Mexican state environmental regulation was held to have interfered with the claimant's right to operate a hazardous waste landfill and constituted an illegal expropriation in violation of NAFTA Article 1110.

(ii) *S.D.Myers v. Government of Canada* (2001) involved a challenge by a U.S., company to the Canadian government's ban on exporting polychlorinated biphenyl (PCB) wastes. Without the PCB wastes, the claimant alleged that it would cease to be economically viable. Noting that before the claim had been filed, Canada's PCB industry had lobbied its government to ban PCB waste exports, the NAFTA arbitration tribunal ruled that the ban was based on the intent to "protect and promote the market share of enterprises that would carry out the destruction of PCBs in Canada and that were owned by Canadian nationals." The ban was declared protectionist, rather than environmental, and the tribunal ruled against Canada.

(iii) NAFTA provides an interesting example of the potential for increased participation by environmental lawyers and NGOs in what are generally closed proceedings under Chapter 11. In *Methanex v. United States* (2001), a NAFTA arbitration panel agreed for the first time to accept an *amicus* brief filed by an NGO.

The Arbitral Panel reviewed the WTO's approach in *Hot-rolled Lead and Carbon Steel (European Communities v. United States)*, where *amicus* briefs were accepted and considered. It decided that the general scope of Article 15(1) of the UNCITRAL Arbitration Rules gave it the power to accept written *amicus curiae* submissions. Having determined this, it deferred to a later date the decision whether, on the specific facts of the case, such submissions would in fact assist it in determining the award.

Bilateral Investment Treaties

In *Aguas del Tunari S.A. v Republic of Bolivia*, and *Metalclad Corporation v. United Mexican States*, bilateral agreements between states and foreign corporations were referred to international arbitration through ICSID. The usefulness for parties of this procedure is perhaps best demonstrated by the fact that ICSID's current docket of recently filed pending cases lists 125 such disputes under arbitration. Arbitration proceedings generally have the advantage that they tend to be concluded more speedily, with greater finality and at lesser expense than full-blown court cases.

The WTO mechanisms are generally used by TNCs and other major corporations rather than progressive lawyers. In such cases, the role of the progressive lawyer will be to identify tactics both inside and outside the dispute resolution procedure that will advance the cause of the poor and disadvantaged. In *Aguas del Tunari S.A. v Republic of Bolivia*, under pressure from the World Bank, in 1999 Bolivia contracted with International Water, a subsidiary of Bechtel, for it to take over water supply to Cochabamba, the country's third largest city. In an economy where the minimum wage was $100 a month, water prices soared to $20 a month. Street conflicts erupted and a number of people were reported killed. Bechtel withdrew from Bolivia and sued the government for between US$25 and $50 million. However, in January 2006 Bechtel dropped its claim as a result of a worldwide campaign of protest and the resulting negative publicity.

HUMAN RIGHTS AGREEMENTS

Two cases currently pending before the Inter-American Commission on Human Rights illustrate another forum in which environmental issues can be litigated:

(i) *San Mateo Tailings* case. In 2004, the IACHR accepted a request from the Centre for International Environmental Law (CIEL) for precautionary measures to protect the life and health of members of the San Mateo community in Peru who are affected by toxic waste from mining operations. This led to the removal of the toxic waste that had been dumped in the community and constitutes a landmark ruling on the connections between environmental rights and human rights. CIEL has documented, *inter alia*, violations of the civil and political rights to life, personal integrity and the rights of the child.
The IACHR in November 2005 requested Peru to take measures to safeguard the lives and personal integrity of members of the San Mateo community; to initiate a public health assistance programme; to prepare immediately an environmental impact study required for the removal of toxic waste; and on completion of the study, to initiate removal of the tailings dump. Although the government of Peru responded quickly to remove the dry waste by truck, the necessary specialised health care is not fully in place; remediation of living conditions in the area has

not been adequately implemented; the special health needs of children affected by the contamination have not been properly addressed; and no compensation has been paid to the community for personal injury and property damage. The case therefore continues.

(ii) In *Petition to the Inter-American Commission on Human Rights seeking relief from violations resulting from global warming caused by acts and omissions of United States*, the Inuit Circumpolar Conference petitioned the IACHR, requesting "relief from human rights violations resulting from global warming and climate change caused by acts and omissions of the United States." The petition asserts that: "Nowhere on Earth has global warming had a more severe impact than the Arctic," and that that the United States is obligated to protect the rights of the Inuit by its membership in the Organization of American States and its acceptance of the American Declaration of the Rights and Duties of Man:

– "The impacts of climate change, caused by acts and omissions by the United States, violate the Inuit's fundamental human rights protected by the American Declaration of the Rights and Duties of Man and other international instruments. These include their rights to the benefits of culture, to property, to the preservation of health, life, physical integrity, security, and a means of subsistence, and to residence, movement, and inviolability of the home."

Further violations enumerated in the petition include the right of the Inuit to use and enjoy their traditional lands; to enjoy their personal property; their right to health and life; their rights to residence and movement and the inviolability of their homes; and their right to their own means of subsistence. The petition asks the Commission to make an onsite visit to investigate and confirm the harms suffered by the Inuit; to hold a hearing to investigate the claim; to declare that the United States of America is internationally responsible for violations of rights affirmed in the American Declaration of the Rights and Duties of Man and in other instruments of international law; and to implement remedial measures.

The petitioners presented testimony in support of their petition at hearings of Inter-American Commission Washington DC in 2007. The case remains under review.

MULTILATERAL ENVIRONMENTAL AGREEMENTS

The Basel Convention: Ivory Coast Toxic Waste Dumping Litigation

A current example of litigation arising from a multilateral environmental agreement concerns the illegal dumping of toxic waste in violation of the Basel

Convention's ban on the shipping of hazardous waste from rich to poor countries. In Abidjan, Ivory Coast, in September 2006, the first casualties of toxic waste dumping were reported. Protests broke out on the streets against the government, which was blamed for allowing the dumping. Some 16 people reportedly died, including several children. Some 100,000 people required medical treatment. The other casualty was the Ivorian government, whose members resigned en masse.

The toxic waste was dumped openly at various sites on the streets of Abidjan, having been delivered by a ship chartered by Trafigura Ltd (controlled by the Dutch firm Trafigura Beheer BV), which claimed it thought the waste would be "properly treated" in this poor African nation. A number of troubling features about the background to this case include the fact that Port of Amsterdam authorities apparently examined the cargo and, due to its noxious state, told the Trafigura it would be charged €500.000. The ship promptly left Amsterdam and travelled around the African coast, ultimately stopping and unloading its cargo in Ivory Coast, a country which happens not to have ratified the Basel Convention.

A no-win, no-fee civil suit for £100,000 on behalf of the victims, the largest ever class action for personal injury in Britain, is pending before the High Court in London. In Abidjan, two of Trafigura's officials and two members of the Ivorian company which contracted with Trafigura to dispose of the waste were arrested and charged with criminal offences. The Ivorian government also filed as civil case against Trafigura, which settled out of court with a payment of $198 million to the government. The Trafigura officials were promptly released without further criminal charge. The two Ivorian businessmen were not so fortunate (or perhaps not so wealthy) and were sentenced respectively to terms of 20 and five years' imprisonment. The UN Human Rights Council's Special Rapporteur on illicit movement and dumping of toxic waste paid a visit to both Abidjan and the Netherlands to examine the cause of the disaster.

AD HOC ARBITRATIONS

In *New Zealand v. France (The Rainbow Warrior Affair)* the U.N. Secretary-General was called in to mediate after French agents in 1985 sabotaged and sank Greenpeace's *Rainbow Warrior*, killing one of its crew members in a New Zealand harbour. Two French agents were sentenced to 10 years' imprisonment by a New Zealand court and France threatened trade sanctions if they were not immediately released. New Zealand claimed the trade sanctions were illegitimate and demanded compensation for damage it incurred in the incident. In 1986 the Secretary-General awarded $7 million in damages to New Zealand and requested that France refrain from measures to inhibit trade between New Zealand and the E.U. The French agents were ordered to spend the next three years on an isolated French military base in the Pacific.

The Secretary-General's award also provided for measures in the event that France failed to fulfil its responsibilities. When the agents were prematurely

repatriated, New Zealand initiated arbitration proceedings which found France to have breached its responsibilities and ordered France to establish a fund to promote the close and friendly relations between the two countries. France was ordered to pay $2 million into the fund.

REGIONAL AND INTERNATIONAL BODIES ON THE ISSUE

The right to a healthy environment is now to be found in a number of regional human rights instruments around the world. Article 11 of the Additional Protocol to the Inter-American Convention on Human Rights (1994) popularly known as the San Salvador Protocol, states that (1) everyone shall have the right to live in a healthy environment and to have access to basic public services; (2) the state parties shall promote the protection, preservation and improvement of the environment.

The Convention on the Rights of the Child (1989) at article 24(2) (c) requires State parties in the mater of combating disease and malnutrition to take into consideration, 'the damage and risks of environmental pollution.' The African Charter on Human and People's Rights 1981 proclaims in Art. 24(1) a right to 'a general satisfactory environment favourable to their development.' In fact, the Final Report of the Special Rapporteur on Prevention of Discrimination and Protection of Minorities listed over 15 rights relative to environmental quality.

Some of these include:

a. The right to freedom from pollution, environmental degradation and activities which threaten life, health or livelihood;
b. Protection and preservation of the air, soil, water, flora and fauna;
c. Healthy food and water; a safe and healthy working environment.

The first principle of the 1972 Stockholm Declaration declares that: "Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well being, and he bears a solemn responsibility to protect and improve the environment for present and future generations." Almost twenty years later, in resolution 45/94 the UN General Assembly recalled the language of Stockholm, stating that all individuals are entitled to live in an environment adequate for their health and well-being. The resolution called for enhanced efforts towards ensuring a better and healthier environment.

In the mid 1990s, recognizing the urgent need and importance of deepening the link between human rights and the environment, and of exploring ways to achieve a better collaboration, harmony, and complement the agendas of different United Nations institutions working on both subjects, the UN created the position of Special Rapporteur on Human Rights and Environment. The Rapporteur prepared an important report, the Ksentini Report, which offered a theoretical, thematic, and practical framework to address the linkages between human rights and the environment.

In the absence of petition procedures pursuant to environmental treaties, cases concerning the impact of environmental harm on individuals and groups have often been brought to international human rights bodies. For example, the Committee on the Elimination of Discrimination Against Women linked environment to the right to health in its Concluding Observations on the State report of Romania, expressing its "concern about the situation of the environment, including industrial accidents, and their impact on women's health."

The same can be seen in reports submitted by the Committee on the Rights of the Child. In its Concluding Observations on the State report submitted by Jordan, the CRC recommended that Jordan "take all appropriate measures, including through international cooperation, to prevent and combat the damaging effects of environmental pollution and contamination of water supplies on children and to strengthen procedures for inspection." The CRC's Concluding Observations on South Africa also expressed the Committee's "concern at the increase in environmental degradation, especially as regards air pollution" and "recommend[ed] that the State party increase its efforts to facilitate the implementation of sustainable development programmes to prevent environmental degradation, especially as regards air pollution."

Links between the environment and human rights have also been recognized by the Inter-American Court of Human Rights. The case of *Awas Tingni Mayagna (Sumo) Indigenous Community* v. *Nicaragua*, involved the protection of Nicaraguan forests in lands traditionally owned by the Awas Tingni. Government-sponsored logging on this native land was found to be a violation of the human rights of these tribals. Similarly, the Commission established a link between environmental quality and the right to life in response to a petition brought on behalf of the Yanomani Indians of Brazil. The construction of a highway was found to have violated the American Declaration of the Rights and Duties of Man.

The European Convention on Human Rights has also been invoked in environmental matters. In Europe, most of the victims invoke either the right to information or the right to privacy guaranteed under the Convention. Under the said Convention and Protocol, it has been recognized that pollution or other environmental harm can result in a breach of ones right to privacy and family life. While this harm may be excused if it results from an authorized activity of economic benefit to the community in general, as long as there is no disproportionate burden on any particular individual; *i.e.*, the measures must have a legitimate aim, be lawfully enacted, and be proportional. Of course, the State enjoys some margin in determining the legitimacy of the aim being pursued, but the Court has been playing an active role in ensuring fairness and balancing the scales. One important point to be noted in the context of the European Convention is the fact that it has successfully invoked most of all in the context of environmental pollution. Resource management, nature conservation and the protection of biological diversity have not been easily brought under the rubric of the European Convention. This is because of the absence of a specific right to a safe and ecologically-balanced environment.

Nearly all global and regional human rights bodies have accepted the link between environmental degradation and internationally-guaranteed human rights. In nearly every instance, the complaints brought have not been based upon a specific right to a safe and environmentally-sound environment, but rather upon rights to life, property, health, information, family and home life. Underlying the complaints, however, are instances of pollution, deforestation, water pollution, and other types of environmental harm.

Reg. International Judicial interventions

If we look at the developments that are taking place through the intervention of national Courts in various parts of the world, we come to note several things: *first*, the courts are moving the right to a healthy environment up the hierarchy of human rights by recognising it as a fundamental right; *second*, the courts are defining the content and nature of the right to a healthy environment through landmark decisions.

- In Argentina, the National Constitution recognizes since 1994 the right to a healthy and suitable environment. However, even before the law provided for such explicit recognition, courts had acknowledged the existence of the right to live in a healthy environment.
- In Columbia, the right to the environment was incorporated in 1991. In the case of *Antonio Mauricio Monroy Cespedes*, in 1993, the Court observed that "side by side with fundamental rights such as liberty, equality and necessary conditions for people's life, there is the right to the environment. The right to a healthy environment cannot be separated from the right to life and health of human beings. In fact, factors that are deleterious to the environment cause irreparable harm to human beings. If this is so we can state that the right to the environment is a right fundamental to the existence of humanity."
- In the same year, the Supreme Court of Costa Rica affirmed the right to a healthy environment in a case concerning the use of a cliff as a waste dump. In the case of *Carlos Roberto García Chacón,* the Supreme Court stated that life "is only possible when it exists in solidarity with nature, which nourishes and sustains us – not only with regard to food, but also with physical well-being. It constitutes a right that all citizens possess to live in an environment free from contamination."
- Guatemala too has seen the environmental ombudsman note in a 1999 case that "lack of interest and irresponsibility on the part of authorities in charge of National Environmental Policy amounts to a violation of human rights, considering that it impairs the enjoyment of a healthy environment, the dignity of the person, the preservation of the cultural and natural heritage and socio-economic development."

The question of human rights and the environment has also come up for consideration in our neighbouring countries. The Constitution of Bangladesh does not explicitly provide for the right to healthy environment either in the

directive principles or as a fundamental right. Article 31 states that every citizen has the right to protection from 'action detrimental to the life liberty, body, reputation, or property', unless these are taken in accordance with law. It added that the citizens and the residents of Bangladesh have the inalienable right to be treated in accordance with law. If these rights are taken away, compensation must be paid. In 1994, a public interest litigation was initiated before the Supreme Court dealing with air and noise pollution. The Supreme Court agreed with the argument presented by the petitioner that the constitutional 'right to life' does extend to include right to a safe and healthy environment. A few years later, the Appellate Division and the High Court Division of the Supreme Court dealt with this question in a positive manner, in the case of *Dr. M. Farooque v. Bangladesh,* reiterating Bangladesh's commitment in the 'context of engaging concern for the conservation of environment, irrespective of the locality where it is threatened.'

Article 9 of the Constitution of Pakistan states that no person shall be deprived of life or liberty save in accordance with the law. The Supreme Court in *Shehla Zia v. WAPDA* decided that Article 9 includes 'all such amenities and facilities which a person born in a free country is entitled to enjoy with dignity, legally and constitutionally'. The petitioner questioned whether, under article 9 of the Constitution, citizens were entitled to protection of law from being exposed to hazards of electro-magnetic field or any other such hazards which may be due to installation and construction of any grid station, any factory, power station or such like installations.

The Court noted that "under [the Pakistan] Constitution, Article 14 provides that the dignity of man and subject to law, the privacy of home shall be inviolable. The fundamental right to preserve and protect the dignity of man and right to 'life' are guaranteed under Article 9. If both are read together, question will arise whether a person can be said to have dignity of man if his right to life is below bare necessity line without proper food, clothing, shelter, education, health care, clean atmosphere and unpolluted environment."

6

Environmental Policy and Management Frameworks

Driven by its commitment for sustainable growth of power, NTPC has evolved a well defined environment management policy and sound environment practices for minimising environmental impact arising out of setting up of power plants and preserving the natural ecology.

NATIONAL ENVIRONMENT POLICY

At the national level, the Ministry of Environment and Forests had prepared a draft Environment Policy (NEP) and the Ministry of Power along with NTPC actively participated in the deliberations of the draft NEP. The NEP 2006 has since been approved by the Union Cabinet in May 2006.

NTPC ENVIRONMENT POLICY

As early as in November 1995, NTPC brought out a comprehensive document entitled "NTPC Environment Policy and Environment Management System".

Amongst the guiding principles adopted in the document are company's proactive approach to environment, optimum utilisation of equipment, adoption of latest technologies and continual environment improvement. The policy also envisages efficient utilisation of resources, thereby minimising waste, maximising ash utilisation and providing green belt all around the plant for maintaining ecological balance.

RESOURCES CONSERVATION

With better awareness and appreciation towards ecology and environment, the organization is continually looking for innovative and cost effective solutions to conserve natural resources and reduce wastes.

Some of the measures include:

- Reduction in land requirements for main plant and ash disposal areas in newer units.
- Capacity addition in old plants, within existing land.
- Reduction in water requirement for main plant and ash disposal areas through recycle and reuse of water.
- Efficient use of Fuel (Coal, Natural gas and Fuel oil)
- Reduction in fuel requirement through more efficient combustion and adoption of state-of-the-art technologies such as super critical boilers

WASTE MANAGEMENT

Various types of wastes such as Municilal or domestic wastes, hazardous wastes, Bio-Medical wastes get generated in power plant areas, plant hospital and the townships of projects. The wastes generated are a number of solid and hazardous wastes like used oils and waste oils, grease, lead acid batteries, other lead bearing wastes (such as garkets, *etc.*), oil and clarifier sludge, used resin, used photochemicals, asbestos packing, e-waste, metal scrap, C and I wastes, electricial scrap, empty cylinders (refillable), paper, rubber products, canteen (bio-degradable) wastes, buidling material wastes, silica gel, glass wool, fused lamps and tubes, fire resistant fluids, *etc.* These wastes fall either under hazardous wastes category or non-hazardous wastes category as per classification given in Government of Indias notification on Hazardous Wastes (Management and Handling) Rules 1989 (as amended on 06.01.2000 and 20.05.2003). Handling and manegement of these wastes in NTPC stations have been discussed below.

Municipal Waste Management

Domestic or municipal waste is generated in households at townships. This waste is seggregated into bio-degradable and non-biodegradable wastes at source itself in different coloured containers and thereafter the two types are disposed separately. Bio-degradable waste is spread uniformly in identified low lying areas and thereafter it is covered with soil for use later as manure after composting. The seggregated non bio-degradable waste is disposed off separately in other identified low lying areas and is spread out uniformly.

Hazardous Waste Management

NTPC being a proactive organization, the handling and disposal of hazardous wastes are done as per the Hazardous Wastes (Management and Handling) Rules 1989 (as amended in 2003) guidelines issued by Government of India for the treatment, storage and disposal of hazardous wastes. Scientific study on management and handling of hazardous wastes was carried out at a few NTPC

stations to adopt the best practices so that there is a complete compliance with statutory requirements. In NTPC sataione, the Hazardous Wastes (Recyclable) are sold/auctioned to registered recyclers/refiners. The other hazardous wastes such as the activated carbon resins, used drums (hazardous) chromium (Cr-III electrolytes, used petro-chemicals, asbestos packings, used torch batteries, ribbon, toners/cartridges, mixed wastes (waste oil, water and cotton) filters, earth contaminated with synthetic oil (FQF) glass used and sodium silicate, lamps and tubes, *etc.*, fall under the category of Hazardous Wastes (Non-Recyalable). These wastes are small in quantity and are stored in properly identified locations. As per the notification, hazardous wastes (non-recyalable) are to be sent to State Pollution Control Board (SPCB) approved common treatment storage and disposal facility (TSDF).

Bio-Medical Waste Management

Hospital (or Bio-medical) wastes get generated from hospitals and they include urine bags, human anatomical wastes, plaster of aris waste, empty plastic bottles of water and glucose, blood and chemical mixed cotton, blood and urines tubes, *etc.*, these wastes are segregated and are placed in buckets of different colours as per the notification for Bio-Medical Waste (Management and Handling) Rules. The seggregated bio-medical wastes are either disposed through the SPCB approved agency or they are treated in autoclaves before disposal into bio-medical waste disposal pits. The treated bio-medical waste is spread uniformly and covered with 10 cm thick soil in bio-medical waste disposal pits.

LAND USE/BIO-DIVERSITY

As a policy, NTPC lays special emphasis on land use and Bio-diversity by way of development of green belts, energy plantations, reclmation of abandoned Ash Ponds and EIA and ecological monitoring in the project areas and its surroundings.

Reclamation of Abandoned Ash ponds

The reclamation of abandoned ash pond sites is a challenging task. NTPC has reclaimed temporary ash disposal areas at some of its projects namely Ramagundam, Talcher Thermal, Rihand, Singrauli and Unchahar through plantation and converted these sites into lush green environments. Extensive plantations have also been undertaken on dry ash mound at NTPC-Dadri. It is planned to reclaim all the abandoned ash disposal areas by plantation.

Green Belts, Afforestation and Energy Plantations

Whats more, in a concerted bid to counter the growing ecological threat, NTPC is undertaking afforestation programmes covering vast areas of land in and around its projects. Appropriate afforestation programmes for plant, township and green belt areas of the project have been implemented at all projects. In order to enhance green cover in the areas around our projects, as a

responsible corporate citizen, NTPC till date has planted more than 18 million trees at its projects throughout the country. The afforestation has not only contributed to the aesthetics but also has been serving as a 'sink' for the pollutants released from the station and thereby protecting the quality of ecology and environment in and around the projects. Thrust has also been given to bio-diesel plantation and around 4.8 lakh energy plants including Pongamia and Jatropha have already been planted. A pilot project for extraction of seeds from these bio-diesel plants has also been set up.

ECOLOGICAL MONITORING AND SCIENTIFIC STUDIES

NTPC has been a leader in the industrial sector of India in undertaking scientific studies related to thermal power generation. NTPC has pioneered several scientific studies in collaboration with national/international institutions to develop an environmental databank, *e.g.* Detailed Geohydrological Studies to understand the impact of ash pond leachate on ground water and Ecological Impacts Monitoring through Remote Sensing Data have been carried out at its operating stations as discussed below.

Environment Impact Asssement Studies

Environmental Impact Assessment (EIA) Studies are inevitably undertaken to evaluate potential negative impacts as well as to formulate Environmental Management Plans to overcome the identified impacts. Based on the recommendations of Environmental Impact Assessment Study and Environmental Management Plan (EMP) and the conditions stipulated in the clearances from Ministry of Environment and Forests and State Pollution Control Boards, These studies consists of impact assessment in the area of the land use, water use, socio-economic aspects, soil, hydrology, water quality, meteorology, air quality, terrestrial and aquatic ecology and noise.

These studies are conducted before starting the construction as well as after operation of the plant and gives comprehensive status of the environment as existed before construction as well as in the post operational stages of the project. The EIA involves stage-by-stage evaluation of various parameters which affect the environment. Based on EIA study, wherever required, specific scientific studies are also conducted to scientifically assess the likely impact of the pollutants on the sensitive flora and fauna in the surroundings, as also, to take preventive and mitigatory measures, wherever required.

Apart from project specific EIA studies, Regional Environmental Assessment studies have been conducted for Integrated Development of Singrauli, Korba and Ramagundam areas. Such studies are of first of their kind in India and probably very few such studies have been undertaken in other countries.

Socio-economic Studies

Detailed socio-economic studies are undertaken to establish the socio-economic status of project affected persons and rehabilitation and resettlement

plans are drawn in consultation with the state government. Rehabilitation and resettlement options include land for land (subject to availability), limited jobs with NTPC and contractors and self employment schemes. In addition, NTPC also undertakes community development activities in the surrounding villages.

Ecological Monitoring Programme

NTPC has undertaken a comprehensive Ecological Monitoring Programme through Satellite Imagery Studies covering an area of about 25 Kms radius around some of its major plants. The studies have been conducted through National Remote Sensing Agency (NRSA), Hyderabad at its power stations at Ramagundam, Farakka, Korba, Vindhyachal, Rihand and Singrauli. These studies have revealed significant environmental gains in the vicinity areas of the project as a result of pursuing sound environment management practices. Some of these important gains which have been noticed are increase in dense forest area, increase in agriculture area, increase in average rainfall, decrease in waste land, *etc.* In general, the studies, as such, have revealed that there is no significant adverse impact on the ecology due to the project activities in any of these stations. Such studies conducted from time to time around a power project have established comprehensive environment status at various post operational stages of the project.

Geo-hydrological Studies

NTPC has conducted several geohydrological studies of the ash disposal areas at its projects (Singrauli, Rihand, Vindhyachal, Korba, Farakka and Talcher) through reputed institutions like Indian Institutes of Technology, Roorkee; Indian Institutes of Technology, Mumbai, Centre for Studies on Man and Environment, Calcutta. All these studies conclude that the leaching of heavy metals from ash occurs only under pH 4 or below. In practice, the pH of the ash water is either neutral or alkaline (7 or above) and hence the leaching of heavy metals is highly unlikely.

USE OF WASTE PRODUCTS AND SERVICES -ASH UTILIZATION

Ash is the main solid waste which is put into use for various products and services. NTPC has adopted user friendly policy guidelines on ash utilisation. In order to motivate entrepreneurs to come forward with ash utilisation schemes, NTPC offers several facilities and incentives. These include free issue of all types of ash *viz.* Dry Fly Ash/Pond Ash/Bottom Ash and infrastructure facilities, wherever feasible. Necessary help and assistance is also offered to facilitate procurement of land, supply of electricity etc from Government Authorities. Necessary techno-managerial assistance is given wherever considered necessary.

Besides, NTPC uses only ash based bricks and Fly Ash portland pozzolana cement (FAPPC) in most of its construction activities. Demonstration projects

are taken up in areas of Agriculture, Building materials, Mine filling, *etc.* The utilisation of ash and ash based products is progressively increasing as a result of the concrete efforts of these groups.

Advanced/Eco-friendly Technologies

NTPC has gained expertise in operation and management of 200 MW and 500 MW Units installed at different Stations all over the country and is looking ahead for higher capacity Unit sizes with super critical steam parameters for higher efficiencies and for associated environmental gains.

At Sipat, higher capacity Units of size of 660 MW and advanced Steam Generators employing super critical steam parameters have already been implemented as a green field project. Higher efficiency Combined Cycle Gas Power Plants are already under operation at all gas-based power projects in NTPC. Advanced clean coal technologies such as Integrated Gasification Combined Cycle (IGCC) have higher efficiencies of the order of 45 per cent as compared to about 38 per cent for conventional plants. NTPC has initiated a techno-economic study under USDOE/USAID for setting up a commercial scale demonstration power plant by using IGCC technology.

These plants can use low grade coals and have higher efficiency as compared to conventional plants. With the massive expansion of power generation, there is also growing awareness among all concerned to keep the pollution under control and preserve the health and quality of the natural environment in the vicinity of the power stations. NTPC is committed to provide affordable and sustainable power in increasingly larger quantity. NTPC is conscious of its role in the national endeavour of mitigating energy poverty, heralding economic prosperity and thereby contributing towards India s emergence as a major global economy.

INTERNATIONAL LEGAL MEASURES

Significant International Legal Measure taken for the protection of environment and regulation and control of acid rain, greenhouse effect, ozone depletion, *etc.*

Some of the decision of the courts and international tribunals recognised the State liability in relation to trans-boundary environmentally harms. *Trail Smelter Arbitration52.* Between Canada and the United States concerned action brought by the United States for the pollution caused by a Canadian smelter in British Columbia. It was held by the Arbitral Tribunal that no Action State had the right to use or permit the use of its territory such that emissions cause injury in or to the territory of another State or to properties or persons therein. The tribunal also emphasised the importance of the States jointly working together to eliminate trans-frontier environmental problems.

The trail Smelter decision substantially advanced principles of State responsibility in regards to Tran frontier pollution but uncertainty existed as to how far these principles could extend.

The *Corfu Channel Case*53confirms the principles of State responsibility for injurious act which occur within territory under State control. As a result of this decision, the potential now existed for the principle of Trial Smelter to be extended beyond and air pollution to a wide variety of injurious acts. The 1957 Lake Lanoux Arbitration between France and Spain further developed some of these principles by making reference to the obligations State owned to advise their neighbours of activities which could result in Tran boundary harm.

In the 1950s, the international community legislate on International oil pollution in the oceans, and the conservation of living resources of the High Seas and the Antarctica region. In the 1960s, State liability for nuclear damage and the oil pollution damage was recognised. By the 1970s, the regional consequences of pollution and the destruction of flora and fauna were obvious. Some very significant conventions took place during this decade such as the *1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora*. Over 113 nations had signed the 1973 Convention on International Trade in Endangered Species (CITES).CITIES does not seal to directly protect endangered species or the development practices that destroy their habitats. Rather, it seeks to reduce the economic incentive to kill endangered species and destroyed their habitat by closing off the international market.

Cites regulates by means of an international permit system. For plant and animal species threaten with extinction, international import or export is strictly forbidden. For plant and animal species suffering decline but not yet facing extinction, international import/export permits must be secured. These CITES permits enable the trade to be controlled and monitored so that it does not lead species extinction or decline. By the late 1980s, global environment threats were part of the international community's agenda as scientific evidence identified the potential consequences of *ozone depletion, climate change and loss of bio-diversity*. Local issue were recognised to have Trans boundary, and then regional, and ultimately global consequences. The 1990s saw the crucial Rio Conference. The 1985 Vienna Convention can be cited as examples of international regulations being adopted in the face of scientific uncertainty and in the absence of an international consensus on the existence of environmental harm.

STOCKHOLM CONFERENCE

THE United Nation Conference on Human Environment 1972, marked watershed in international relations and placed the issue of the protection of biosphere on the official agenda of international relations and placed the issue of the protection of biosphere on the official agenda of international policy and law. The States reveals apart the narrow issues of the sovereignty and jurisdiction to collectively resolve complex issues of environment and development.

The initial stages of the conference saw the emergence of two conflicting approaches. The first approach insisted that the primary concern of the conference was the human impact on the environment with the emphasis on control of

pollution and conservation of natural resources. The second approach laid emphasis on social and economic development as the real issue. The conference was remarkable achievement as 114 participating nations agreed generally on a declaration of principles and an action plan. The principles contained in the Stockholm Declaration demonstrate that the world has just one environment.

Principle 21 of the Declaration confers responsibility on States to ensure that activities within their jurisdiction and control do not cause damage to environment of other States. Principle 22 requires the State to co-operate to develop international standards regarding liability and compensation for the victims of pollution and other ecological damage. Principle 25 of the Stockholm Declaration states: "State shall ensure that international organisations play a coordinated, efficient and dynamic role for the protection and improvement of the environment."

The Stockholm Conference is a major landmark in the effort of nations to collectively protect their life support base on earth. UNEP, an activator of the Stockholm Action Plan, has given the international environment movement universality, legitimacy, and acceptability in the developing countries. The United Nations Environment Programme (UNEP) born out of the common concern of mankind for the environment. The primary significant of UNEP lies in the fact that it provides a forum acceptable to the developing countries that emphasise on the development as a vehicle for raising the quality of the environment. UNEP has been responsible for the establishment and implementation to the Regional Seas Programme, including some thirty regional treaties, as well as important global treaties addressing ozone depletion, trade hazardous waste and biodiversity. It also established the Global Environment Monitoring System (GEMS) under its 'Earth Watch' programme.

THE MONTREAL PROTOCOL (OZONE TREATY)

In 1985, Vienna Convention 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'. The Montréal Protocol, 1987, which cane into force from January 1, 1989, initially aimed at the elimination of ozone depleting substances at a uniform rate irrespective of the development status of a country. The pact was signed by 48 nations, mostly developed countries. India and the other developing nation like Malaysia and china refuse to sign it because of pragmatic considerations and discriminatory clauses in Protocols, namely (i) Per Capita Consumption of CFCs. (ii) Patterns of consumption of CFCs. (iii) Massive switch over costs. (iv)Transfer of technology. All were either directed against developing nations or the onus of pollution to be beard by north countries.

PROTOCOL AFTER "LONDON/OTHER AMENDMENTS"

The amendments to the pact resulted because of a firm stand taken by the developing nations including India. The amendments provided for – a

multilateral nations including India. The amendments provided fro – a multilateral fund with obligatory contributions from developed nation; equal voting rights for all the parties to the protocol;; a fund to cover all extra costs incurred by developing nations in meeting the obligations of protocol; and, to ensure transfer of technology to developing nations. India was the last major country to sign Protocol. The amendments became operational from august, 1992: developed countries will phase-out CFCs between 1995 and 2000, while developing nations will begin their elimination programme only in 2000 and end it in 2010.

As per the Montreal Protocol, the State parties should not only help prohibit trade in 'controlled-substances' (ozone depleting substances) between the parties and non-parties of Protocol.

Thus, parties to the Protocol are prohibited from improving such substances or exporting CFC production technology and equipment. This comprehensive trade ban places both economic and diplomatic pressure on al nations to join the Protocol. The Protocol was further supplemented wit the amendment in Copenhagen on 25th November 1992, wherein time table for phasing out substance was enhanced. The list of controlled substances has been further expanded with the adoption of 1995 and 1997 amendments to the Protocol.

KUALA LUMPUR CONFERENCE

A ministerial level conference of developing nations in 1992at Kuala Lumpur, Malaysia, adopted certain far-reaching declarations. For example, setting up of an international "green fund" for greening the Earth (each country to cover at least 30 per cent of its area with forest by 2000 A.D.) with a higher share from the developed nations. However, US rejected the proposal as existing GEF was sufficient, and a country receiving funds may divert money for other purposes. Global Environment Facility (GEF) it's an U.N. mechanism (with World Bank's assistance) for funding the greening of the earth and promoting sustainable development; India and the other developing nations opposed it as it has a 'donor bias' and its not democratic. India, at this conference, also mooted the idea of "Environment Tax" on developed nations to pay for the global environment clean up. Also, India outlined a 'new global partnership' based on the sound principles- equal weight age to all nations, with stronger U.N role; no condition in funding of trade on grounds of environment protection; no globalisation of national resources like genetic diversity, and, no enforcing of environmental standards at international level in place of national limits. Thus, India recognises the sovereign "right to development".

RIO CONFERENCE (EARTH SUBMMIT)

Rio de Janeiro, Brazil, was chosen as the venue for the earth summit to effectively highlight the consequences of man's recklessness and to device strategies to combat the ecological disaster. This UN Conference for Environment and Development UNCED), held in June 1992, was attended by representatives of 178 nations and 115 heads of government.

(A) Key Issues

Issues dividing the North and South were placed in the agenda for discussion at the summit. The issue were as follows:

(i) *Greenhouse gas emission*: North want a shift from the use of coal and wood for energy and to stabilise CO2 emission at 1990 levels by 2000 A.D.
South blames for excessive emission and wants them to reduce it; opposed to any cut in its own emission as it hinders development.

(ii) *Forests*: North wants a legally binding convention to restrict deforestation in tropical countries rich in bio-diversity. South asserted that such works would impinge on national sovereignty; rich must compensate for conservation and share profits for researches on species.

(iii) *Population*: North wants population control in South, and thus to check deforestation, population, *etc.*
South blames the rich for over consumption *i.e.*, 60 per cent of world's energy.

(iv) *Technology transfer*: North say that technology development is commercial and thus countries wanting to utilise it must pay. South says that" environment-friendly" technology to be transferred cheaply.

(v) *Finance ('who would pay for the clean up'?):* North say that existing UN mechanism of GEF is sufficient; want finance sharing from all countries with no mandatory contribution from North.

South favours "*polluter must pay*" principle, thus North to pay major part with firm commitments; a new institution, in place of GEF, is needs whose functioning is transparent and democratic.

(B) Outlook

(i) Rio declaration – a statement of principles which set out the rights and obligations of all nations in relation to the environment, however, not legally but morally hiding only.

(ii) Climate convention- a commitment to reduce CO2 emission, signed by 150 nations including USA, however, or does not fix any deadline for reducing or any immediate change in fuel consumption.

(iii) Declaration on principles in forestry conservation- adopted, however, it is not legally binding convention.

(iv) AGENDA 21- a blue print for ecologically safe development up to year 2000 and beyond (21 century) adopted, covering issues like transfer of environment – friendly technology. Creating environmental awareness, an integral approach to land resource use, checking deforestation, peaceful use of nuclear energy, *etc.* However, it avoided the question of who would pay for it (European countries promised to pay only a partial amount).

(v) New UN panel on environment- to assess the environmental impact of lending by WB and IMF, and implementation of Agenda 21. Also, a Sustainable Development Commission 9SDC) to be set up to monitor the implementation of Agenda 21.
(vi) Biodiversity treaty- 1550 nations, excluding USA, signed a companion treaty to protect the endangered species on earth.

(C) Attitude of USA-

USA stuck to its unreasonable stand even though it got completely isolated (its allies Japan and Britain signed the bio-diversity treaty).US watered down the climate treaty by non- inclusion of any deadlines. US were concerned that it would require major changes in economy that will lead to joblessness in the country. USA did not want to sign the bio-diversity treaty as it would harm the interest of its bio-technology companies (regarding patents); impose upon burden on its tax-payer(because of the funds for conservation),and; raise problems of 'control' on funds the developing countries will get. USA instead proposed a separate international plan for the world's forests by developing eco-technological practices, and contributing funds for it.

(D) India's Contribution-

India, a key player in negotiations, put much heart and energy even at the risk of getting unpopular with the US administration. India did not agree to the phraseo graphy in the text of some clauses of Agenda 21('terms for transfer of technology'), India had strong reservations about the dilution of original commitment in climate treaty. India proposed a "Planet Protection Fund to help but environment 'friendly technology world-wide and make them available free of cost to any country seeking them.

(E) Significance of summit-

Earth summit was intended to call attention to the environment as an urgent international issue, and to agree on how to fix it. What the summit achieved id that the problem of environment has come to be recognise as central to saving this planet and inscribed as the agenda of this day and age. However, summit failed to achieve agreement on crucial environmental issues and to extract definite commitments for financial resources from the developed countries. The summit failed to raise enough funds for GEF. Also, the question of technology transfer remained unclear. The summit, surprisingly, did not address the central question of world population. Thus, the net- outcome is hardly satisfying in any concrete measure to the developing countries.

The experience of the summit was that the developed nations were unwilling to bear the responsibility for their consumerism though they acknowledge that their model of civilization is bringing disaster for developing nations. However, the basis of this new perception is their realisation that their own future is equally threatened. In the final analysis, North will have to be more firm in its

commitments, and South must endeavour and thereby forge a consensus on the approach to save the planet. The Earth Summit Plus Five (1997), a special session of the UN General Assembly held after five year from the historic "earth summit", was suppose to ascertain that "hoe far the committed nation had gone from Rio." The representatives of various nations reviewed the progress that they had made in achieving the goal of sustainable development and to save the planet Earth from the further deterioration.

Agenda 21

Adopted at the 1992 UNCED, Agenda 21 is another important non binding instrument and action plan for sustainable development. It provides mechanisms in the form of policies, plans, programme, and guidelines for national governments to implement the principles contained in the Rio Declaration. Agenda 21 comprises 40 chapters focusing on major issues like poverty, sustainable agriculture, desertification, land degradation, hazardous wastes, atmosphere, fresh water, toxic chemicals, biological diversity, *etc.*

These various chapters are categorized under four sections:

- Social and Economic Dimensions
- Conservation and Management of Resources for Development
- Strengthening the Role of Major Groups
- Means of Implementation

Under Agenda 21, provisions were adopted for decision making on natural resources management to be decentralized to the community level, giving rural populations and indigenous peoples land titles or other land rights and expanding services such as credit and agricultural extension for rural communities. The chapter on major groups calls on governments to adopt national strategies for eliminating the obstacles to women's full participation in sustainable development by the year 2000.

ENVIRONMENT MANAGEMENT, OCCUPATIONAL HEALTH AND SAFETY SYSTEMS

NTPC has actively gone for adoption of best international practices on environment, occupational health and safety areas. The organization has pursued the Environmental Management System (EMS) ISO 14001 and the Occupational Health and Safety Assessment System OHSAS 18001 at its different establishments. As a result of pursuing these practices, all NTPC power stations have been certified for ISO 14001 and OHSAS 18001 by reputed national and international Certifying Agencies.

POLLUTION CONTROL SYSTEMS

While deciding the appropriate technology for its projects, NTPC integrates many environmental provisions into the plant design. In order to ensure that

NTPC comply with all the stipulated environment norms, various state-of-the-art pollution control systems/devices as discussed below have been installed to control air and water pollution.

Electrostatic Precipitators

The ash left behind after combustion of coal is arrested in high efficiency Electrostatic Precipitators (ESPs) and particulate emission is controlled well within the stipulated norms. The ash collected in the ESPs is disposed to Ash Ponds in slurry form.

Flue Gas Stacks

Tall Flue Gas Stacks have been provided for wide dispersion of the gaseous emissions (SOX, NOX etc) into the atmosphere.

Low-NOX Burners

In gas based NTPC power stations, NOx emissions are controlled by provision of Low-NOx Burners (dry or wet type) and in coal fired stations, by adopting best combustion practices.

Neutralisation Pits

Neutralisation pits have been provided in the Water Treatment Plant (WTP) for pH correction of the effluents before discharge into Effluent Treatment Plant (ETP) for further treatment and use.

Coal Settling Pits/Oil Settling Pits

In these Pits, coal dust and oil are removed from the effluents emanating from the Coal Handling Plant (CHP), coal yard and Fuel Oil Handling areas before discharge into ETP.

DE and DS Systems

Dust Extraction (DE) and Dust Suppression (DS) systems have been installed in all coal fired power stations in NTPC to contain and extract the fugitive dust released in the Coal Handling Plant (CHP).

Cooling Towers

Cooling Towers have been provided for cooling the hot Condenser cooling water in closed cycle Condenser Cooling Water (CCW) Systems. This helps in reduction in thermal pollution and conservation of fresh water.

ASH DYKES AND ASH DISPOSAL SYSTEMS

Ash ponds have been provided at all coal based stations except Dadri where Dry Ash Disposal System has been provided. Ash Ponds have been divided into lagoons and provided with garlanding arrangements for change over of the ash slurry feed

points for even filling of the pond and for effective settlement of the ash particles. Ash in slurry form is discharged into the lagoons where ash particles get settled from the slurry and clear effluent water is discharged from the ash pond.

The discharged effluents conform to standards specified by CPCB and the same is regularly monitored. At its Dadri Power Station, NTPC has set up a unique system for dry ash collection and disposal facility with Ash Mound formation. This has been envisaged for the first time in Asia which has resulted in progressive development of green belt besides far less requirement of land and less water requirement as compared to the wet ash disposal system.

ASH WATER RECYCLING SYSTEM

Further, in a number of NTPC stations, as a proactive measure, Ash Water Recycling System (AWRS) has been provided. In the AWRS, the effluent from ash pond is circulated back to the station for further ash sluicing to the ash pond. This helps in savings of fresh water requirements for transportation of ash from the plant.

The ash water recycling system has already been installed and is in operation at Ramagundam, Simhadri, Rihand, Talcher Kaniha, Talcher Thermal, Kahalgaon, Korba and Vindhyachal. The scheme has helped stations to save huge quantity of fresh water required as make-up water for disposal of ash.

Dry Ash Extraction System (DAES)

Dry ash has much higher utilization potential in ash based products (such as bricks, aerated autoclaved concrete blocks, concrete, Portland pozzolana cement, *etc.*). DAES has been installed at Unchahar, Dadri, Simhadri, Ramagundam, Singrauli, Kahalgaon, Farakka, Talcher Thermal, Korba, Vindhyachal, Talcher Kaniha and BTPS.

Liquid Waste Treatment Plants and Management System

The objective of industrial liquid effluent treatment plant (ETP) is to discharge lesser and cleaner effluent from the power plants to meet environmental regulations. After primary treatment at the source of their generation, the effluents are sent to the ETP for further treatment. The composite liquid effluent treatment plant has been designed to treat all liquid effluents which originate within the power station, *e.g.* Water Treatment Plant (WTP), Condensate Polishing Unit (CPU) effluent, Coal Handling Plant (CHP) effluent, floor washings, service water drains, *etc.*

The scheme involves collection of various effluents and their appropriate treatment centrally and re-circulation of the treated effluent for various plant uses. NTPC has implemented such systems in a number of its power stations such as Ramagundam, Simhadri, Kayamkulam, Singrauli, Rihand, Vindhyachal, Korba, Jhanor Gandhar, Faridabad, Farakka, Kahalgaon and Talcher Kaniha. These plants have helped to control quality and quantity of the effluents discharged from the stations.

Sewage Treatment Plants and Facilities

Sewage Treatment Plants (STPs) sewage treatment facilities have been provided at all NTPC stations to take care of Sewage Effluent from Plant and township areas. In a number of NTPC projects modern type STPs with Clarifloculators, Mechanical Agitators, sludge drying beds, Gas Collection Chambers etc have been provided to improve the effluent quality.

The effluent quality is monitored regularly and treated effluent conforming to the prescribed limit is discharged from the station. At several stations, treated effluents of STPs are being used for horticulture purpose.

ENVIRONMENTAL INSTITUTIONAL SET-UP

Realizing the importance of protection of the environment with speedy development of the power sector, the company has constituted different groups at project, regional and Corporate Centre level to carry out specific environment related functions.

The Environment Management Group, Ash Utilisation Group and Centre for Power Efficiency and Environment Protection (CENPEEP) function from the Corporate Centre and initiate measures to mitigate the impact of power project implementation on the environment and preserve ecology in the vicinity of the projects. Environment Management and Ash Utilisation Groups established at each station, look after various environmental issues of the individual station.

ENVIRONMENT MANAGEMENT DURING OPERATION PHASE

NTPC's environment friendly approach to power has already begun to show results in conservation of natural resources such as water and fuel (coal, oil and gas) as well as control of environmental pollution. As already mentioned earlier, NTPC has chalked out a set of well defined activities that are envisaged right from the project conceptualisation stage so that during the entire life cycle of the power plant, NTPC is fully compliant with various environment regulations and a pristine environment and ecological balance is maintained in and around its power station and townships. Following is brief description of some of the measures taken during the operation phase of the stations.

Performance enhancement and up-gradation measures are undertaken by the organisation during the post operational stage of the stations. These activities have greatly helped to minimise the impact on environment and preserve the ecology in and around its power projects. These measures have been enumerated as follows.

Monitoring of Environmental Parameters

A broad based Environment Monitoring Programme has been formulated and implemented in NTPC. All pollutants discharged from the power plant such as stack emission, ash pond effluent, main plant effluent, domestic effluent

and Condenser Cooling Water (CCW) effluent are monitored at the stipulated frequency at the source itself and at the points of discharge. In addition to the above, ambient air, surface water and ground water quality in and around NTPC plants are regularly monitored to assess any adverse impacts as a result of operation of the power plant.

On-Line Data Base Management

In order to have better control on pollution and to achieve effective environment management in and around NTPC stations, it is imperative to have an on-line, reliable and efficient environment information system on the plant operational and environmental performance parameters at all three levels i.e generating Stations, Regional Headquarters and Corporate Centre. In consideration of the above, a computerized programme, namely "Paryavaran Monitoring System" - PMS, which could provide reliable storage, prompt and accurate flow of information on environmental performance of Stations was developed and installed in NTPC.

This software facilitates direct transfer of environment reports and other environment related information from stations to the Regional Headquarters and Corporate Centre. The PMS has already been implemented at Corporate Centre, the Regional Headquarters and most of the Stations. This system has helped in achieving continuous improvement in NTPCs environment performance through improved monitoring and reporting system by using the trend analysis and advanced data management techniques.

ENVIRONMENT REVIEWS

To maintain constant vigil on environmental compliance, Environmental Reviews are carried out at all operating stations and remedial measures have been taken wherever necessary. As a feedback and follow-up of these Environmental Reviews, a number of retrofit and up-gradation measures have been undertaken at different stations. Such periodic Environmental Reviews and extensive monitoring of the facilities carried out at all stations have helped in compliance with the environmental norms and timely renewal of the Air and Water Consents.

Upgradation and Retrofitting of Pollution Control Systems

In order to keep pace with the changing norms and ensure compliance with statutory requirements in the field of pollution control, NTPC keeps an open mind for Renovation and Modernisation (R and M) and Retrofitting and Upgradation of pollution monitoring and control facilities in its existing stations. It is important to mention that such modifications/retrofit programmes not only helped in betterment of environment but also in resource conservation. High efficiency Electro-Static Precipitators (ESPs) of the order of 99.5 per cent and above have been provided at NTPC stations for control of stack particulate emissions. However, the ESPs of a number of stations were built prior to the

promulgation of the Environment (Protection) Act, 1986 and notification of emission control standards under this Act. Remedial measures have already been taken up and implemented to improve the efficiency of the existing ESPs at various NTPC stations. ESP performance enhancement programme by adopting advanced microprocessor based Electrostatic Precipitator Management System (EPMS) was installed at its power stations at Singrauli, Ramagundam, Korba, Farakka, Rihand, Vindhyachal and Unchahar. Additional ESPs were retrofitted in the older power stations, namely at Badarpur and Talcher Thermal.

As a result of the above retrofits, the emission of Suspended Particulate Matter (SPM) has been brought down appreciably at the above stations and is maintained within the present statutory limit of 150 mg/Nm^3. In new projects, the ESPs have been designed for a maximum permissible outlet dust emission of 50 mg/Nm^3 to meet the likely stringent emission norms in the near future.

7

Environmental Impact Assessment and Security Measures

INDUSTRIAL ACCIDENTS PRINCIPLE OF 'NO-FAULT' AND ABSOLUTE LIABILITY

Strict liability means 'No fault liability' whereas time has proven it to be 'No liability'

Introduction to Strict Liability

The concept of strict liability was introduced in the late nineteenth century. It has been evolved from the concept of negligence which generally refers to a careless activity. It involves a duty of care towards one's neighbours and breach of such duty results into damage caused to the neighbours. If there is negligence on the part of the defendant, he/she is held liable to compensate the plaintiff for the damage caused. Whereas, under strict liability, the defendant is held liable irrespective of the presence of any negligence on his part.

Strict liability was initially introduced in the case of *Rylands v. Fletcher* in 1868. The case was treated as an aspect of nuisance or a special rule of strict liability. The defendant, in order to improve his water supply, constructed a reservoir by employing reputed engineers. There was negligence on the part of contractors that they didn't seal the mine shafts which they came across while constructing the reservoir due to which water flooded into plaintiff's coal mine resulting into damage to the mines of the plaintiff.

The plaintiff sued Fletcher for damages. The engineers were independent contractors and thus were not held liable. Justice Blackburn J. held the defendant liable by introducing the concept of *strict liability* which states that "The rule of law is that the person who, for his own purpose, brings on his land and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril; and if he does not do so is *prima facie* answerable for all the damage which is the natural consequence of its escape."

It simply means that the defendant will be held liable without any negligence or '*fault*' on his part. Thus it was proved out to be a 'No fault liability'. It does not matter if the defendant has intended to cause such damage or not.

In other words, this principle held a person strictly liable if the following essentials are applicable simultaneously:

1. *Some dangerous thing must have been brought by a person on his land:* It is necessary that the thing brought on the land is dangerous. A *dangerous thing* is defined as something which poses an exceptionally high risk to the neighbouring property such as electricity, vibrations, explosives, *etc.*
2. *It must be non-natural use of land:* It is the unusual use of land which amounts to special hazards, judged by the standards appropriate at the relevant place and time such as constructing a water reservoir.
3. *The thing thus brought or kept by the person must escape:* It is essential that the thing causing damage must escape in the area outside the occupation or control of the defendant such as the escape of extremely dangerous wild dogs from an individual's property in the locality.
4. *The damaged caused should be foreseeable to the defendant:* Foreseeability of damage is essential to claim damages in cases of strict liability such as accidents in a cracker factory in very much foreseeable to the owner as well as workers of the factory.

Exceptions to Strict Liability

1. *Act of God:* Acts which are occasioned by the forced nature and cannot be controlled by the agency of men such as earthquake, lightning, severe frost, storm, *etc.* Comes under the category of the act of god.
2. *The wrongful act of the third party:* The defendant cannot be held liable if the damaged caused is due to an inevitable accident or wrongful act of a third party.
3. *Plaintiff's own fault:* The defendant cannot be held liable in case damage caused to the plaintiff is because of his own default. For example, if the plaintiff enters into defendant's garden without his permission and consumes some toxic fruits which caused damage to his health.
4. *Artificial work maintained for the common benefit of both plaintiff and defendant:* The defendant cannot be held responsible for damage caused by a source which was equally beneficial to the plaintiff or either consented by the plaintiff such as sharing the same building or a common water resource.

5. *Acts of statutory authority:* No one can be held liable for doing acts which the legislature has authorised provided it is done without any negligence on their part such as a municipal corporation.

Criticisms or Drawbacks of Strict Liability

After the principle of strict liability was established, many cases were filed under the rule applied in the case of *Rylands v. Fletcher*. But, after dealing with various cases, the house of lords felt that the laws so formed in the nineteenth century were no longer applicable in this modern era. Most of the times it occurred that all the essentials of the principle were not applicable thus they didn't found the cases to be justifiable. Some of them are discussed below:

Read v. J. Lyons & Co. (*escape of the dangerous thing):*

In this case, the defendant took control of the management of an ordinance factory where highly explosive shells for the government were made. An explosion inside the factory caused damage to the plaintiff and several others.

When plaintiff asked for damages under the principle of strict liability, since there was no negligence on the part of the authorities, *THE HOUSE OF LORDS* upheld the decision and said that although there was an unnatural use of land, no escape of dangerous thing occurred. Thus, no compensation was granted on part of the defendant.

Cambridge water co. Ltd. V. Eastern Countries Leather Plc *(Foreseeability of damage):*

The plaintiff was a company licensed to water supply while the defendant was a company engaged in manufacturing of fine leather. The defendant company used a volatile solvent known as perchloroethylene (PCE) which seeped into the ground and slowly in 9 months, got mixed with plaintiff's borehole water 1.3 miles away.

After detection of the chemical, the plaintiff's borehole was ceased to be wholesome and could not be lawfully supplied. When plaintiff claimed damages, THE HOUSE OF LORDS in negativing the claim said that this kind of percolation could not be foreseen by the defendant and thus, the defendant could not be held liable for the damages claimed.

Transco plc v. Stockport MBC *(non-natural use of land):*

The plaintiff installed a gas main along an embankment on the stretch of a disused railway line.

The defendant laid a tower block of flats which was supplied with water by means of water pipe which the defendant has constructed between the tower block and the water main. The water pipe once fractured and discharged water leading to the collapse of the embankment.

The plaintiff was compelled to do the considerable work to remedy the situation and claimed damages on the rule of Rylands v. Fletcher. The HOUSE OF LORDS in negativing the claim held that the provision of water supply to large blocks of flats did not amount to a special hazard constituting an extraordinary use of land.

EVOLUTION IN THE CONCEPT OF STRICT LIABILITY

Case: M. C. Mehta v. Union of India

The case was related to the leakage of oleum gas from one of the units of Shriram Foods and fertilizer industries which lead to several deaths and injuries in Delhi and NCR region. The petitioner M. C. Mehta filed a PIL under Article 32 of the Indian constitution against the dangerous effects of the chemicals used in the factory. Moreover, the Delhi legal aid and advise board claimed compensation for the damages so caused. The court asked the company to pay the compensation and to shut down the factory in those regions and introduced a new concept of *"Absolute Liability"*.

Concept of Absolute Liability

Where an enterprise is engaged in a hazardous or inherently dangerous activity and it results in harm to anyone on account of an accident which was caused in the operation of such hazardous or inherently dangerous activity. This will make the enterprise absolutely liable to compensate all those who are affected by the accident and such liability is not subject to any of the exceptions or any Strict liability principle as held in the case of Rylands v. Fletcher. For example, if there is an escape of toxic gas, the enterprise is strictly or absolutely liable to compensate all those who are affected by the accident with no exception to the case.

The court earlier pointed out this duty is "*Absolute and non-delegable"* and the enterprise cannot escape liability by showing that it had taken all reasonable care and there was no negligence on its part and thus is named as "*No liability"*

The basis of the new rule as indicated by the supreme court was:

- If an enterprise is allowed to carry on any hazardous activity, it is presumed that such permission is conditional on the enterprise absorbing the cost of any accident arising on account of such hazardous or inherently dangerous activity as an appropriate item of its overheads.
- The enterprise alone has the resource to discover and guard against hazards or dangers and to provide warning against potential hazards.

Reasoning given by the Court in its Judgement

The judgement made on 20/12/1986 by the supreme court in the bench of three judges including CJ P. N. Bhagwati, D. P. Madon and G .L. OZA gave the following justification:

The law so laid by the English govt. in case of Rylands v. Fletcher was justifiable according to the demands of law at that time. But it is not necessary or binding to the Indian government to strictly follow the rule so laid in the late 19th century because in the modern industrial society with highly developed scientific knowledge and technology, where it is necessary to run hazardous or inherently dangerous industries as a part of the development programme.

This rule was laid in the 19th century when this type of development in science and technology has not taken place as compared to today's economy and social structure. Law needs to be kept changing according to the needs of the society and evolving social structure. Law cannot afford to remain static.

We need to evolve new principles and laid down new and amended rules which could adequately deal with the problems of a new and industrialised economy. We cannot allow judicial thinking to be restricted to the laws laid down in England or any other country.

We can take light from these sources but we need to make our own jurisprudence. We have to evolve according to the needs and circumstances of our own country. We have to develop new laws and develop new principles to deal with the unusual situation so aroused and likely to arise in future.

ENVIRONMENTAL IMPACT AND SECURITY

A recent study about the rising electronic pollution in the USA revealed that the average computer screen has five to eight pounds or more of Lead representing 40 percent of all the lead in US landfills. All these toxins are persistent, bioaccumulative toxins (PBTs) that create environmental and health risks when computers are incinerated, put in landfills or melted down. The emission of fumes, gases, and particulate matter into the air, the discharge of liquid waste into water and drainage systems, and the disposal of hazardous wastes contribute to environmental degradation. The processes of dismantling and disposing of electronic waste in developing countries led to a number of environmental impacts as illustrated in the graphic. Liquid and atmospheric releases end up in bodies of water, groundwater, soil, and air and therefore in land and sea animals – both domesticated and wild, in crops eaten by both animals and human, and in drinking water.

One study of environmental effects in Guiyu, China found the following:

- Airborne dioxins – one type found at 100 times levels previously measured
- Levels of carcinogens in duck ponds and rice paddies exceeded international standards for agricultural areas and cadmium, copper, nickel, and lead levels in rice paddies were above international standards
- Heavy metals found in road dust – lead over 300 times that of a control village's road dust and copper over 100 times

The Agbogbloshie area of Ghana, where about 40,000 people live, provides an example of how e-waste contamination can pervade the daily lives of nearly all residents. Into this area—one of the largest informal e-waste dumping and processing sites in Africa—about 215,000 tons of secondhand consumer electronics, primarily from Western Europe, are imported annually. Because this region has considerable overlap among industrial, commercial, and residential zones, Pure Earth (formerly Blacksmith Institute) has ranked Agbogbloshie as one of the world's 10 worst toxic threats (Blacksmith Institute 2013).

A separate study at the Agbogbloshie e-waste dump, Ghana found a presence of lead levels as high as 18,125 ppm in the soil. US EPA standard for lead in soil in play areas is 400 ppm and 1200 ppm for non-play areas. Scrap workers at the Agbogbloshie e-waste dump regularly burn electronic components and auto harness wires for copper recovery, releasing toxic chemicals like lead, dioxins and furans into the environment.

Researchers such as Brett Robinson, a professor of soil and physical sciences at Lincoln University in New Zealand, warn that wind patterns in Southeast China disperse toxic particles released by open-air burning across the Pearl River Delta Region, home to 45 million people. In this way, toxic chemicals from e-waste enter the "soil-crop-food pathway," one of the most significant routes for heavy metals' exposure to humans. These chemicals are not biodegradable— they persist in the environment for long periods of time, increasing exposure risk.

In the agricultural district of Chachoengsao, in the east of Bangkok, local villagers had lost their main water source as a result of e-waste dumping. The cassava fields were transformed in late 2017, when a nearby Chinese-run factory started bringing in foreign e-waste items such as crushed computers, circuit boards and cables for recycling to mine the electronics for valuable metal components like copper, silver and gold. But the items also contain lead, cadmium and mercury, which are highly toxic if mishandled during processing. Apart from feeling faint from noxious fumes emitted during processing, a local claimed the factory has also contaminated her water. "When it was raining, the water went through the pile of waste and passed our house and went into the soil and water system. Water tests conducted in the province by environmental group Earth and the local government both found toxic levels of iron, manganese, lead, nickel and in some cases arsenic and cadmium. "The communities observed when they used water from the shallow well, there was some development of skin disease or there are foul smells," founder of Earth, Penchom Saetang said. "This is proof, that it is true, as the communities suspected, there are problems happening to their water sources."

Depending on the age and type of the discarded item, the chemical composition of E-waste may vary. Most E-waste are composed of a mixture of metals like Cu, Al and Fe. They might be attached to, covered with or even mixed with various types of plastics and ceramics. E-waste has a horrible effect on the environment and it is important to dispose it with an R2 certifies recycling facility.

Some major impacts of E-waste on environment are:

- Toxic materials like lead, zinc, nickel, flame retardants, barium and chromium, found in computers and most electronics, if released into the environment, can cause damage to human blood, kidneys as well as central and peripheral nervous system.
- The damage caused by warming up of E-waste releasing toxic chemicals into the air and damaging the atmosphere is one of the biggest

environmental impacts from E-waste. This will result in number of airborne diseases and increase the toxicity of air, making it unfit for breathing and living.

- The electronic waste, which often gets thrown out into landfills, release toxins, which seep into ground water. This affects both land and sea animals. Especially in developing countries, where most of the electronic waste is dumped in landfills, also affects the health of the people. This contamination of soil will also result in loss of vegetation and affecting the ecosystem.
- The electronic waste which is created via cell phones, especially in countries like United States, where most Americans' get new cell phones every 12 to 18 months. And only 10 percent of these cell phones are recycled. This creates more and more E-waste with lack of responsible recycling, the environmental issues of E-waste are continually increasing. Mobile phones are "considered hazardous waste" in California; many chemicals in such phones leach from landfills into the groundwater system.
- In places like Guiyu, China, which receives shipments of toxic E-wastes from all over the world, the largest E-waste disposal site, many people living around here often exhibit substantial digestives, neurological, respiratory and bone problems.

INFORMATION SECURITY

Proper recycling and disposal of electronics is not only important for the environment but it also has a big impact on data security as well. It's quite easy for anyone to extract personal data from electronic devices. Dragging your important documents to the Recycling Bin won't be enough to keep your data secure. That's because digital information often leaves a trail of breadcrumbs that can be recovered effortlessly using the right hardware.

Prior to disposing of IT Equipment improperly, always consider all aspects, including data security and liability in addition to the environment. E-waste presents a potential security threat to individuals and exporting countries. Hard drives that are not properly erased before the computer is disposed of can be reopened, exposing sensitive information. Credit card numbers, private financial data, account information, and records of online transactions can be accessed by most willing individuals. Organized criminals in Ghana commonly search the drives for information to use in local scams. Unwanted electronic devices go through several hands during the recycling process. They are dismantled piece by piece by authorized professionals at different facilities. That means there are plenty of opportunities for information to be stolen. But there is a way to avoid this from happening.When e-waste is disposed of improperly and without the use of a company that specializes in proper data destruction, there is a severe risk of identity theft, data breaches and massive liability for the companies involved. Electronic files about government contracts have been

discovered on hard drives found in Agbogbloshie. Multimillion-dollar agreements from United States security institutions such as the Defense Intelligence Agency (DIA), the Transportation Security Administration, and Homeland Security have all resurfaced in Agbogbloshie.

There are few ways to properly erase data off harddrives which can be used by both individuals and companies, these steps are:

1. *Full Disk Overwriting:* While there are many softwares that provides overwriting techniques, only those offering full disk overwriting can perform desirable data deletion of significance effect. Disk overwriting programmes that cannot access the entire hard drive, including hidden/ locked areas like the host protected area (HPA), device configuration overlay (DCO), and remapped sectors, perform an incomplete erasure, leaving some of the data intact. By accessing the entire hard drive, data erasure eliminates the risk of data remanence. The Gutmann algorithm is a method of disk wiping that overwrites data using a total of 35 passes. This makes it one of the most secure data erasure methods, but also the most time-consuming.
2. *Data Deletion using standard Operating approach:* Most companies implementing an information security policy tend to have a written and approved means of data management, which includes data deletion and retention and also, a part that speaks to change management which spells out the steps to be taken incase a change is being carried out in an environment, this with respect to electronic waste, has to be approved for change after all the required process (data management) has been performed. In the case of the data found in Agbogbloshie, it is evident that such change management procedures were not performed on the waste before disposal. Some of the standards are; Transported asset protection association (TAPA) – North America – Freight security requirements standard. Information Security Management System (ISO 27001) – Global – Relates to the recycling of waste electrical and electronic equipment, asset management involving secure data eradication and the repair and reuse of electrical and electronic equipment. Assured Service (Sanitisation) scheme (CAS-S) – United Kingdom – Scheme offered by NCSC for companies wishing to provide sanitization services to owners of highly classified Government data.

Recycling

Recycling is an essential element of e-waste management. Properly carried out, it should greatly reduce the leakage of toxic materials into the environment and mitigate against the exhaustion of natural resources. However, it does need to be encouraged by local authorities and through community education. Less than 20% of e-waste is formally recycled, with 80% either ending up in landfill or being informally recycled – much of it by hand in developing countries, exposing workers to hazardous and carcinogenic substances such as mercury, lead and cadmium.

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as gold, silver, platinum, *etc.*, and such base metals as copper, iron, aluminum, *etc.* One way e-waste is processed is by melting circuit boards, burning cable sheathing to recover copper wire and open- pit acid leaching for separating metals of value. Conventional method employed is mechanical shredding and separation but the recycling efficiency is low. Alternative methods such as cryogenic decomposition have been studied for printed circuit board recycling, and some other methods are still under investigation. Properly disposing of or reusing electronics can help prevent health problems, reduce greenhouse-gas emissions, and create jobs. Reuse and refurbishing offer a more environmentally friendly and socially conscious alternative to downcycling processes.

Consumer Awareness Efforts

The U.S., Environmental Protection Agency encourages electronic recyclers to become certified by demonstrating to an accredited, independent third party auditor that they meet specific standards to safely recycle and manage electronics. This should work so as to ensure the highest environmental standards are being maintained. Two certifications for electronic recyclers currently exist and are endorsed by the EPA. Customers are encouraged to choose certified electronics recyclers. Responsible electronics recycling reduces environmental and human health impacts, increases the use of reusable and refurbished equipment and reduces energy use while conserving limited resources. The two EPA-endorsed certification programmes are Responsible Recyclers Practices (R2) and E-Stewards. Certified companies ensure they are meeting strict environmental standards which maximize reuse and recycling, minimize exposure to human health or the environment, ensure safe management of materials and require destruction of all data used on electronics. Certified electronics recyclers have demonstrated through audits and other means that they continually meet specific high environmental standards and safely manage used electronics. Once certified, the recycler is held to the particular standard by continual oversight by the independent accredited certifying body. A certification board accredits and oversees certifying bodies to ensure that they meet specific responsibilities and are competent to audit and provide certification.

Some U.S., retailers offer opportunities for consumer recycling of discarded electronic devices. In the US, the Consumer Electronics Association (CEA) urges consumers to dispose properly of end-of-life electronics through its recycling locator at www.GreenerGadgets.org. This list only includes manufacturer and retailer programmes that use the strictest standards and third-party certified recycling locations, to provide consumers assurance that their products will be recycled safely and responsibly. CEA research has found that 58 percent of consumers know where to take their end-of-life electronics, and the electronics industry would very much like to see that level of awareness increase. Consumer electronics manufacturers and retailers sponsor or operate

more than 5,000 recycling locations nationwide and have vowed to recycle one billion pounds annually by 2016, a sharp increase from 300 million pounds industry recycled in 2010.

The Sustainable Materials Management (SMM) Electronic Challenge was created by the United States Environmental Protection Agency (EPA) in 2012. Participants of the Challenge are manufacturers of electronics and electronic retailers. These companies collect end-of-life (EOL) electronics at various locations and send them to a certified, third-party recycler. Programme participants are then able publicly promote and report 100% responsible recycling for their companies.

The Electronics TakeBack Coalition (ETBC) is a campaign aimed at protecting human health and limiting environmental effects where electronics are being produced, used, and discarded. The ETBC aims to place responsibility for disposal of technology products on electronic manufacturers and brand owners, primarily through community promotions and legal enforcement initiatives. It provides recommendations for consumer recycling and a list of recyclers judged environmentally responsible. While there have been major benefits from the rise in recycling and waste collection created by producers and consumers, such as valuable materials being recovered and kept away from landfill and incineration, there are still many problems present with the EPR system including "how to ensure proper enforcement of recycling standards, what to do about waste with positive net value, and the role of competition," (Kunz et al.). Many stakeholders agreed there needs to be a higher standard of accountability and efficiency to improve the systems of recycling everywhere, as well as the growing amount of waste being an opportunity more so than downfall since it gives us more chances to create an efficient system. To make recycling competition more cost-effective, the producers agreed that there needs to be a higher drive for competition because it allows them to have a wider range of producer responsibility organizations to choose from for e-waste recycling.

The Certified Electronics Recycler programme for electronic recyclers is a comprehensive, integrated management system standard that incorporates key operational and continual improvement elements for quality, environmental and health and safety performance. The grassroots Silicon Valley Toxics Coalition promotes human health and addresses environmental justice problems resulting from toxins in technologies. The World Reuse, Repair, and Recycling Association (wr3a.org) is an organization dedicated to improving the quality of exported electronics, encouraging better recycling standards in importing countries, and improving practices through "Fair Trade" principles. Take Back My TV is a project of The Electronics TakeBack Coalition and grades television manufacturers to find out which are responsible, in the coalition's view, and which are not.

There have also been efforts to raise awareness of the potentially hazardous conditions of the dismantling of e-waste in American prisons. The Silicon Valley

Toxics Coalition, prisoner-rights activists, and environmental groups released a Toxic Sweatshops report that details how prison labour is being used to handle e-waste, resulting in health consequences among the workers. These groups allege that, since prisons do not have adequate safety standards, inmates are dismantling the products under unhealthy and unsafe conditions.

Processing Techniques

In many developed countries, electronic waste processing usually first involves dismantling the equipment into various parts (metal frames, power supplies, circuit boards, plastics), often by hand, but increasingly by automated shredding equipment. A typical example is the NADIN electronic waste processing plant in Novi Iskar, Bulgaria—the largest facility of its kind in Eastern Europe. The advantages of this process are the human worker's ability to recognize and save working and repairable parts, including chips, transistors, RAM, *etc.* The disadvantage is that the labour is cheapest in countries with the lowest health and safety standards.

In an alternative bulk system, a hopper conveys material for shredding into an unsophisticated mechanical separator, with screening and granulating machines to separate constituent metal and plastic fractions, which are sold to smelters or plastics recyclers. Such recycling machinery is enclosed and employs a dust collection system. Some of the emissions are caught by scrubbers and screens. Magnets, eddy currents, and Trommel screens are employed to separate glass, plastic, and ferrous and nonferrous metals, which can then be further separated at a smelter.

Leaded glass from CRTs is reused in car batteries, ammunition, and lead wheel weights, or sold to foundries as a fluxing agent in processing raw lead ore. Copper, gold, palladium, silver and tin are valuable metals sold to smelters for recycling. Hazardous smoke and gases are captured, contained and treated to mitigate environmental threat. These methods allow for safe reclamation of all valuable computer construction materials. Hewlett-Packard product recycling solutions manager Renee St. Denis describes its process as: "We move them through giant shredders about 30 feet tall and it shreds everything into pieces about the size of a quarter. Once your disk drive is shredded into pieces about this big, it's hard to get the data off". An ideal electronic waste recycling plant combines dismantling for component recovery with increased cost-effective processing of bulk electronic waste. Reuse is an alternative option to recycling because it extends the lifespan of a device. Devices still need eventual recycling, but by allowing others to purchase used electronics, recycling can be postponed and value gained from device use.

Benefits of recycling

Recycling raw materials from end-of-life electronics is the most effective solution to the growing e-waste problem. Most electronic devices contain a variety of materials, including metals that can be recovered for future uses. By

dismantling and providing reuse possibilities, intact natural resources are conserved and air and water pollution caused by hazardous disposal is avoided. Additionally, recycling reduces the amount of greenhouse gas emissions caused by the manufacturing of new products. Another benefit of recycling e-waste is that many of the materials can be recycled and re-used again. Materials that can be recycled include "ferrous (iron-based) and non-ferrous metals, glass, and various types of plastic." "Non-ferrous metals, mainly aluminum and copper can all be re-smelted and re-manufactured. Ferrous metals such as steel and iron also can be re-used." Due to the recent surge in popularity in 3D printing, certain 3D printers have been designed (FDM variety) to produce waste that can be easily recycled which decreases the amount of harmful pollutants in the atmosphere. The excess plastic from these printers that comes out as a byproduct can also be reused to create new 3D printed creations.

Benefits of recycling are extended when responsible recycling methods are used. In the U.S., responsible recycling aims to minimize the dangers to human health and the environment that disposed and dismantled electronics can create. Responsible recycling ensures best management practices of the electronics being recycled, worker health and safety, and consideration for the environment locally and abroad. In Europe, metals that are recycled are returned to companies of origin at a reduced cost. Through a committed recycling system, manufacturers in Japan have been pushed to make their products more sustainable. Since many companies were responsible for the recycling of their own products, this imposed responsibility on manufacturers requiring many to redesign their infrastructure. As a result, manufacturers in Japan have the added option to sell the recycled metals.

Improper management of e-waste is resulting in a significant loss of scarce and valuable raw materials, such as gold, platinum, cobalt and rare earth elements. As much as 7% of the world's gold may currently be contained in e-waste, with 100 times more gold in a tonne of e-waste than in a tonne of gold ore.

e-Waste Disposal Methods

There are several practices or methods of e-waste disposal; however, this paper seeks to explain the following methods: landfilling, Acid bath, and Incineration, which are standard practice.

Landfilling

This is the most popular technique of e-waste disposal. Soil is unearthed, and pits are dogged for burying the a-waste in it. An impervious liner is created of clay or plastic with a leachate basin for assemblage and moving the ex-waste to the treatment plant. However, the landfill is not an environmentally correct process for disposing of the e-waste as toxic substances like cadmium, lead, and mercury are discharged inside the soil and groundwater, which in turn contaminate the water and soil./

Incineration

This is an organized procedure of predisposing off the e-waste, and it involves the combustion of electronic waste at high temperatures in uniquely devised incinerators. This e-waste disposal approach is somewhat advantageous as the waste quantity is decreased remarkably much, and the energy recovered is likewise exploited separately. Nevertheless, it also not without disadvantages as harmful gases, cadmium, and mercury are emitted into the environment.

Acid Bath

Acid bath as a technique for e-waste disposal includes dousing of the electronic circuits in the incredible sulphuric, hydrochloric or nitric corrosive solutions that disengage the metals from the electronic pathways. The recouped metal is used in the assembling of different items, while the dangerous corrosive waste discovers its routes in the nearby water sources.

E-waste Recycling Techniques

Printed circuit sheets (PCBs) is one of the most noteworthy sections of electronic hardware. These PCBs envelop most of the essential metals and, again, the vast majority of the hurtful/harmful parts in the e-waste.

PCB waste recycling includes three significant procedures which are: pre-treatment, physical reusing, and synthetic reusing. The pre-treatment level includes dismantling of the recyclable or reusable and poisonous parts utilizing destroying or isolation and joined by the physical reusing process.

From that point, the material is re-shrouded by a synthetic reusing process that incorporates gasification and pyrolysis.

There are different conventional and some contemporary practices to recover the significant metallic and non-metallic divisions from printed circuit boards (PCBs). The following section will subsist of different physical and compound recycling forms for the reusing of metallic and non-metallic divisions from waste PCBs.

Pyrolysis Method

Pyrolysis is a substance recycling framework generally used for recycling engineered polymers, including polymers that are related to glass filaments. Pyrolysis of such polymers gives gases, oils, and burns. These items can additionally be abused as synthetic feedstock or fuels. The printed circuit boards are heated to a condition, sufficiently able to dissolve or melt the solders applied to interface the electrical components to the circuit board.

Hydrometallurgical Method

This technique for reusing is significantly utilized for the productive recycling of the metallic part. In this methodology, metal structures are broken up into draining arrangements, for example, acids and soluble bases. This is joined by

the electrorefining of required metals. This strategy is accepted to be progressively adaptable and control sparing, which in the end, prompts cost-productive.

Generally utilized leachate is water Regia, nitric corrosive, sulfuric corrosive, and cyanide arrangements. In this way, a pure metal recuperated is sold with no further preparing while the staying non-metallic substrates still require to be dealt with thermally prior to recycling or discarding in landfills. The considerable disservice of this procedure is the damaging and harmful nature of the fluid being utilized.

Mechanical Method

Mechanical recycling is a physical recycling technique which could be said to be more effective and efficient in the recycling of electronic waste. In this approach, the disassembled samples are first to cut into different sizes depending upon the milling needs. Then the fragments are put through a milling process converting into finely pulverized PCB powder. This powder is subjected to eddy current separators that sever the metal by their various but unique current components. These powder samples are then exposed to the density separation process. Depending upon the thickness and molecule diameter, stratification can be observed in the liquid column.

Benefits of e-Waste Recycling

Recycling of e-waste empowers us to recoup different significant metals and different materials from gadgets, sparing common assets (vitality), diminishing contamination, conserving landfill space, and creating employment. According to the United Environmental Protect Agency (EPA), recycling one million PCs can spare what might be compared to the energy that can run 3,657 U.S., family units for a year. Recycling one million mobile phones can likewise recoup 75 pounds of gold, 772 pounds of silver, 35,274 pounds of copper, and 33 pounds of palladium.

On the other hand, e-waste reusing assists with cutting down on the volume of waste generation. As indicated by the Electronics TakeBack Coalition, it takes 1.5 tons of water, 530 lbs of petroleum product, and 40 pounds of synthetic compounds to make a single PC and screen. 81% of the energy-related to a PC is utilized during production and not when it has been used.

The printed circuit boards (PCBs) are not scraps; they are urban mines. With this Automatic PCB Recycling Line, you can decrease natural/environmental contamination, yet besides, make attractive benefits.

REPAIR AS A MEANS OF REDUCING ELECTRONIC WASTE

There are several ways to curb the environmental hazards arising from the recycling of electronic waste and save our planet. One of the factors which exacerbate the e-waste problem is the diminishing lifetime of many electrical and electronic goods. There are two drivers (in particular) for this trend. On the

one hand, consumer demand for low cost products mitigates against product quality and results in short product lifetimes. On the other, manufacturers in some sectors encourage a regular upgrade cycle, and may even enforce it though restricted availability of spare parts, service manuals and software updates, or through planned obsolescence.

Consumer dissatisfaction with this state of affairs has led to a growing repair movement. Often, this is at a community level such as through repair cafës or the "restart parties" promoted by the Restart Project.

The "Right to Repair" is spearheaded in the US by farmers dissatisfied with non-availability of service information, specialised tools and spare parts for their high-tech farm machinery. But the movement extends far beyond farm machinery with, for example, the restricted repair options offered by Apple coming in for criticism. Manufacturers often counter with safety concerns resulting from unauthorised repairs and modifications.

Also,one of the best and easiest methods of reducing the electronic waste footprint is to sell or donate your electronic gadgets to those in need rather than thrash them.

Improperly disposed e-waste is becoming more and more hazardous, especially as the sheer volume of our e-waste increases.For this reason, large brands like Apple, Samsung, and other companies have started giving options to its customers to recycle old electronics.Recycling old electronics allows the expensive electronic parts inside to be reused. This can save a lot of energy and reduce the need for mining of new raw resources, or manufacturing new parts.You can find electronic recycling programmes in your local area by doing a Google search for "recycle electronics" and your city or area name.

In recent times,Cloud services have proven to be much better in storing data which can be accessible from anywhere in the world without the need to carry a storage device at all times. Cloud storage also gives you a large amount of storage, for free or very cheap.This not only offers convenience, it also reduces the need for manufacturing new storage devices which in turn curbs the amount of e-waste generated.

One other important measure to curb the generation of electronic waste is to rent rather than out rightly buy a specific piece of electronic equipment which is not used everything.For example, if you sparingly use industrial weighing scales for measuring, rent the scales instead of buying them.

ENVIRONMENTAL LAW AND POLICY

"Environmental Law and Policy" is an indispensable resource that offers a comprehensive examination of the legal framework and policy tools designed to address environmental challenges at local, national, and global levels. This authoritative text explores the intersection of law, policy, and environmental science, providing readers with a nuanced understanding of the complex issues surrounding environmental protection and sustainability. The book begins by examining the foundational principles of environmental law, including the precautionary principle, the polluter pays principle, and the principle of sustainable development. It then delves into the various sources of environmental law, including international treaties, national legislation, and judicial decisions, highlighting the role of regulatory agencies and enforcement mechanisms in ensuring compliance. Through case studies and real-world examples, "Environmental Law and Policy" explores key environmental issues such as air and water pollution, climate change, biodiversity loss, and resource depletion. It analyzes the effectiveness of different policy instruments, such as command and control regulations, market-based mechanisms, and voluntary agreements, in addressing these challenges. With its interdisciplinary approach, the book examines the role of stakeholders such as government agencies, industry groups, environmental NGOs, and indigenous communities in shaping environmental policy and governance. It also discusses emerging trends and debates in environmental law and policy, including the intersectionality of environmental justice, human rights, and sustainable development goals. Whether used as a textbook in environmental studies courses or as a reference guide for policymakers and practitioners, "Environmental Law and Policy" provides invaluable insights into the legal and policy frameworks that underpin efforts to protect and preserve the environment for future generations.

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