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PROMOTING SUSTAINABLE CONSTRUCTION INDUSTRY ACTIVITIES *

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I. INTRODUCTION

1. Construction has a dual-faceted role in achieving sustainable-development goals. First, construction provides the direct means for the development, expansion, improvement and preservation, through maintenance, of human settlements. Owing to its strong links with other sectors of the economy, construction activity generates increases in production, employment, income and savings, and, thus, promotes development and economic growth. Sustained output of the construction industry is, therefore, vital to the achievement of national socio-economic development goals, including human settlements development goals, but it depends, amongst other things, on the continued availability of physical resources. The fact that non-renewable resources are in limited supply and that even renewable resources can only be replenished by nature over time imposes limits on the pace of construction that can be sustained in the long term. Secondly, construction can contribute to the degradation of the environment, through physical disruption and chemical pollution caused by construction activities. The rapid increase in the volume and complexity of construction, since the early 1950s, and the resource-demanding nature of modern technology have imposed severe stress on the biosphere, through depletion of the natural-resource base, degradation of fragile eco-zones and increases in chemical pollution, underscoring the urgent need for improving construction practices through appropriate policy initiatives and related measures. Agenda 21, recently adopted by the United Nations Conference on Environment and Development (UNCED) has brought to the fore the direct relationship between sustainable human settlements development and sustainable construction industry activities by including "Promoting sustainable construction industry activities" as a distinct programme area (See Annex I) in its recommendations on "Promoting Sustainable Human Settlements Development (Section G of Chapter 7).
2. The present issue paper addresses the concerns for sustainability of construction activities expressed by all countries in Agenda 21, and attempts to provide a practical framework for coordinated action by the industry, governments and the international community. The paper begins by highlighting the major areas of environmental stress caused by construction activities, such as deterioration of the physical environment, the impact of construction on non-renewable resources, and air pollution. The paper then proceeds to elaborate some strategic options to be considered by actors involved in the construction industry, stressing the important role that governments have to play in facilitating the sustainability of the sector. Finally, the paper draws the attention of the Consultation to the key areas requiring intervention for sustainable construction industry activities.

II. THE CONSTRUCTION INDUSTRY AND ENVIRONMENTAL STRESS

II.1. The construction industry and deterioration of the physical environment

3. A fundamental requirement of sustainable development is that the harmful side-effects of the development process, particularly of construction activities, must not exceed or overload the assimilative capacity of the biosphere, so that the process of development can be sustained. The spontaneous and, often, uncontrolled pace of human settlements development in many developing countries, and even in some industrialized countries, makes it particularly difficult to control the attendant degradation of living conditions. For example, the increasing spread of human settlements into fragile eco-zones is rapidly destabilizing natural eco-systems in many developing countries. Occurrences of floods, landslides, mudslides, etc., caused by construction on delicate hillslopes, wetlands etc., testify to the vulnerability of the environment to intervention by human activities. Appropriate land-use policies and planning, specially aimed at eco-sensitive zones, would be required to reverse this trend.¹
4. The highly dispersed character of construction activities in most developing countries makes it difficult to monitor the physical disruption caused by construction. There is a growing concern, in many countries, about increasing land dereliction, caused by quarrying of sand and gravel, extraction of brick clay etc., which ultimately reduces the available land for human settlements development. The degradation of the marine environment, caused by coral mining for production of building lime, and the disruption of wildlife habitats and watertables, by excavations, etc., are now attracting increasing attention of physical planners and coast-conservation authorities.²
5. Construction activities similarly contribute to the loss of forests and wildlands by their conversion to other uses; it contributes to the loss of forests, both closed forests and open woodland, by their unsustainable exploitation for building timber, bamboo and other raw materials for construction and by the use of timber to provide energy for building-materials production.

¹ United Nations Centre for Human Settlements (Habitat), *People, Settlements, Environment and Development*, pp. 56.

² Ibid.

II.2. Construction and the use of non-renewable resources

6. Construction activities are a major user of the world's non-renewable resources. Apart from its share of fossil fuel use, the construction industry is a heavy user of tropical hardwood and several metals which have limited remaining exploitable reserves, notably lead, copper and zinc.
7. The construction industry is the principal user of sawnwood and wood-based panels. By the year 2000, the consumption of these two products is likely to reach 538 and 156 million cu.m. respectively, with average growth rates of 1.0 per cent and 2.3 per cent respectively.³ European community is the single largest importer of tropical hardwood followed by Japan and the USA.⁴ According to one estimate, less than 1 per cent of the world's tropical forests which are suitable for timber production are being managed effectively to provide sustainable, long-term production.⁵ The consequences of poor management are already apparent - once common species such as Cuban and African Mahagonies are commercially extinct and many other tropical timbers currently in widespread use face extinction. Countries which were formerly exporters of timber, such as Thailand, Nigeria and Côte d'Ivoire have become depleted to such an extent that they have become net impetus. The World Bank estimates that by the end of the century, the 33 developing countries that are now net exporters of forest products will be reduced to fewer than ten, and the total developing country exports of industrial wood products are predicted to drop from their current level of \$7 bn to less than \$2 bn.
8. The construction industry is responsible for the consumption of commercial energy in two principal ways: through the consumption of energy in the production of buildings and other constructed facilities, and through the consumption of energy in the subsequent use of these buildings and facilities. The energy in the production of buildings is used directly by the construction industry, whereas that consumed in buildings in use is controlled to a large extent by the eventual user. The design of buildings can also have a major impact on the intensity of

³ World Bank Technical Paper Number 83, *The Forest Industries Sector, An Operational Strategy for Developing Countries*, Andrew J. Ewing and Raymond Chalk, The World Bank, Washington D.C. 1988, pp. 7.

⁴ The Economist Intelligence Unit, *Construction Materials and the Environment, Preparing for stricter Building Products Standards*, R. Lorch, June 1990, pp. 20.

⁵ Ibid. pp. 20.

subsequent energy use.

9. Energy is used in buildings for cooking, space-heating and cooling and lighting and also for productive activities. Studies show that in areas where there is a substantial annual heating requirement, coal-burning stoves are often used in urban housing: insulation standards in such housing are frequently very poor by comparison with those of industrialised countries, and the combustion products add considerably to urban air pollution. In areas where the primary need is for cooling, there is an increasing demand for air-conditioning in workplaces and the upper-income urban households. Air-conditioning is inherently energy-intensive in relation to the cooling achieved: the poor insulation and sealing of many air-conditioned spaces adds to the energy demand.

II.3. Construction and air pollution

10. Construction activities contribute to air pollution at all levels. It creates air pollution at a local scale through emissions of dust, fibre, particles and toxic gases from site activities and building materials production processes. It contributes to regional pollution through emissions of nitrogen and sulphur oxides in building materials production. And it contributes to pollution on a global scale in two important ways: (a) by the use and release of chlorofluorocarbons (CFCs) in buildings contributing to the depletion of the atmospheric ozone layer, and (b) by the emission of carbon dioxide and other 'greenhouse gases'.
11. An estimated 8 to 20 per cent of these emissions in different countries are due to construction and building-materials production activities, and a further 2.5 per cent globally results from the chemical reactions taking place in cement and lime production. World carbon dioxide emissions from fossil fuel consumption and cement manufacture increased nearly four-fold from 6,000 tonnes per year in 1950 to 22,000 tonnes in 1989.⁶ A further enormous contribution to global emissions results from the energy consumption of buildings in use, up to as high as 50 per cent in northern industrialised countries.⁷
12. Organic compounds such as methane make a considerable contribution to the greenhouse effect. A particular concern is in relation to CFCs used both in insulation materials, in fire-extinguishing systems and in air-conditioners.

⁶ Spence, R., *Sustainable Development and the Construction Industry*. Unpublished draft report prepared for the United Nations Centre for Human Settlements (Habitat), 1993.

⁷ Ibid

Although the volumes of CFC emission are low, they have a disproportionately high impact on climate.

III. MEANS TO REDUCE ENVIRONMENTAL STRESS CAUSED BY CONSTRUCTION

13. It is clear that if current trends continue, construction activities will intensify all these areas of environmental stress, some of which are reaching critical proportions. But it does not need to be assumed that future construction will inevitably continue present patterns. There are many ways in which the construction industry could adapt its practices in ways that could substantially reduce the resulting environmental impacts. These include:
- more careful land-use planning, both in the siting of new developments and extraction of raw materials, to avoid land-use conflicts;
 - movement towards sustainable management of timber and other forest resources;
 - movement towards increased use of mineral, agricultural and construction wastes in building materials;
 - improvements in the total life-cycle energy efficiency of buildings;
 - increased control of the pollution consequences of construction activity, particularly atmospheric pollution, but also water pollution;
 - finding substitutes for non-renewable sources of energy and materials with limited available reserves; and
 - building for longer-life and eventual recycling.
14. These are major changes and none of them can occur speedily. The construction industry, because of its fragmented nature, is particularly slow to change. All of them will involve changes in technology, investment programmes and procedures within the industry, involving actions by design teams, by builders and contractors and by producers of building materials; but many of these changes are unlikely to come about without stimulus from outside the industry; thus governments and international agencies have an essential part to play. The following sections outline possible lines of action for different actors both within and outside industry.

III.1. Action by designers

15. Designers have the responsibility for defining the scope, dimensions and the location of what is built, as well as for specifying the materials and equipment which are to be

used, and the technical performance standards required for subsequent use of a building or any civil engineering project. Frequently, they also define the actual sources of the raw or manufactured materials to be used. Their role in defining the material inputs in construction which ultimately determines the future energy-in-use requirements is, therefore, crucial.

16. Designers can assist in improving loss of forests and agricultural land by selecting only timber materials or other forest products which originate from sustainably managed forests; and by specifying materials in such a way as to require or permit the use of secondary, recycled and waste materials.
17. Designers can assist in improving the life-cycle energy efficiency of buildings by selecting materials and systems with low-embodied energy contents; by minimising the total use of materials per unit of built space; by designing of buildings for high thermal efficiency through insulation and by using passive design techniques; by avoiding air-conditioning; and by designing for long-life, adaptability and for eventual recycling.
18. Designers can contribute to the control of atmospheric pollution by reducing life-cycle energy requirements in the ways described above, by considering the pollution consequences of the materials and energy systems adopted and using materials and fuels which minimise these consequences.
19. Some of these actions will achieve more than one environmental benefit simultaneously. For example, the selection of recycled and waste materials will often simultaneously reduce the utilisation of primary materials (and hence the loss of land through quarrying and waste disposal) and reduce embodied energy. In other cases trade-offs will be required. Timber is one of the lowest-energy, structural materials available, so using timber will reduce embodied energy. On the other hand, it may increase unsustainable forest-use. The appropriate design strategy will depend on the circumstances, priorities and on economic factors.

III.2. Action by builders and contractors

20. Builders and contractors respond to designs drawn up by the designers. But builders are commonly responsible for the location and extraction of the low-value bulk materials, e.g. aggregates and fill materials, and often for the selection of other materials to meet a particular performance specification.
21. Builders and contractors can assist in reducing loss of forests and agricultural land by selecting only timber materials which originate from sustainably managed forests;

minimising the environmental impact of quarrying and extraction operations; and by looking for ways to maximise the use of secondary, recycled and waste materials.

22. Builders and contractors can assist in reducing the embodied-energy content of buildings and other constructed facilities by improving the energy-efficiency of plants, buildings and site operations; by reducing wastage or excessive use of materials; by separating and recycling all demolition and construction wastes ; and by minimising the extent of materials haulage.
23. In addition to the reductions in atmospheric pollution arising from reduced energy consumption, builders and contractors can also limit pollution by monitoring and limiting production of dust, particles and waste gases produced by site and quarrying operations, and by environmentally sensitive disposal of all non-reusable wastes.
24. As in the case of designers these strategies will tend to be mutually reinforcing, but all of them will require an increase in supervision and quality control of site operations. Although there may be some pay-offs, there will be a net financial cost to builders in implementing such strategies. Governments, therefore, have a role in creating regulations and incentives for their implementation which will be discussed later.

III.3. Action by building materials producers

25. The building materials industry makes the greatest direct environmental impact of the three groups within the construction industry. Materials account for more than half of construction costs, and a considerably higher proportion of energy consumption; and they account for most of the pollution caused by the construction industry. Although designers are responsible for the selection of materials, nevertheless the choice and control of the production technology, and the selection of inputs, can have a considerable impact on the amount of resource consumption or other forms of environmental damage resulting from each unit of production.
26. Building materials producers can assist in reducing loss of forests and agricultural land by minimising the extraction of primary materials; and by maximising the opportunities to use secondary and waste materials as inputs to production processes, wherever possible.
27. Building materials producers can help to reduce the energy content of their products by: improving energy efficiency in all kiln processes; by replacing energy inefficient processes with more efficient ones; by the use of waste and low-energy materials as inputs; by the use of solar energy or waste kiln heat in low-temperature operations; and by

reduction of transport energy by appropriate location and scale of production plants.

28. Building materials producers can reduce atmospheric pollution by reducing energy consumption in all the above ways and by installing abatement equipment such as dust precipitators and desulphurisation equipment in kiln-gas stacks; and by conducting pollution-emission audits of all production processes.
29. Because of the high energy intensities of many production processes, most large producers using modern technologies, notably steel, cement and glass producers, have already long term investment programmes to improve energy efficiency. However, in developing countries, many of the producers of building materials operate at a small scale, in dispersed production plants which use very energy-inefficient plants. These small-scale producers have very little capacity for innovation and tend to be slow to respond to changing fuel prices. Thus, governments have a role in assisting building materials producers to reduce the environmental impact of their operations through regulation and economic incentives.

III.4. The role of governments

30. Although the construction industry can adapt itself in numerous ways to reduce the environmental impact of construction and make it more sustainable, in most countries it operates competitively within the existing framework of legislative and fiscal controls set by governments. Thus, in order to change its technology, procedures or investment programmes to achieve increased sustainability, it will need to have some economic or other types of incentives to do so.
31. All governments are now aware of the unsustainable nature of the current developmental approach. Many are participants in international protocols to limit their emissions of both carbon dioxide and CFCs, and are committed to specific targets in that respect. But converting these goals into specific policies has not yet, except in a few cases, been carried very far. Three sorts of policies are available to governments: regulation and controls; economic incentives; and attitude-formation, through education and training, information and guidance. Each of these has its part to play in the creation of a suitable policy environment for change to occur in the industry. The scope and effectiveness of each is discussed below.
 - (a) **Regulations and controls**
32. The establishment of regulations and controls is the traditional function of a government in relation to the environment. Some examples of the types of regulations

which might be appropriate include:

- ° Regulations to control conversion of agricultural land to urban use, such as the: establishment of development control green belts around towns and cities; compulsory environmental impact assessments of major projects; and the maintenance of registers of existing derelict land.
 - ° Regulations to reduce the extraction of primary materials, including the imposition of restoration and environmentally-sensitive operation requirements for quarrying; legislation to prohibit the disposal of waste materials which could be recycled; and directions requiring that a proportion of the materials used on all construction projects are recycled.
 - ° Regulations in timber producing countries to influence the rate of tropical deforestation, such as: longer term leases; more detailed operating restrictions on tropical timber; concessionaires to achieve sustainable management; a ban on existing forest-clearing to establish plantations.
 - ° Regulations in consumer countries to reduce the rate of tropical deforestation, such as: an outright ban on the use of imported tropical hardwoods from uncertified sources or a ban in their use for particular applications; a requirement that all imported tropical timber is labelled to identify sources; and providing an incentive for producers to establish sustainable plantations.
 - ° Regulations to promote greater energy-efficiency in buildings, such as: requirements in building regulations that all new buildings be insulated to a certain standard; limitation on the use of air-conditioning for certain types of building; compulsory energy-efficiency standards for all heating and lighting equipment in buildings; and requirement in building regulations that all new and existing buildings be energy-rated.
 - ° Regulations, in addition to those for limiting energy consumption, to reduce pollution resulting from buildings and construction processes such as: compulsory emissions standards for all construction plant and vehicles; banning the future use of insulants and air-conditioning systems containing CFCs in buildings; and compulsory audits of pollution emissions.
33. Some of the regulations identified above are already included in government environmental protection acts; they form the basis in many countries of current attempts to

limit the environmental impacts of development and industrial activities. But such regulations are often difficult to enforce in the construction industry which is highly scattered, with a large part operating in the informal sector.

(b) Economic incentives

34. Economic or market-based incentives operate by establishing a price for whatever environmental resources are used. Their principal goal is to increase the purchase price of goods whose consumption degrades the environment by an amount which is equal to the environmental cost involved. Other forms of economic incentives are also feasible, for instance, subsidies to producers or consumers of environmentally acceptable products.

35. Some particular forms of environmental taxes could be considered which could, significantly reduce the impact of construction activity on the environment. For example,

◦ Landfill waste charges

This constitutes a tax on the landfill disposal of wastes which might otherwise be recycled. It will, however, be important to ensure that wastes are not disposed of in alternative environmentally damaging ways. This should encourage recycling of mineral wastes, and the reuse of demolition and construction wastes. Many countries already have or are about to implement such charges.

◦ Increased royalties for timber extraction from natural forests

This would constitute a tax on the felling of trees. This should reduce overall rate of forest loss, an intensification of the search for alternatives to tropical timber, and a greater incentive for replanting of forests.

◦ Charges for pollution

Where emissions can be quantified, charges can be labelled on industries in direct relationship to the pollution caused; or a system of tradeable permits developed to encourage development of pollution-reduction technologies. Discharge of sulphur and nitrogen oxides, carbon dioxide from cement and lime production could be possibly controlled in this way. This would also promote cleaner technologies such as the use of gasifiers in building materials production industries.

° Product Charges

This is a tax levied on a product to discourage the use of non-renewable, energy-intensive and polluting materials. Tropical timber, CFC - related products, asbestos etc. are likely candidates for such charges.

36. The introduction of such charges is not, however, an easy matter. They are often difficult to collect - for example many countries collect less than 30 per cent of potential rent from logging.⁸ It is also commonly argued that the poor pay a proportionally higher burden of such taxes than the rich. And all would have the effect, initially, of raising prices and, thus, slowing development.
37. Subsidies, in contrast, are not consistent with the "pollutor pays principle" and they have to be found from government budgets. But they should lower rather than increase costs, and they can be targeted to achieve specific environmental benefits, such as the development of new technologies, a switch to environmentally more acceptable fuels, home insulation, the redevelopment of derelict land, or the development of new quarrying areas.

(c) Non-regulatory activity

38. Through their access to media, control of education budgets and sponsorship of research organisations, governments have potentially very powerful tools for information dissemination and persuasion at their disposal. An aware and concerned public is likely to be more responsive to economic and regulatory measures to protect the environment, and in many instances may act in advance of such measures. Environmental groups in all countries have been increasingly effective in changing consumer's behaviour through information about environmental impacts. Governments can contribute strongly to these trends. Government's non-regulatory activities could include:

° Research and information

Government research institutes, and government sponsorship of research in industry and universities can have a big influence on the rate of technical change through activities, such as: compilation of data on environmental stress and energy-use; pollution consequences of construction-related activities; development and evaluation of new materials and technologies; and investigating the social and economic aspects of environmental protection. Reliable and accessible information underpins all

⁸ Pearce, D. (ed), *Blueprint 2: Greening the World Economy*, Earthscan, London, 1991.

actions for change.

◦ Stimulating voluntary action

Governments of industrialised countries are seeking to rely, to an increasing extent, on voluntary action by individuals, organisations and businesses in response to environmental problems, instead of depending on controlling legislation. Industries and local authorities, for instance, can be urged to adopt bold targets for reducing energy use and carbon dioxide emissions. The government of the Netherlands has agreed a 20 per cent efficiency improvement target with its industry to be achieved through long-term sectoral agreements.⁹ Governments also target individual home-owners as potential energy-savers through improved insulation, using the media and well-designed leaflets.

◦ Education and training

The success of government efforts to simulate voluntary action depends on an educated and aware public. Governments' influence on school curricula can ensure that environmental topics are taught at all levels. Innovation can be encouraged in higher and further education, particularly in the development of courses related to construction and the built environment, to increase the supply of skilled people available for environmental protection roles in the construction industry and in the government.

◦ Standards and specifications

Standards are voluntary agreements between producers and users. But the formulation of standards enables them to be incorporated into contracts and building specifications. Government-sponsored standards organisations can take a lead in formulating and improving standards for energy-efficiency and emission in the construction industry.

◦ Eco-labelling Schemes

It is a comparative quality label that is awarded to products with superior environmental qualities. For example, Eco-labelling of low embodied-energy building materials can improve this competitiveness in the market. In eco-labelling, consideration is given to a product's life span: raw material extraction, manufacturing, use, disposal and recyclability. Eco-labelling is already well-established in most European countries and Japan; some developing countries have

⁹ Ibid, ref. 6.

already initiated eco-labelling schemes which can be easily extended to cover construction products.

° Demonstration projects

Government departments are commonly the clients for a wide range of construction projects, particularly those civil engineering projects and large buildings which make the greatest environmental impact. This gives them the opportunity to demonstrate innovative uses of resources such as the utilisation of mineral wastes, or the application of new technologies, e.g. renewable energy technologies.

III.5. International action

39. Three distinct types of international activity can be identified which can assist the sustainable development of the construction industry in developing countries. These are:

- (a) formulation and implementation of international protocols for environmental protection;
- (b) transfer of new technologies and local-capacity building; and
- (c) funding support for environmental protection expenditures.

(a) Formulation of international protocols

40. International protocols are essential if serious progress towards environmental protection is to be made, because so many aspects of environmental deterioration are international in scope. Unless a high proportion of countries which contribute to a polluting activity agree to a formula to limit it, the full effect is not achieved, and in addition, those who continue to pollute gain an economic advantage from doing so. These international agreements have very wide implications for industry and for living patterns in those countries which are signatories to them. In particular, they will have profound implications for the construction industry, which will have to be given incentives to find substitutes and to develop new technologies. But it is important that the particular problems and cost of developing countries in complying with them are considered, and fairly shared by the industrialised countries.

(b) Transfer of technologies and local capacity-building

41. Many of the changes needed in the construction industry to ensure sustainability involve new or improved technologies. Developing countries will benefit from the transfer of low-waste and non-waste technologies and cleaner technologies

for building-materials production. Transfer of appropriate technologies for resource management in construction, particularly, for non-renewable resources, will also be crucial for improving energy-efficiency in both on-site and off-site activities.

42. The industries and institutions of the industrialised countries can also help the local capacity-building needed for technological change in a great many ways: through support for research organisations, standards organisations, forestry departments, local government planning, environmental control departments and building inspectorate. Developing countries also need help to strengthen their capacity to evaluate and select technologies appropriate to their needs. And industries in developing countries can help strengthen the capacity of the local industry to find ways to utilise locally available organic and agricultural wastes.

(c) Multilateral funding for environmental protection

43. Two principal candidates for international finance are the costs of protection of the tropical forests, and investments in low-energy or energy-efficient technologies. The costs of other types of pollution abatement technology, such as substitutions for CFCs in construction related products should also be eligible for support from multilateral funding sources such as the General Environmental Facility. In debtor countries, the principle of debt-for-nature swaps could be extended to provide local funds for such programmes. International aid organisations can also contribute to environmental protection through project appraisal procedures which properly incorporate the environmental costs and benefits involved. This should include not only major direct environmental impacts, such as deforestation and destruction of wildlife habitats, but should also extend to the impacts resulting from the extraction of raw materials and the energy embodied in the building materials used.

IV. QUESTIONS FOR CONSIDERATION

IV.1. Questions for consideration by the construction industry

44. What are the main barriers to introducing appropriate land-use policies and planning regulations specially aimed at protection of eco-sensitive zones against physical disruption by construction and construction-related activities? What could be the strategic intervention points which could help overcome these barriers?
45. In what ways designers can be sensitized to adopt planning and design decisions that can improve the life-cycle energy efficiency of buildings by:
 - selecting environment-friendly, low-energy materials and recycled waste materials;
 - reducing material content of buildings per unit of built space;
 - improving thermal efficiency of buildings where space heating or cooling is necessary.
46. What conflict of interest between the clients and builders can be envisaged in introducing environment-friendly, energy-efficient construction practices? How can they be overcome?
47. What are the main problems and constraints in improving the energy-efficiency and reducing pollution in the building materials industry, especially in the small-scale sector? How can they be overcome?

IV.2. Questions for consideration by governments

48. In what ways governments can create a policy environment in the construction industry that promotes investments in energy-efficiency and environment-friendly construction practices?
49. Given the severe resource constraints in the construction industry in developing countries, what regulatory measures can be realistically introduced to promote the increased use of energy-efficient designs and materials and to discourage the use of non-renewable resources?
50. What are the experiences with economic incentives designed to promote energy-efficient and environment-friendly construction practices in industrialized countries?
51. How can governments promote improved construction practices through non-regulatory activities such as:
 - research and information?

- eco-labelling schemes?
- education and training?
- standards and specifications?
- demonstration projects?

IV.3. Questions for consideration by the international community

52. How can the industrialised countries help the developing countries to meet international protocols on the control of greenhouse gas emissions and CFC emissions by sharing adjustment costs in the construction industry?
53. How can timber-importing and timber producing countries effectively collaborate to move towards sustainable management of the tropical forests ?
54. How can industrialised countries help developing countries improve energy efficiency and reduce pollution in the construction industry by:
 - information exchange and transfer of appropriate technologies?
 - institutional capacity-building ?
55. How can the appraisal of civil engineering projects be modified to incorporate environmental costs and benefits into decision-making?

ANNEX

PROMOTING SUSTAINABLE CONSTRUCTION INDUSTRY ACTIVITIES

Basis for action

The activities of the construction sector are vital to the achievement of the national socio-economic development goals of providing shelter, infrastructure and employment. However, they can be a major source of environmental damage through depletion of the natural resource base, degradation of fragile eco-zones, chemical pollution and the use of building materials harmful to human health.

Objectives

The objectives are first, to adopt policies and technologies and to exchange information on them in order to enable the construction sector to meet human settlement development goals, while avoiding harmful side-effects on human health and on the biosphere, and, second, to enhance the employment-generation capacity of the construction sector. Governments should work in close collaboration with the private sector in achieving these objectives.

Activities

All countries should, as appropriate and in accordance with national plans, objectives and priorities:

(a) Establish and strengthen indigenous building materials industry based, as much as possible, on inputs of locally available natural resources;

(b) Formulate programmes to enhance the utilization of local materials by the construction sector by expanding technical support and incentive schemes for increasing the capabilities and economic viability of small-scale and informal operatives which make use of these materials and traditional construction techniques;

(c) Adopt standards and other regulatory measures which promote the increased use of energy-efficient designs and technologies and sustainable utilization of natural resources in an economically and environmentally appropriate way;

(d) Formulate appropriate land-use policies and introduce planning regulations specially aimed at the protection of eco-sensitive zones against physical disruption by construction and construction-related activities;

(e) Promote the use of labour-intensive construction and maintenance technologies which generate employment in the construction sector for the underemployed labour force found in most large cities, while at the same time promoting the development of skills in the construction sector;

(f) Develop policies and practices to reach the informal sector and self-help housing builders by adopting measures to increase the affordability of building materials on the part of the urban and rural poor through inter alia credit schemes and bulk procurement of building materials for sale to small-scale builders and communities.

All countries should:

(a) Promote the free exchange of information on the entire range of environmental and health aspects of construction, including the development and dissemination of databases on the adverse environmental effects of building materials through the collaborative efforts of the private and public sectors;

(b) Promote the development and dissemination of databases on the adverse environmental and health effects of building materials and introduce legislation and financial incentives to promote recycling of energy-intensive materials in the construction industry and conservation of waste energy in building materials production methods;

(c) Promote the use of economic instruments, such as product charges, to discourage the use of construction materials and products that create pollution during their live cycle;

(d) Promote information exchange and appropriate technology transfer among all countries, with particular attention to developing countries, for resource management in construction, especially for non-renewable resources;

(e) Promote research in construction industries and related activities, and establish and strengthen institutions in this sector.

Means of implementation

(a) Financing and cost evaluation

It is roughly estimated that the construction activities of developing countries amount to about US\$400 billion annually and will increase by about US\$20 billion annually. The stream of new investments for these levels of activity and to bring in clean technologies is estimated at US\$40 billion annually, primarily from private sources. If 10 per cent of the new investments come from the international community, this would amount to US\$4 billion annually. About US\$3 million would be needed to strengthen international organizations.

(b) Human resource development and capacity-building

Developing countries should be assisted by international support and funding agencies in upgrading the technical and managerial capacities of the small entrepreneur and the vocational skills of operatives and supervisors in the building materials industry using a variety of training methods. These

countries should also be assisted in developing programmes to encourage the use of non-waste and clean technologies through appropriate transfer of technology.

General education programmes should be developed in all countries, as appropriate, to increase builder awareness of available sustainable technologies.

Local authorities are called upon to play a pioneering role in promoting the increased use of environmentally sound building materials and construction technologies, e.g. by pursuing an innovative procurement policy.

