SUSTAINABLE DEVELOPMENT: SOME KEY ISSUES

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ABSTRACT

This paper raises the question, how can sustainable development be achieved and what are the limiting constraints in achieving sustainable development? The main objective of this paper is to focus on key conceptual issues of 'sustainable development' with important operational implications for the attainment of 'sustainable development'. This paper is not designed to generate a general theory of sustainability.

Even though there are various definitions of sustainable development, the paper uses the definition put forward by Peace and Warford (1993) which defines sustainable development as "development that secures increases in the welfare of the current generation provided that welfare in the future does not decrease" (Pearce and Warford, 1993, p. 49). Using this definition, the paper considers four important sub-objectives of sustainable development namely: equity and social justice issues, ecological issues, economic issues (maximising service to a given stock of resources) and environmental issues (minimising throughput to maintain a given level of stock). Using this framework, the paper considers the conditions necessary for sustainable development namely: (1) maintaining a minimum population, (2) reducing poverty, (3) optimal depletion of non-renewable resources, (4) optimal depletion of renewable but exhaustible resources, (5) preventing environmental degradation and (6) improving energy efficiency. Finally, the paper also emphasises the need to change the current measurement of growth which fails to account for sustainability principles.
1. **INTRODUCTION**

Traditional economic thinking, in pursuit of economic growth has led to the wanton exploitation of the environment. In the absence of sustainable development, there seems to be an inverse relationship between economic growth and the environmental quality. That is, as economic growth or man made capital rises, in the absence of sustainable development, environmental quality or environmental capital falls and *vice versa* (Pearce et al., 1990).

For many critics of sustainable development the environmental crisis is nothing less than civilisational impasse. Sachs (1991) argues that with the rise in the 'global ecocracy', the crucial ethical debates regarding what sort of society we wish to create and how we wish to live are ignored in favour of global managerial solution. For these critics, the current predicament is the result of ignoring the ethic of exploitation. But this paper will take the view that environmental degradation is essentially of economic concern. Environmental degradation is largely the result of government and market failure and widespread poverty which places an intolerable stress on the environment.

The lack of consideration of the environment as a capital good has sometimes lead to irreversible damage such as the hole in the ozone layer and the loss of biodiversity (Pearce et al., 1990 and Tisdell, 1993). The misuse of the environment or the lack of consideration of the environment as a capital asset is due to market imperfections such as the common property nature of the environment.
The environment is a resource which people want to use for various purposes such as a natural resource base, an aesthetic unit, a waste assimilation unit and a life support system. Therefore, if the environment was treated as a capital asset in the growth process, then the objective of economic growth in the long-run would have been to minimise the undue depreciation of this capital asset.

The environment is a normal good - that is, it has a positive income elasticity. The objective of increasing the economic production in a country is to increase the per capita income of the population in that country. Therefore, as per capita income increases, the people may also demand better environmental quality. But economic growth in the past has led to the greater misuse of the environment.

Therefore, the society and the government at large has to find ways to resolve this conflict between increased production on the one hand and the preservation of the environment on the other. In other words the society has to find ways and means of increasing per capita output with minimum depreciation of the environmental capital. Such an action may help in achieving sustainable development.

2. WHAT IS SUSTAINABILITY?

There are a large number of definitions on sustainable development. For example, Pezzey (1989) suggests sixty definitions. But this paper will concentrate on the definition of sustainable development that relates to economic activity.
The World Commission on Environment and Development (1987), which was established by the United Nations under the Chairmanship of Gro Brundtland, former Prime Minister of Norway, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p.43). This definition is closely related to the concept of inter-generational equity.

But economists have difficulty with the term 'needs', as economic discipline is concerned about 'unlimited wants with limited means' and not about 'needs'. To overcome the above problem with the concept of 'needs', Pearce and Warford (1993) redefined the above definition of sustainable development as "development that secures increases in the welfare of the current generation provided that welfare in the future does not decrease" (Pearce and Warford, 1993, p.49). This definition is in line with the economic discipline.

Pearce and Turner (1990) give the working definition of sustainable development as development that "involves maximising the net benefits of economic development, subject to maintaining the services and quality of natural resources over time" (Pearce and Turner, 1990, p.24). The implications of the above definition on sustainable development on resource utilisation by any generation is that: (1) renewable resources should be utilised at a rate equal to or less than their rate of natural regeneration and (2) non-renewable resources should be utilised in an optimal efficient manner, subject to: (a) resource substitutability, especially with labour and reproducible capital and (b) technological availability and the likelihood of technical progress.

In other words, the current generation should conduct itself in a manner that it will leave the
future generations the options or the capacity to be as well off as the current generation. To achieve this, the sustainability principle should take into account not only the resources that we use up and the resources that we leave behind, but also the type of environment we leave behind, such as the built environment, productive capacity and technological knowledge.

This leads us to the question of 'what comprises capital?'. Turner identified capital to "encompass man-made capital, $K_m$, natural capital, $K_n$, human capital, $K_h$, and moral (ethical) and cultural capital, $K_c"$ (Turner, 1993, p.9). Within this broad idea of capital there are many views on sustainable development such as:

(a) very weak sustainability,
(b) weak sustainability,
(c) strong sustainability,
(d) very strong sustainability.

It is important to consider whether the above concepts of sustainable development is realistic in practice.

(a) **Very weak sustainability**

This takes the view that the stock of capital assets, whether man-made, natural or otherwise, is perfectly substitutable for one another. Therefore, under this rule it is only necessary to preserve the overall level of stock of capital assets and it is possible to deplete environmental capital as long as it is replaced by some other capital. That is, according to this view,
substitution can take place between natural and man-made capital, and a country is said to be on a sustainable development path if it saves enough to offset the depreciation of its capital asset (Pearce and Atkinson, 1992).

This view is clearly unrealistic as it could lead to dangerous depletion of the environment, once natural capital reaches a critical level. Such an attitude may reduce scarcity in the short term. But in the long term it will lead to greater scarcity and this scarcity will be brought about by irreversible deterioration of the environmental capital (Tisdell, 1993). That is, irreversible depletion of the environment is a strong possibility under the very weak sustainability view. Irreversible depletion of the environment will not help in achieving sustainable development as man-made capital is not a suitable substitute for natural resource capital (Pearce et.al., 1989).

(b) Weak sustainability

Here some recognition is given to the fact that man-made capital is not perfectly substitutable for environmental capital. But according to this there is some minimum level of environmental capital that must be maintained to ensure ecosystem stability and resilience (Barbier and Markandya, 1989; Pearce and Turner, 1990).

Although recognition is given to the fact that a critical minimum level of environmental capital needs to be maintained, current technology or current knowledge is unable to suggest what this minimum level should be. Therefore, because of this lack of knowledge on the critical minimum level, depletion of the environment below this level is a very real possibility.
However, for environmental resources, we may be able to overcome this problem by using the minimum health standards of the environment as the critical level.

(c) **Strong sustainability**

This view recognises that there is imperfect knowledge about the overall contribution of environmental capital and that the environment has not been correctly assigned values (Ehrlich and Ehrlich, 1992). Therefore, according to this view, it is not just enough to protect the overall level of capital but environmental capital must also be protected as some environmental capital is non-substitutable (Turner, 1993). That is, the strong sustainable rule will require natural capital to be constant.

There is a lack of perfect knowledge about the interdependency of ecological systems and the economic system. Therefore, if no depletion of natural capital is permitted, then there is no danger that the critical level of natural capital will be breached (unless it has already been breached) and therefore economic growth will still be permissible. That is, economic growth will be sustainable in the long term. But in reality, is it possible not to deplete the natural capital\(^1\), especially when it also includes non-renewable resources? Depletion of non-renewable resources depends on the social rate of return at that point in time.

(d) **Very strong sustainability**

According to this view, the economic system should be maintained at a steady state dictated by thermodynamic limits, with zero population growth (Daly, 1983). The dilemma with this
view is in deciding the level of population and the state at which the economy should be maintained. Therefore, the very strong sustainable standard may be difficult to achieve.

3. CONDITIONS FOR SUSTAINABILITY

As strong sustainability concept seems to be the safest to implement it is not considered to be a feasible proposition. Therefore this paper will only consider the conditions necessary for a situation in between weak and strong sustainability. Here the objective will be to prevent the depletion of renewable natural capital below a critical level\(^2\). This way the author believes it is possible to have growth which is sustainable. This approach will ensure that the environmental impact of economic growth will be kept at a minimum\(^3\).

(a) Maintaining a minimum population

It is a well known fact that the poor countries in the world are over populated. Over population in developing countries will bring with it rapid environmental degradation and unmanageable urbanisation problems. Also high population growth could bring in problems such as rising ethnic and social tensions and discrimination.

Most children in developing countries are born to poor families mostly in rural areas. This high population growth poses a serious constraint to future economic growth as a result of more poor people in rural areas depleting natural resources faster than before, especially when they have no prospect of gaining access to other productive resources (Pearce and Warford, 1993). It will, therefore, prevent sustainable development. It has been shown, in the case of
Third World countries, environmental destruction and high fertility go together. The reason for this direct correlation between population increase and environmental degradation in these countries, is because of the increase in absolute poverty resulting from increases in population in these countries. Furthermore, current poverty will breed more poverty in the future.

The world today has about 6 billion people. It is estimated that this global population will grow to about 8.2 billion by the year 2025 (Turner and Pearce, 1994). Of the 6 billion people living today, only about 20 per cent live in the industrialised countries of western Europe, the United States and Japan. This shows that there is a greater threat for the Third World through over population.

Rapid population growth can quickly negate the benefits of technology. It would lead to considerable expansion in food production by extensive land opening, often resulting in the exploitation of marginal lands not suitable for agriculture, leading to unsustainable agricultural production. Decline in population in these Third World countries may well be necessary for future growth to continue, as population growth in these countries can impose physical limits on growth and sustainable development.

Sustainability implies improving and maintaining a high quality of life in these developing countries. Therefore, the policy should not only reduce population growth by reducing high fertility, but also reduce child mortality and raise population quality.

To stem the growth in population, increase in wealth and increase in education and occupation is required in these countries. In other words, to achieve sustainable development in the Third
World, issues such as landlessness, lack of access to institutional and educational resources should be addressed. The economic, environmental and social problems are all interconnected. Therefore, this calls for a holistic approach and not a compartmentalised one by the governments in Third World countries on the above issues.

Constraints to achieve smaller population growth in the developing nations are imposed by some religious institutions. Imposing a virtual ban on family planning in these countries has been argued based on 'moral' and religious grounds. For example, the Government of Pakistan has imposed a virtual ban on family planning on 'moral grounds' since 1984. But it can be argued that no policy on population control can be effective unless abortion is legalised. The other side of the coin is that it is also quite possible that some oppressive governments may carry out slow genocide of some minority ethnic groups using methods validated by population policies.

The problems created by the increase in population in Third World countries is not simply a developing country issue alone. It is one that crosses the international boundaries. The industrialised countries of Western Europe, the United States and Japan hold about 98 per cent of the world's wealth. Therefore unless something is done to stem the birth rate in the developing countries, the industrialised nations would face an influx of economic refugees. This is seen clearly now in the United States with Mexicans, and in Western Europe with illegal immigrants from Eastern Europe.

The above migration pattern is understandable. This is because there is no social security system in the Third World countries, and it is not possible to have such social security
systems in these countries. As these economies do not have any guaranties for the future of the people living and working in these countries, they do not have the capability of making savings to pay for their retirement. To overcome this problem they may be forced to have more children. That is, the people in poor countries have children as an insurance policy for their old age. This may, in the absence of out migration, lead to poverty breeding more poverty in the Third World countries.

(b) Reducing poverty

In has been shown that more than one billion people living in the developing world are poor. Of this about 800 million live in Asia. High birth rates in the developing countries (3 per cent in Sub-Saharan Africa and 2.2 per cent in South Asia) coupled with slow income growth in these countries, is producing a rapidly growing labour force with low levels of human capital. This situation, if not checked, will lead to further increases in the number of people living in poverty in the developing world. Environmental degradation is often associated with poverty. Poverty alleviation is a necessary condition for sustainable development. Sustained economic growth is a necessary condition for poverty alleviation.

Rural poor households in Third World countries are usually larger and headed by individuals who are either illiterate or have little formal education. Rural areas in Third World economies have less access to education, health care, sanitary facilities and so on.

Urbanisation is pronounced in many developing countries, especially in the Asia-Pacific region. Urbanisation is generally recognised as a normal process of economic development.
Urbanisation also brings about rapid demographic and economic transition from rural to urban societies. In such a scenario, these developing countries are least equipped to cope with the challenges posed by urbanisation.

In 1990, Asian urban population was estimated to be around 991 million (ADB, 1995), which is about a third of the total population in Asia. This number is expected to increase to about 2.4 billion by the year 2020 (ADB, 1995). Furthermore, the urban poor also possess little human capital and also not much physical capital that can be traded when their income is unstable. Therefore, if sustainable economic development is to be achieved in this region, the respective governments in this region should take adequate measures to increase the efficiency and productivity of urban areas, especially those of the urban poor.

The diseconomies of agglomeration of urban population, such as high social costs, including health and environmental costs, has outweighed the economies of agglomeration or scale economies in many Third World countries. Therefore, if sustainable development is to be achieved in these economies, there is a greater need to promote regional centres, with the aim of absorbing the urban poor into the productive units of these regional centres.

Therefore, appropriate investment in human capital is required to raise the quality and productivity of labour. Quality and productivity of labour are important considerations for foreign investment and technology transfer. But such investments are beyond the outlay of most of the developing country governments. Therefore, this has to be financed externally through foreign aid. Unfortunately there are many claimants to limited foreign aid.
Furthermore, unless the industrialised world changed their trading alliances, the industrialised world would face not only the problem of Third World overpopulation but also inexorable tide of economic refugees. That is, the industrialised countries should give less developed nations the benefits of their new technology and know-how in return for cheap methods of production.

The industrialised world should promote the export-oriented, labour intensive industries of the Third World, as developing countries are likely to have comparative advantage in commodities that are labour intensive, given surplus labour and scarce capital in developing countries. This may be possible only when the industrialised countries realign some of their trade routes away from other industrialised countries and towards less developed nations. This would enable the less developed nations to reap the capital investment necessary to lift standards of education and living, and hence cut poverty and the consequent overpopulation mentioned before.

(c) **Optimal depletion of non-renewable resources**

These resources are a capital asset not only to the owner but also to the society. They derive their market value from the prospect of extraction and sale. With depletion, the size of the existing stock will decrease through time.

The sustainability principle requires that when we use these irreplaceable resources such as oil and minerals we should think of providing a substitute of similar value such as future productive capacity including technical knowledge (see Hartwick, 1978). For example, Solow
(1993, p. 185) argues that "If we were to think that our obligation to the future is in principle discharged by seeing that the return to non-renewable resources is funnelled into capital formation, any kind of capital formation - plant and equipment, research and development, physical oceanography, economics or environmental investment - we could have some feeling that we were about on the right track". Massive investment in human resource development leading to the accumulation of human capital, skills, and technical know-how is a critical factor in establishing and sustaining potential future growth in developing countries.

Therefore, it could be argued that non-renewable resources should not just be utilised to maintain only the current generation's consumption. Instead, some fraction of the revenue raised from the sale of these resources should be used for investment in capacity in the future, including human capital development. Investment in capacity in the future could be on those pertaining to the exploitation of non-exhaustible resources such as solar power or wind energy.

Unfortunately, since the future generation is not represented in today's market, the ordinary market behaviour consisting of supply and demand will not take care of this, (Solow, 1993) and therefore government intervention may be required (Tisdell, 1993). But whether the government will be interested in doing this is questionable as future generations do not have any voting power at the current time of the parliament. That is, the government is generally myopic in its attitude. Furthermore, the major problem in many Third World countries is to have more consumption today, rather than investment, in order to alleviate current poverty. Therefore, there is a conflict between equity within generations and equity between generations. This conflict will act as a major constraint for sustainable development in Third
World countries.

(d) **Optimal depletion of renewable resources**

Most of the renewable resources are common property resources⁵. The objectives of sustainable development with regard to common property resources are as follows:

(i) maintain constant stock,
(ii) maximise service to that given stock,
(iii) prevent rent dissipation,
(iv) reduce externality.

(i) **Maintaining constant stock of renewable resources**

Maintaining a constant stock of renewable resources is to meet both the present and future needs of the population. In other words, it is aimed at maintaining inter-generational equity. In the absence of well defined property rights, there will be a tendency towards over exploitation, with a correspondingly greater risk of extinction of these renewable resources.

It is a well known fact that in a common property situation, reducing the use of the resource by one individual will contribute to the available supply of other users. Therefore, the user has no incentive to conserve the resource in a sustainable manner. This action could ultimately lead to the depletion of the renewable resource beyond recovery. Therefore, to overcome this problem some form of quasi property rights have to be given to these
resources. This is only possible by some sort of political/administrative mechanism.

(ii) **Maximising service to a given stock**

Service from renewable resources is determined by the quantity and quality of the renewable stock of resources. Since sustainable development implies the maintenance of renewable but exhaustible resources, the sub-objectives of sustainable development at any given time is to maximise service from this given stock of renewable resources. This is known as economic efficiency and may be achieved by the following:

(a) by ensuring full employment of all resources, including people, so that the economy is operating on the production possibility frontier;

(b) by improving the allocation of resources between alternative uses, so that society is on the economically efficient point on the production possibility frontier.

There are various economic policies that are discussed in the renewable resource economics literature that are available to achieve this maximum economic yield from these (renewable) resources (forestry, fisheries). This paper will not go into details about these policies.

(iii) **Prevention of rent dissipation**

When individuals are able to appropriate property rights to a resource, then the marginal
product of the individuals effort is the relevant measure to compare his/her income in alternative employment (Tisdell, 1982). In such a situation the marginal cost will be equated to the marginal social product and the rent from the resource will be maximised.

But when individuals are unable to appropriate property rights to any part of the resource, the average product of effort and not the marginal product of effort is the relevant measure to compare his/her income (Tisdell, 1982). When average product is equated to average cost, rent gets dissipated. As resources belong to the society it is important to prevent any rent dissipation.

To prevent rent dissipation, some government policy may be required. But this government policy should not be aimed at giving property rights or quasi property rights to just the powerful and rich lobby groups only. To deal with the intra-generational equity problem, government policy should also give property rights over these natural resources to the poor.

(iv) Reducing externality

Common property nature of renewable but exhaustible resources leads to harmful externalities such as intergenerational and contemporaneous externalities. These are well documented in text books in resource economics. Therefore this paper will not go into details, except to say that, even though, 'marginal external' costs are difficult to calculate with any confidence, there is no reason why they should be ignored altogether.
(e) Preventing environmental degradation

When one of the sub-objectives of sustainable development is met, which is maximising service to a given level of stock, simultaneously, the other sub-objective of sustainable development, namely, minimising throughput to a given level of stock, also has to be met. Throughput is defined as "the entropic physical flow of matter-energy from nature's sources, through the human economy, and back to nature's sink, and it is necessary for maintenance and renewal of the constant stock" (Daly, 1983, p.258). Such an objective will prevent the undue depreciation of the environment. Minimising environmental depreciation is only possible when you have some form of property rights over the environment.

Environmental problems, such as air and water pollution, are the end result of treating the atmosphere and water as common property. This is because some of the non-exhaustible common property resources do not have sufficient capacity relative to all the demands on them.

With many people using non-exhaustible common property resources for many purposes the environmentally damaging use dominates the non-damaging use and not vice versa. The damaging use of the environment by any individual is rational in the absence of the following:

(i) a social conscience,
(ii) informal community sanction,
(iii) formal legal sanction.
Rational, because the individual reaps the full benefit of using the environment to dispose of his/her waste products, but bears only a fraction of the welfare cost of his/her pollution activity. The end result, of this individual selfishness, will be that the society as a whole will end up worse-off, if we all follow the same action. In other words, the "invisible hand" does not work when common property resources exist. All individuals would be better-off if they all refrained from attempting to maximise their own self interest. To do this, government involvement is necessary.

Government intervention in the Third World countries should not only be chosen carefully, but also carried out efficiently in order to eliminate or minimise government failure. The government should concentrate on facilitating poverty-reducing economic growth, and providing safety nets in areas of social concern if it is to achieve sustainable economic development in Third World countries.

But unfortunately, governments may be despotic, and interested only in favouring the powerful lobby groups rather than the community as a whole, especially if such policies may impose costs on members of powerful pressure groups. This is quite so, not only in developing countries, but also in developed countries. Therefore, such despotic governments may not be helpful in achieving sustainable development. To achieve sustainable development you may need a strong socially benevolent political system.

(f) Improving energy efficiency.

Energy sector and land use is the biggest source of greenhouse gas emissions in most Third
World countries. Therefore, energy sector reform and improving energy efficiency in developing countries will be rewarded with cleaner air and lower health costs.

With future increases in population, coupled with urbanisation and economic development in many developing countries, energy consumption is bound to rise. Therefore, energy conservation and efficiency improvements in the industrial sectors in developing countries is called for. Furthermore, the efficient management of energy supply and demand, by moderating consumption and enhancing efficiency, could also help in reducing carbon dioxide emissions. Such reductions could minimise the impact of carbon dioxide on global climate. Energy efficiency could be increased by eliminating price subsidies on energy and introducing full cost pricing, which takes into account the environmental cost as well (Tietenberg, 1992).

4. **INSTRUMENT FOR MEASUREMENT OF SUSTAINABLE DEVELOPMENT**

Standard income accounts, such as gross domestic product (GDP) or gross national product (GNP), as the case may be, is not a measure that will enable rational decision making regarding sustainable economic growth. Even though the net domestic product (NDP) or net national product (NNP) takes into account the rate of depreciation of capital, it also fails to take account of any changes in natural capital and human capital. For example, the number of living species and the extent of biological diversity is being rapidly reduced to a large extent because of habitat destruction by man, as man uses natural areas more intensively to provide inputs for economic growth. Thus, the quality of the environmental capital may be less than that at the beginning of the period.
Net domestic product or net national product fails to take into account the non market benefits of growth. Furthermore, costs associated with growth may be included in the NDP or NNP measure, but it is not separated out as costs. Examples of these costs are as an economy grows, more time, energy and money must be spent for information and control, highways, reduction of pollution, in order to restore the same level of living rather than improve it.

Also, NDP or NNP does not take into account any amenity loss from production. But when growth takes place, destruction of amenities such as quality of water, quality of air, wildlife and open space also takes place. These have to be subtracted if our aim is to achieve sustainable development. Therefore the yardstick of sustainable development should also take into account the quality of the environmental capital.

5. CONCLUSION

For sustainable development to be a potential reality and not a passing fad, the population at large and the governments in particular should consider all the conditions for sustainability discussed in Section 3. It should be realised that income growth is a prerequisite for sustainable poverty reduction. Sustainable poverty reduction is a necessary condition for sustainable economic development. In low income countries, poverty and the environment are inter-related, and to make sustainable development a possible reality, it is essential to launch a frontal attack on poverty and environmental issues simultaneously.

In order to reduce rural poverty at a rapid pace in many developing countries, the ruling governments need not have any objections in inviting bonafide foreign funded voluntary non
governmental organisations (NGO) to undertake social development programs that may help towards the improvement of the quality of life of people living mainly in the rural areas. In this regard the governments in these countries should also make the multinationals and other big businesses operating in these countries, contribute a percentage of their before tax profits (which could be made tax deductible), to foreign sponsored voluntary NGOs working in these countries, with the aim of rural upliftment and transformation of the village or rural life through the spread of literacy, better health care and improvement in the quality of life of women and other vulnerable groups.

If governments continue to ignore the market imperfections when dealing with the environment, then in the long-run, the welfare gains from income growth may be outweighed by the losses from environmental damage. This is further exacerbated by the fact that the distribution of economic benefits from growth is uneven and those who suffer the costs are often not those who benefits from economic growth. The beneficiaries of high income from development are generally able to cushion themselves from the economic and social cost of development.

Therefore, economic and environmental policies of governments should be integrated together when formulating economic development strategies, so that both private and social cost of development should converge and not diverge. That is, policies should be aimed at making the individual behaviour take account of the true social value of environmental resources. Such policies should rely more on economic incentives. However, incentive based policies may not be universally applied to all environmental problems.
As we strive for sustainable economic development for the future generations, the onus is on both the individuals in society at large and the governments in particular. Effective incentive based market policies with efficient administrative and political institutions may help in making sustainable development a possible reality and not a potential fad. Such a measure will not only increase the income growth that is necessary for sustainable development but also provide for resources that are necessary for better environmental management. Last but not the least, the measurement of economic development should move away from GDP or GNP measures and should encompass sustainable development principles.
1. Natural capital includes both renewable and non-renewable resources.

2. This will be set by the maximum economic yield level for biological resources and by minimum health standard for ambient environment.

3. This is because the economy and the environment are linked. Societies have to extract natural resources from the environment and after processing and consumption have to return these resources in a transformed way back to the environment as waste. Some of this waste is not recyclable due to the law of entropy.

4. Refugees seeking a better life.

5. Common property resource is one that is used in common by all members of the community. Neither exclusion nor discrimination is permitted with respect to its access. Therefore, there is rivalry in consumption.

6. Marginal external cost is the difference in cost between the social cost of an additional production and the private cost of production.

7. Non-damaging use such as swimming depends on the damaging use such as the discharge of effluent in an inverse manner and not vice versa.

8. Greenhouse gases that have direct effect on climate change include carbon dioxide, methane and nitrous oxide.
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