



RESOURCE MANAGEMENT AND SUSTAINABLE DEVELOPMENT IN INDIA

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The story of resource management and their sustainability is relatively recent in human history. Far too long, the natural resources, both biotic as well as a-biotic, were considered inexhaustible. The enthusiasm generated following the industrial revolution in the beginning of the 19th century tinged the human civilization, especially the western world, with some measure of arrogance that saw the possibility of conquering nature, exploiting the natural resources for its own benefit and developing a culture replete with unlimited possibilities. Destruction of woodlands, meadows and even wetlands to reclaim land for agriculture or other economic activities, like establishing towns or factories, laying down of transport and communication lines or similar other activities became a frequent economic activity. By the mid-nineteenth century, a creeping wanton destruction of natural resources had set in with the establishment of colonial rule across many parts of the world, especially Asia and Africa. These resource-rich regions bore much of the brunt of the onslaught of industrial expansion that fed itself on the resources of these regions, without any regard for the future of the regions and their people.

Following the Second World War and the liberation of most of the colonies, the newly emerged independent nations were faced with the task of writing a constitution, formulating their own development programmes, aimed at the elimination of abject poverty that had gripped the Third World Countries, following centuries of exploitation. Most developing countries were engaged in setting their houses in order, oblivious of the risk of degradation and pollution of environment. It was natural, as the priority was growth in agricultural and industrial production, employment for their people and uplifting the level of their living. In the early days, after the Second World War, and the establishment of the new democratic regimes in the liberated colonies, the issue of environment conservation was nowhere in sight. Even in India, a lot of unreserved and unprotected forests were cleared to make way for agricultural lands, as a part of the Grow More Food Campaign. The economically advanced countries, many of them shorn of their colonial empires, launched massive programmes of industrialization and economic development, in their own countries and abroad, wherever possible, partly to repair the damage caused during the Second World War, but equally to capture a larger share of world market. The competitive atmosphere of post-war industrial development and a fast rising population of the world stressed the world's natural resources. Great destruction, termed exploitation, was caused to world's resources, besides the pollution of water and air that was unleashed during the wake of industrial development. The resultant environmental scenario was the pollution of air and water, warming of the atmosphere caused by high level emissions of GHG and other toxic gases by highly industrialized countries of the world, and the discharge of huge industrial wastes that polluted soil and water, besides a wanton destruction of forests and random exploitation of minerals. Excessive exploitation of natural resources and the unlimited burning of fossil fuels sullied the nature to an unbearable limit. The result, the degradation of environment and the global warming, the two most visible consequences, the humanity under the aegis of the UNO is struggling to cope with.

Resistance and early Voices against Excessive Exploitation of Nature:

The signs of this adverse natural scenario had started appearing even in the mid-nineteenth century, and there were enlightened people, even then, who recognized the changing face of the earth, and raised their voices. The first salvo that was fired, pointing to the adverse changes brought out by man on the face of the earth, was by an American, George Perkins Marsh. Though a diplomat and a philologist, Marsh was a keen observer of nature and wrote - 'The Earth as modified by Human Action'

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in 1874. This did not arouse the sentiments of a growing American economy. It was hundred years later, in the mid-twentieth century, that the work of a celebrated American marine biologist, Rachel Carson, titled- 'Silent Spring' (1962) that attracted wide attention in the USA and carried a world-wide impact. The concern for conservation of resources mounted fast, and within a decade, the UN conference on 'Human Environment' was held at Stockholm in 1972. This was a watershed in the history of nature conservation and the preservation of environment. From thereon, environmental concern, started appearing on the agenda of most countries of the world. It may be mentioned in passing that the Stockholm conference was attended, among others, by India's then Prime Minister, Indira Gandhi.

In the history of the Movement for 'Environment and Resource Conservation', the Stockholm conference is a watershed after which efforts were directed towards resource conservation and the protection of natural environment from degradation and pollution. Almost at the same time, a study commissioned by the Club of Rome and authored by Donella M. Meadows, Dennis M. Meadows and Jorgan published the results of a computer-run programme to evaluate the relationship between population, industrial development and resources. It was revealed that while the population, industrialization and pollution were growing unchecked, the growth in resources was only a linear. This established, hypothetically, the very well recognized dictum of "*Limits to Growth*".

The Indian context: The Citizenry in India had grasped the truth and significance of the international events and many biologists and environmentalist initiated a movement for protecting the environment. In this context, one may mention the "The State of India's Environment: A Citizens Report" (1982), produced by the Centre of Science and Environment, New Delhi, that appeared as a wake-up call. This much talked-of report brought the environmental concern centre stage, and an environment movement started by India, pioneered, besides others, by Madhav Gadgil, a distinguished biologist, attached to Indian Institute of Science, Bangalore, and several other wild life lovers, experts and nature conservationists. This was the phase (1980s) when projects like Silent Valley in the Palghat section of Western Ghats, in Kerala, promoted by the Kerala Government were not only stalled but completely abandoned.

The response of the Government of India has been to establish a new department in 1980, subsequently upgraded to a ministry, the Ministry of Environment and Forests (1987). The environment movement in India turned so vigorous that several other projects have, since, been delayed indefinitely, or completely forgotten, if not abandoned. Every development project has now to secure a clearance from the Ministry of Environment after having produced an Environmental Impact Assessment.

Resource Utilization, Environment Protection and Nature Conservation: At some stage, during the last four decades, there emerged a congruence between environment protection, wildlife and nature conservation and a sagacious utilization of resources. It included all kinds of natural eco-systems, mountains, wetlands, grasslands, deserts and above all forests, not only for their economic value but also for their being the ideal natural wild life habitat. This created a difficult situation especially in areas of mineral extraction, reservoir development, building of dams, laying of roads and communication lines, establishment of new factories and many other aspects of development activities where reclamation of areas and change in land use was to be effected for economic development. This was a conflict situation, as exploitation of resources for development is as important as the protection of environment. The protests by many conservationists, and occasionally a bandwagon of activists, have delayed, if not completely stopped, many irrigation projects, and some of the most important ones were to be cleared by the highest judicial body of the Country, the Supreme Court of India. Many conservation-biologists who insisted on carving out national parks, wildlife

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sanctuaries and forest reserves to preserve the bio-diversity of certain regions, are often indifferent to the needs of the people of India.

The Dilemma of Resource Conservation, Utilization and Management: The first dilemma that the country and its planners faced was the conflict between need for development and poverty elimination on the one hand and environment protection and nature conservation on the other. Most development projects are land-based, may these be irrigation, road network, airports, establishment of factories, hill stations, recreation grounds or any other. Acquisition of land is the primary step in all these projects, a stage where many of the projects get stuck and face as much resistance from environmentalist and conservationists as from the owners of the land. No activity illustrates this idea of conflict more eloquently than mining, especially of coal, iron, bauxite, uranium and in some cases even limestone. Not long ago, many coal bearing forested areas were declared as 'No go' areas for coal mining, the supply of coal diminished, affecting the thermal power plants, creating a shortage of electrical energy.

It has to be understood that the impact on environment is inevitable, no matter where and what kind of project is undertaken. It is only a matter of degree. In some cases, it is just a modification, in some it is the shrinkage of the pre-existing use, and in some, it is a complete transformation in the character of the land, water bodies, forests and mineral zones.

India faces the challenge of resolving the conflict between conservation of nature and economic exploitation of its resources.

World Commission on Environment and Development: Within a decade after the Stockholm conference, it was realized that there is an apparent conflict between the preservation of environment and the expansion of economic activities, especially in the developing and under-developed countries, which needed massive effort and investment for their economic growth. United Nations appointed a Commission called 'World Commission on Environment and Development', a commission that was to take into consideration the development needs of the developing countries and the concern of the international community to preserve environment. It was done in fact 'in response to the conflict between promoting economic growth and accelerated ecological degradation occurring on the globe'. The commission presided over by the Norwegian Prime Minister G.H. Brundtland, came out with a report in 1987, called the Brundtland Report titled – “Our Common Future”. This report clearly introduced and defined the idea of Sustainable Development.

The Idea of Sustainable Development: The idea of sustainable development as defined by Brundtland report, and as commonly understood, refers to 'a judicious use of earth's resources in such a way that it doesn't deprive the future generations of the benefits of these resources'. The idea of sustainability is opposed to the idea of exhaustive exploitation of resources and conforms to the idea of judicious use and preservation. The concept of sustainability is to be extended to all the resources, especially those that are not renewable like minerals. But many life forms including flora and fauna, though apparently renewable, are difficult to reproduce if exploited beyond certain limits. This explains why certain biological species are endangered or at the brink of extinction. Over-grazing have turned many parts of earth's surface into treeless wastes. Similarly, excessive fishing has resulted in a decline in the reproductive potential of certain species of fish. The same logic can be applied to other resources like forests or even wildlife.

United Nations 'Millennium Development Goal-2000, and Sustainable Development Goal-2015: At the dawn of the current millennia, the UNO floated what is known as the United Nations Millennium Development Goals, with an eightfold agenda, on the top of which was the *elimination of*

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extreme poverty followed by issues related to primary education, gender equality, reduction of child mortality, improvement of maternity health, combating HIV and malaria and the effort to ensure environment sustainability.

On the 75th anniversary of the United Nations (25 September, 2015), it adopted another resolution aiming at a 'Sustainable Development of the Society'. Its objective was *to end poverty, protect the planet and ensure prosperity for all*. The resolution was more elaborate, as it had 17 sustainable goals and 169 targets. The resolution talked of responsible consumption and production *and sustainable management of the resources of the planet*.

The Indian Situation: Till a century and a half ago, much of India's natural resources were rather well preserved, not as a consequence of an efficient management system but because of the enormity of resources-land, water, forests and minerals and a relatively small population. These, except the cultivated land, remained largely unexploited. The reasons were two-fold: a small population without any modern technology at its command and a vast storehouse of resources.

An exploitation of the non-agricultural resources of the country started with the arrival of the colonial powers, especially the British, in the 18th century. Vast tracts of land were reclaimed in what is now part of Pakistan, irrigation projects were developed and river-water was utilized by damming the rivers and building canals, valuable teak and other forest resources were exploited to keep the British navy running and to be used as slippers for the railways. Minerals, especially coal and iron were exploited, the former to be used as a source of energy to run the trains or to generate thermal electricity and the latter to be exported to UK, to feed the British steel plants. An important fact that one has to notice is that the population of the country grew, during that period, at a snail's pace. The population of undivided India, in 1941, was around 388 million. During the last seventy years, the population of India alone has grown to over 1.28 billion, causing very heavy demand on our natural resources. The Indian leadership, during the Freedom Movement, perhaps, could not foresee the spurt in population growth that was to follow after the country's independence in 1947.

Sustainable Development and Management of Resources: For a sustainable development, especially where earth resources are involved, has to be judicious, to make sure that the resources are neither degraded nor over exploited to the point of exhaustion and non-generation. The most talked about resources of which the misuse is often alluded to, are the land, water, forests, minerals and fisheries. Some others, which are threatened, are the wildlife and several species of plants and animals.

The Case of Land and Special Economic Zones: The Conflict between the National and Individual Interests: In a democracy, it is difficult to plan effectively the use of resources in a judicious way, as quite often, the development projects get involved in controversies where the interests of a community or an individual clash with the pre-meditated plans evolved at the national level. The acquisition of land for many development purposes, highways, canals, factories, expansion of sites or airports is a case in point. In most cases, communities or the individuals do not want to part with the land that has been a traditional source of their livelihood. It is ironical yet true, that some of the most fertile and irrigated patches of lands were acquired by the Governments under the excuse of 'Acquisition for Public Purpose'. This is injudicious and unsustainable, more so as there is enough acreage of infertile land unsuitable for agriculture which could be utilized for industrial purpose. As a matter of policy, agricultural land, especially fertile irrigated land, should be spared from acquisition for economic activities, other than agriculture, unless it is unavoidable. The famous **Posco**, a Korean iron and steel company, trying to acquire the most fertile land under betel leaves plantation and rice in

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Odisha, was prevented from doing so, and the case still lingers unresolved. This shows the reluctance of the farming community, living off agriculture for generations, in parting with their most prized possession, the land. The total harvested area (the term used by FAO in India) is 341 million hectares, and with a population of 1267 million (2014), the per capita harvested area comes to 0.27 hectare, as compared to 0.38 ha, world average of per capita harvested land (*UNO-FAO Statistical Pocket Book-World Agriculture-2015*). This is quite inadequate to engage and even support the large rural population of the country. The per capita availability of cultivated land in most South Asian countries has dwindled over the decades, as a result of their galloping population. It is, therefore, best to avoid acquiring agricultural land for non-agricultural uses. Secondly, the country with its production of 250 million tons of food grains, is still struggling to produce enough balanced food for its population, as seen in a shortage of pulses, the main source of protein for a large section of its population. Added to this is the frequent drought and flood situation, when a stored buffer stock comes to the rescue of the population. With a change in the food habit of people looking for a higher amount of protein and other horticultural products, the country cannot afford to dislocate its land under agriculture for other economic activities like industries which could be sited anywhere in a non-productive land. Some agricultural land is bound to go with the expansion of sprawling urban centres, but agricultural land should be the last and only compulsive choice for acquisition.

The case of forests: Forests have, for long, drawn the attention of environmentalists, biologists and other nature conservationists. They have a long history of destruction. In this context, an important point that has to be borne in mind is that all the fertile agricultural plains were, at one time or the other, under forests, later cleared for cultivation. This process of forest clearing and burning continued for centuries and persisted even after independence. Even today, large chunks of prime forests are burnt every year for shifting cultivation, a practice locally known as *jhuming*, in North-East India. Yet, the entire blame for forest destruction cannot be laid on the doorstep of the present generation. Large areas for tea and coffee plantations were reclaimed from primeval forests, during the colonial times. There has also been a controversy about the area of forests India has. This is attributed to the flawed recording of the actual forest area. The forest departments of different state governments recorded all the area in their control as forest, though many areas recorded as forests had no trace of forests on them. The original assessment of 75 million hectares forests was challenged in the 1980s, and the forested areas were recalculated on the basis of remotely sensed satellite data. The forest area, thus calculated, tumbled down from original 75 million hectares to roughly 70 million hectares. Today, the country has 702,979 sq km (70.2 million hectares) of forests under different categories (India State of Forest Report, 2013 & 2015, Forest Survey of India, Govt of India, Dehradun). The forests are to be saved specially in their fringe zone, the area most susceptible to encroachment.

The question, however, is not only of saving the forest land but even preserving their bio-diversity. The biologists refer to an assemblage of a variety of life-forms in an area as its bio-diversity, an area of great concern. The preservation of bio-diversity has turned out to be an area of great concern not only nationally but even at an international level. The International Union for the Conservation of Nature (IUCN) has identified several areas in the world referred to as biological hotspots with great bio-diversity. India has two such areas, one of these is represented by the dense forests of Western Ghats and the other is the forested areas of Nagaland and Manipur. The conflict around the Ecology of Western Ghats clearly demonstrates the extreme positions taken by the biologists on the one hand and a people-centric approach the ruling establishments seek to adopt, on the other. In this context, one may mention the views of the Western Ghats Ecology Expert Panel (WGEEP) (2011), headed by Madhav Gadgil, and the reservations shown by the Central Government of India and the State Governments of Maharashtra, Karnataka and Kerala, in accepting the recommendations of the Committee. The confrontation between the high-powered committee (WGEEP) and the Government of India on the

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other led the latter to appoint another committee headed by another scientist Dr. Kasturirangan, who modified the recommendations of the previous committee, to make it acceptable to all the states in whose domain the Western Ghats lie. The interests of people, their livelihood and material wellbeing, is as important as the environment, and it is not prudent to think of only one aspect of an issue and not the other. The extreme position taken by environmentalists is not always in people's interest, nor does it promote a better understanding of environment among the peasants. Again, one has to look for sustainability a prudent balance between conservation and utilization of resources.

Water : Of the resources the most precious is water, almost as important as air, for all life forms. The global supply of available water is not unlimited, much of the global water is either in the form of saline water contained in the oceans or locked in polar ice and glaciers. As commonly known, the distribution of global mass of water is as follows:

Distribution of World Water: Million km³% of total Water in the oceans 1,348.097.3 Fresh water 37.5 2.7 The total amount of fresh water for the humanity is 37.5 million km³. A large part of this water is concentrated in glaciers and polar ice and the remaining is distributed as follows. As seen in the table below.

	Volume in million km ³	% of fresh water	% of Total
Polar Ice & Glaciers	28.20	75.2	2.04
Ground Water < 800 m deep	3.74	10.0	0.27
800-4000 m deep	4.71	12.6	0.34
Lakes & Rivers	0.127	0.3	0.01
Soil moisture & Atmospheric vapour	0.704	1.9	0.05
Total	37.48	100.0%	2.71

Source: Central Water Commission, extracted from after "The Role of Dams in the 21st Century, June, 1992, United States Committee on Large Dams

The above table brings to us the limited availability of fresh water in the world. The situation in India - in fact in all countries in the monsoon regime - is not very optimistic. The total renewable fresh water availability in India is as follows:

Total Annual Renewable Fresh Water Availability in India

- Total for India-----1869 million m³ (1869 km³)
- Total utilizable water----- around 1110 km³
- Surface water----- 690 km³
- Ground Water ----- 431 km³

(**Source:** Central Water Commission)

The estimates of Central Water Commission of the water potential, i.e. renewal annual resource including ground water is 1869 km³, of which the usable potential is only around 60%. The difference between the potential utilizable water resource occurs because of various constraints like relief, seasonality of flow etc.. The per capita availability, varying with population, is estimated differently by different agencies. According to FAO-UNO, the per capita availability has been slowly declining,

- 1990-----2187 m³ per capita
- 2000-----1813 m³
- 2008----- 1618 m³
- 2010-----1560 m³

Source: FAO Statistical Year Book-2014, Asia and Pacific

The availability of water in India is at the lower end of other South Asian Countries. For

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instance, while Bangladesh is very comfortably placed with 7932 m³ per capita water available (2012), Pakistan is poorly placed with only 1378 m³ per capita water available annually.

Share of Uses of Water in India.

Agriculture----- 85.3%

Industry----- around 2%

Domestic----- 5%

Per capita use of water is around 600 m³.

As can be seen, much of the water in India is used for irrigation purpose. This is typically in the case of monsoon countries. In Pakistan, for example 97% of the water is used for agriculture. In the USA, 27% of the available water is used for agriculture, while Germany hardly uses any water for agriculture.

Competing Users of Water in India: Besides the need of water for domestic purpose, there is a variety of uses and users who compete for water in specific areas. The need for irrigation in India is so great that often states are involved in inter-state disputes for their legitimate share of water wherever river basins cover more than one state, as is the case between Tamil Nadu and Karnataka claiming increasing proportion of Kaveri water. Similar situation exists between Punjab and Haryana. International water disputes erupt wherever several riparian states are involved. In India, the river Brahmaputra, Indus, Barak and Teesta often evoke controversies. The only river where sharing of river water is settled by a treaty between India and Pakistan is the river Indus which largely flows through a number of countries and its feeder tributaries like Sutlej, Beas, Ravi and Chenab originate in India. This was the Indus Water Treaty-1960, signed by India and Pakistan. Despite this treaty, Pakistan often resents the provisions of the treaty and takes the matter to the International Court of Justice whenever any project is undertaken on any of the tributaries of Indus in Indian territory. The matter is finally settled in the International Court of Justice.

In India, more acute is the problem of the dry core of India, the land enclosed by 500 mm isohyet that encloses many parts of most states of north-western, western and South India. The dry core of Maharashtra running through western districts of the state, with Akhij having the lowest rainfall in the state, needs a very careful plan for assuring regular supply of water. Even in areas where water is brought by canals or tube wells, there is always a claim for priority, like domestic versus industrial, urban supply versus irrigation in rural areas. Increasing urbanization, now reaching 31%, demands ever-increasing supply of water. Water management has become as important as the management of other resources. One cannot create more water, unless a costly process of desalination is adopted, but the latter has very limited potential. Equally severe is the problem of water contamination. Using water wisely and avoiding waste is a timely strategy and it has no longterm implication on its sustainability as it is a renewable resource. The hydrological cycle is an annual phenomenon and would be affected only by a change in the amount, direction of monsoons and consequently the regional distribution of rainfall. The country may not be able to create more water but can use the available water judiciously to avert any crisis.

Spatial overlap of forests, minerals, and ethnic communities. In India, and in many other countries, there is a spatial coincidence of water, forests, mineral resources and the habitat of many tribal communities. The interests of these communities are inextricably linked with the forest and water resources of that area. Whenever, a dam is to be built in such an area, or some minerals are to be mined, there is a general resistance from the local community. Such resistance is partly genuine but often borne out of a wrong perception of their exploitation. Their sentiments and fears are exploited by vested political interests and development of the area is stalled. Several mineral and mining projects,

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situated in tribal areas of the country, have been either delayed or completely stopped, with the active support of some political party or trade union groups. The concern for environment is not always well founded and even elite groups and many NGOs get involved in stalling the projects. The Narmada dam project is a case in point, a case in which Supreme Court had to intervene to enable the state of Gujarat to complete this very important project. This delay may have caused incalculable damage to many parts of the state. Is there a compensation for the delay, or is someone held accountable? Every resistance group goes scot-free.

Protection of environment, sustainable use of resources, maintaining bio-diversity in areas rich in plant and animal life are good initiatives and must be promoted. Yet, one cannot forget the humanity that is the focus of all development. The principle of sustainability, guarding the interests of future generations should be the sheet anchor of our development policy, yet we cannot ignore the immediate interests of the present generation. Let us hope, we develop a good understanding of sustainability to be adopted in the management of resources.

Thank you

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