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# **Conserve wisely or consume carelessly? The plight of species and landscapes in Kerala**

*Renjan Mathew Varghese\**

## **Introduction**

This is the question posed to each one of us in the face of sustainable development. Sustainable development as defined by the Brundtland Commission is “*development that meets the needs of the present generation without hampering the ability of the future generations to meet their own needs*”.<sup>1</sup> Future generation should be replaced with “our own children” so that there is a sense of connection rather than thinking that we are saving for someone else in the future. Kerala claims to be God’s Own Country because of the abundant greenery which is very much attributed to the abundant water resources that we have, namely 44 rivers fed by the monsoons. But the sad plight of our rivers currently is that no adult or child can jump into it and take a dip or go for a swim because as per the study conducted by Centre for Science and Environment and various other agencies, all our 44 rivers are polluted beyond acceptable limits. Is this sustainable development? Many a times we are not able to clearly answer this because

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\* State Director, WWF-India, Kerala State Office, Thiruvananthapuram – 695035. Paper presented at the 3 day National Seminar organized by the School of Indian Legal Thought held from 15-17, Feb 2018 on the topic ‘Transforming the World Towards Sustainable tomorrow: Concerns and Challenges.

1 United Nations World Commission on Environment and Development, Chapter 2, Towards Sustainable Development

sustainable development is more of a concept which is qualitative. In the recent past, this has been converted into a more quantitative term called 'Ecological Footprint' coined by WWF through its Living Planet Report.

### **Ecological Footprint**

It measures the amount of biologically productive land and sea area an individual, a region, all of humanity, or a human activity that competes for the same biologically productive space. Ecological Footprint has four components i.e. (1) Carbon Footprint which includes home energy use & transportation (real time local situation is that there is increase in carbon sources (vehicles), and reduction in carbon sink (urban trees and forests)) (2) Food Footprint (real time local situation is that a major portion of our food is imported, transported over long distances, and cold stored) (3) Housing Footprint (real time local situation is that even for a nuclear family of 2 or 3 members we still prefer to construct a house not less than 2000 square feet with resource intensive designs and architecture and we are still building new houses when we have 13 lakhs houses left unoccupied in the State as per the Economic Review Report) (4) Goods & Services Footprint (real time local situation is that we are a non-industry based economy and hence we have very high dependence on other states and other countries to meet our various needs).

### **Kerala – God's Own Country**

Compared to the other States of India, Kerala is a rather small State with a geographical area of 38,863 square kilometers and hence land is one of the most scarce commodity in the State. Based on topography, the State is divided into three physiographical regions, namely highland, midland and lowland. It has a coastline of 592 kilometers bordering the west and the Western Ghats, hotspot of biodiversity, bordering the east. The State has a moderate climate with average annual rainfall of 3000mm and hence it is blessed with various ecosystems with many microhabitats inhabited by abundant lifeforms.

## **Plight of species and landscapes in Kerala**

Kerala has different ecosystem types spanning across the length and width of the State, primarily (1) Forests including the various subtypes like Evergreen and Semi-evergreen forests, Deciduous and Drydeciduous forests, Grasslands, Shola forests, Myristica swamps, and Mangrove forests. (2) Coastal & Marine Ecosystem (3) Wetlands including Rivers, Estuaries, Freshwater lakes, Ponds, Public tanks, Kole lands, Paddy fields (4) Laterite hillocks and (5) Mountains and hills

## **Forest Ecosystem**

Considering their significance with regard to their values, functions, services and the inhabiting biodiversity, forest ecosystem is accorded different levels of protection and are rather well conserved. This can broadly be categorized into (1) Inside Forest Areas (PAs & Territorial Divisions) including Biosphere Reserve (Nilgiris and Agasthyamalai), National Parks (Silent Valley, Eravikulam, Mathikettan Shola, Anamudi Shola and Pampadum Shola), Wildlife Sanctuaries (Neyyar, Peppara, Shendurney, PeechiVazhani, Chimmony, Wayanad, Aralam, Idukki, Chinnar), Tiger Reserves (Periyar and Parambikulam), Bird Sanctuaries (Thattekad, Mangalavanam, Kumarakom and Choolannur), and (2) Outside Forest Areas (Social Forestry) including Community Reserve (Kadalundi) and Conservation Reserve (Kerala yet to declare one).

Necessary legislations have also been formulated to protect our forests and wildlife which includes the Forest Conservation Act, Wildlife Protection Act, Environment Protection Act and the recent Ecologically Fragile Land Act. Institutional mechanisms have also been setup right from the Central Government, namely Ministry of Environment, Forests & Climate Change with many institutions and autonomous bodies under it up to the State Government Departments, namely Revenue, Forests & Wildlife and Department of Environment and Climate Change.

Inspite of this, there are innumerable challenges faced by our forests and wildlife, primarily clearing of forests for development projects (Sabarimala, high range rail line etc.), poaching, human – wildlife conflicts,

road kills, elephant death on rail tracks and invasive alien species. (India net importer of timber). Solutions are also clear, in that, we have to (a) avoid major infrastructure development in forest areas (b) kill the demand for illegal wildlife products (c) reduce illegal encroachment/ conversion of forest for other purposes, and (d) reduce traffic during night/ enforce speed limit when driving through forest areas etc.

We need to award a higher priority to our forests because while considering the mitigation of global warming and climate change, trees are the solution. The desirable forest cover of a region is 33% of its geographical area. Kerala has a forest cover of 19-21% (which is a disputed figure since this is estimated using remote sensing imageries and sometimes monocrop plantations are also categorized as forests), which is much better than the national average of 13%. Forests provides us with a wide range of functions, values and services which are climate regulation, soil and moisture conservation, habitat for abundant wildlife, home for tribals, source of revenue and livelihood base for many.

### **Coastal and Marine Ecosystem**

Kerala's entire western border is the Arabian Sea. It has got a variety of coastal and marine ecosystems with many inhabiting lifeforms. Fish being an integral part of our food culture and our coastal and marine ecosystems catering to the major share of the fish resources, we have understood the importance of protecting these ecosystems and over the years have enacted many legislations for their conservation and protection including the Kerala Marine Fisheries Regulation Act (KMFRA) & Rules, Coastal Regulation Zone (CRZ) & Coastal Zone Management Plan (CZMP) enforced by the various institutions like the Kerala Fisheries Department, Kerala Coastal Zone Management Authority, Coast Guard and the Marine Enforcement & Vigilance (ME&V). Kerala stands second in the country, next to West Bengal, with regard to population density and subsequently the tenement density is also high. Within the State, it is the coastal area which has the highest population and tenement density and this puts a lot of anthropogenic pressure on these vulnerable and sensitive ecosystems.



Our coastal and marine ecosystem face different challenges, namely increased by-catch, destructive fishing techniques (dynamite fishing, illegal nets and mesh size etc.) and capture and trade of Schedule species. The solutions are also known (a) adopt/ enforce selective fishing techniques (b) patrolling by Coast Guard, ME&V & enforcing Minimum Legal Size (MLS), and (c) creating awareness and enforcement among the various stakeholders.

For example, let us take the case of Marine Turtle, i.e. Olive Ridley Turtles which are included in the Schedule I of the Wildlife Protection Act. Even though they live in the ocean, they come to the shores for making their nests and laying the eggs. During the nesting season mainly, these Turtles are faced with the various anthropogenic challenges like (1) they die when they are caught in trawl nets (2) they are injured and incapacitated when hit by engine propeller blades (3) caught by people for human consumption (4) nests are predated by humans and eggs sold and consumed (5) nests predated by jackals, stray dogs (6) nesting Turtles deterred by seawall construction (7) nesting beaches lost due to beach sand mining (8) artificial lighting landward disorienting the hatchlings.

Humans tend to do this because we feel that we are very superior and that anything and everything around us is at our disposal. We need to understand that all lifeforms have an equal stake to this Planet and they all have the right to live. Yes, humans are superior to other lifeforms in many aspects. But that vests a bigger responsibility on us to think and act responsibly. We need to understand that others do not exist because we exist. But others should exist so that our existence is not compromised. While considering Marine Turtles – what is its connection or relevance to humans? It ultimately filters down to the basic principle of maintaining Prey – Predator relation in the ecosystems around us. Olive Ridley Turtles mainly prey on jellyfish in the sea. In the recent past, we have been hearing more and more incidents of jellyfish blooms in the coastal waters of Kerala. Ever thought why this happens? This is directly linked to the drastic reduction in the population of Turtles because of the various anthropogenic threats listed above. Jellyfish blooms leads to reduction in fish catch and the

subsequent rise in price of fish. Another flip side of this is that, the plastic carry bags that we carelessly dispose off on land ultimately reaches the ocean. They float around in the water and looks just like jellyfish. The Turtles eat these plastic carry bags and many are washed ashore dead as these plastic carry bags clogs their intestine.

We need to understand that everything on our Planet is interconnected and we complement each other to ensure our mutual existence. We need to respect others and live and let others live.

### **Wetland Ecosystem**

Kerala has a wide assemblage of wetland ecosystem, namely rivers, paddy fields, freshwater lakes, estuaries, Myristica swamps, mangroves, mudflats, Pokkali fields, Kole lands etc. They provide us with many values, functions and services. Understanding this, many initiatives have been taken at the international, national, state and local level to ensure the protection of our wetland ecosystems., namely Ramsar Convention and declaration of significant wetlands as Ramsar Sites, enactment of the various laws and legislations like the Environment Protection Act, Wetlands (Conservation & Management Rules) 2010 under EPA, Kerala Paddy field and Wetland Conservation Act enforced by the various agencies like the Revenue Department, State Pollution Control Board, and the State Wetland Authority Kerala under Dept. of Environment and Climate Change

Wetlands are significant in that they provide Food security, Water security and Livelihood security to many people as both direct and indirect stakeholders. Mangroves are considered as the most productive ecosystem in the world, Myristica swamps, Kuttanad and Kole lands are very unique ecosystems

But every day, our wetlands are faced with multifarious challenges including (1) wetlands being considered as wastelands and being used for dumping unsegregated municipal and household waste (2) destruction, encroachment, and reclamation (3) pollution from different sources, and (4) overuse/ over-exploitation of the various resources available from these wetland ecosystems. We need to have some serious rethinking and understand

the values, functions and services provided by wetlands (Dr V.S. Vijayan, Former Chairman, Kerala State Biodiversity Board has estimated that if the functions, values and services provided by wetlands are converted into monetary terms, the figure is more than annual budget of the State) and hence (a) finalise and publish the Land databank (b) monitoring & vigilance, and (c) ensure scientific management of wetlands.

### **Laterite Hillocks**

Kerala has very good laterite hillocks spread out in 7 out of the 14 districts of the State. They are conserved under the Mines and Minerals (Regulation & Development) Act enforced by the Revenue Department, Department of Mining and Geology and Department of Environment & Climate Change. The issues at hand are (1) laterite bricks are cut out and used for mainline construction (2) laterite soil is excavated and used for filling wetlands and reclaiming paddy fields. There is only one solution and that is cutting of laterite hillocks should be regulated. Why should we so much be bothered about the cutting of these hillocks? Laterite hillocks with their numerous criss cross micro pores act as ‘Sponges of Planet Earth’ soaking and storing rain water and slowly letting it reach our water sources. The excavation of laterite hillocks leads to alteration of the topography which in turn will negatively impact the hydrology of the area. This activity is happening mostly unchecked across the State as laterite hillocks are seen as a revenue source rather than as an ecosystem.

### **Mountains & Hills**

Kerala has the highly priced hotspot of biodiversity i.e. the Western Ghats, a continuous strip of mountains and hills extending all the way from Kanyakumari to Gujarat, as its eastern border. There are many other smaller hillocks also in the State. These ecosystems are governed by the various laws and legislations enacted time to time by the Centre and the State including the Forest Conservation Act, Wildlife Protection Act, Environment Protection Act, Ecologically Fragile Land (EFL) Act, and the Community Forest Rights (CFR) Act. There are many direct and indirect stakeholders

(managers) connected to our mountain and hillocks, namely Forests & Wildlife Department, Local Self Government Institutions, Tourism Department and Revenue Department.

In spite of all the legal and institutional measures for protecting them, our mountains and hills are faced with various issues: (1) encroachment & conversion (2) land use change & soil and water erosion (3) pollution, and (4) over-exploitation (tourism). The solutions we have at hand are (a) regulation and enforcement (b) go organic, and (c) wise use

We should take all the measures necessary to protect our mountains and hills because (a) Western Ghats is a hotspot of biodiversity because of its very high endemism (endemism means species seen in that area is not present in any other part of the world) (b) our mountains and hills provides the base for a wide range of ecosystems and inhabiting lifeforms (c) they are the originating points of our rivers (d) they regulate the weather and micro-climate of our State (e) provide shelter to people and provides livelihood for many, and (f) they are a steady source of revenue for the State.

## **Conclusion and Way Forward**

With regard to all that has been stated above, we are not too late. It is not just the mandate of the Central or State Governments and their Departments, Legislature, Judiciary, enforcement agencies, NGOs, people's movements or environmentalists to respond to all these issues. Article 51A of the Indian Constitution says about Fundamental Duties which clearly states that 'every Indian Citizen has the role and responsibility to protect and safeguard the environment around them'. But the fundamental problem is that we are not aware about what is happening around us, what is its significance, why should we protect it and how should we do it. As the saying holds so true "*what we know, we will love; what we love we will protect. What we do not know, we fear; what we fear, we tend to destroy*". Let us take an all-out effort to know our forests, rivers, our coasts, our marine ecosystem, our laterite hillocks, mountains and smaller hills – understand their values, functions and services and its significance for our

healthy existence. Once we know that, we will develop a sense of belonging and with that we will start to love them as our own and hence we will go all out to protect them. A recent paper has highlighted the stark fact that *“the greatest threat to Planet Earth is our thinking that someone else will save it”*. We also make excuse saying that we do not have time. The question to us is *“If not you, who? If not now, when?”*

So let us do all things possible in our capacity to (1) Explore, Learn, Understand (2) Share the word around (3) Join in global, national and local campaigns (4) Raise your voice, Stand up for the voiceless (5) Volunteer – Time, Talent, Treasure (6) Take initiative on addressing local issues (7) Encourage Govt. Officials, and (8) Support environmental NGOs.

## **Soil Analysis and Crop Responsive Fertilizer Application Approach in Paddy in Acid Sulphate Soils for Improving Soil Health and Profit Maximisation- A Case Study with Field Level Demonstration in Thiruvvarppu Panchayath of Kottayam District, Kerala**

*Dr. Bini. K.,\* Pramod P.V,\* Ramesh P,\*\* J. Justin Mohan\*\*\**

### **Introduction**

India was hit by frequent famines during the period from 1940 to 1970s. The worst disaster was in 1943 during the Bengal Famine. An estimated 2.1–3 million,<sup>1</sup> out of a population of 60.3 million, died of starvation, malaria and other diseases along with malnutrition. After independence also India faced the challenges of insufficiency in food supply. During the period from 1940s to 1960s witnessed an increase in agriculture manifold, worldwide, under the initiative of Norman E Borlaug known as the ‘Father of Green Revolution’. The green revolution was the result of a set of research and

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1. Amartya Sen, *Starvation and exchange entitlements: a general approach and its application to the great Bengal famine*, 1 Cambridge Journal of Economics 35-59(March 1977)

technological advances like use of high yielding varieties of cereal grains, synthetic fertilizers and pesticides, irrigation infrastructure and modern agricultural equipments. In India, the main supporters of green revolution strategy were the then Prime Minister, Lal Bahadur Shastri, Agriculture and Food Minister, C. Subramaniam and Indira Gandhi, who followed Shastri in 1966, and M.S. Swaminathan, who became the Director of Indian Agricultural Research Institute (IARI) in 1965. In 1962, Borlaug's dwarf spring wheat strains were grown in the fields of the Indian Agricultural Research Institute (IARI) in Pusa, New Delhi under the guidance of Dr. M.S. Swaminathan who is the Father of Indian Green Revolution. India also adopted IR8 – a semi-dwarf rice variety developed by the International Rice Research Institute (IRRI) that could produce more grains of rice per plant when grown with certain fertilizers and irrigation. Green revolution helped countries like India to have a balance between population and food grain production.

Dr. M. S. Swaminathan himself during the period of Green revolution warned that indiscriminate use of fertilizers, pesticides and fungicides, unscientific tapping of underground water tapping may result in an agriculture disaster with less productive soil and deprival of natural resources. Ecological dimensions have to be added along with increased crop productivity. Sustainability in agriculture is possible through precision farming and need based application of inputs. This has to be popularized and demonstrated properly for increasing the yield and income of the farmer by reducing the cost of production.<sup>2</sup>

Dr. M.S. Swaminathan quoted that what nations with small farms and resource poor farmers need is the enhancement of productivity in perpetuity, without associated ecological or social harm. The green revolution should become an ever-green revolution rooted in the principles of ecology, economics and social and gender equity.<sup>3</sup>

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2 M.S Swaminathan, *An Evergreen Revolution*, 46 Crop Science 2293 (Sept 2006)

3 Reddy, K.C. & Ahmed, S.R. *Soil test based fertilizer recommendation for maize grown in inceptisols of Jagtial in Andhra Pradesh*. 48 J. Indian Society of Soil Sci, 84, 84-89. (2000)

According to the Lok Sabha budget session of March 2015, 36.47 LMT of Diammonium Phosphate (DAP), 2.91 LMT of NPK and 37.97 LMT of Muriate of Potash (MOP) worth 2,098.61 Million US \$ is imported for the fertilizer requirement of the country. The fertilizers like Urea, Di Ammonium Phosphate, various grades of complex fertilizers, Single Super Phosphate (SSP) etc. are being produced in the country. However, the gap between assessed demand and indigenous production is being met through imports. The demand of Muriate of Potash (MOP) is fully met through imports as there are no viable sources of MOP in the country. Thus fertilizer chemicals have become a commodity adding financial burden to the economy of the country.

### **Fertilizer policy and regulations in India**

Government of India has passed Fertilizer Control Order (FCO) under Essential commodity Act (EC Act) in the year 1957 for regulating sale, price and quality of fertilizers. Movement Control Order was passed in 1973 in order to control the movement of fertilizers. Based on the recommendations of Joint Parliamentary Committee, Government of India decontrolled all Phosphatic and Potassic (P&K) fertilizers namely DAP, MOP, NPK complex fertilizers and SSP with effect from 25th August 1992 which were under Retention Price Scheme (RPS) since 1977 except Urea which continued to remain under RPS. As a result, production and consumption of nitrogenous fertilizers increased and consumption of P&K fertilizers decreased. This led to severe imbalance in consumption of nitrogenous, phosphatic and Potassic fertilizers. The basic purpose of the Concession Scheme for P&K fertilizers has been to provide P&K fertilizers to the farmers at affordable prices so as to increase the food productivity in the country through balanced use of fertilizers.

Fertilizer is second highest in terms of subsidy (0.73 lakh crore or 0.5 % of GDP) after food. This has led to a high Fiscal Deficit. Fertilizer Association of India (FAI) points out “Budget allocations get exhausted in first few months of the financial year due to gross under-budgeting for the fertilizer subsidy in the successive Union Budgets. Also, only 35% of



total fertilizer subsidies reaches small farmers. The rest leaks out to black market, large farmers and inefficient producers

In early 1990s, the country was facing mounting fiscal deficit and there was an impending danger of foreign exchange crisis. In order to contain the subsidy burden, Government announced an increase of 40% in the price of fertilizers in July, 1991.

In order to check the excessive use of urea which is deteriorating the soil health and adversely impacting overall crop yield the Neem Coated Urea Policy, 2015 came into force stating that for domestic fertilizer firms to “Neem coat” at least 75 per cent of their urea production. The aim was to reduce the subsidy outgo and prevent diversion of urea for industrial use. There are also scientific support that neem coated urea remains in soil for more time period making it more available for plants with lesser adverse effect on soil.

Rationalization of fertilizer subsidies is important and Expenditure Reforms Commission (ERC) examined this issue in 2000 and made a strong statement for rationalization. The Economic Survey stressed on cutting back of price subsidies by using technology as a means to plug leakages. The technology adopted in the present study with increase in soil testing facility and issuing soil health cards is a major step towards this goal. Assessment of fertilizer requirement of each type of soil, pertaining to the crops through scientific experimentation can form the basement for formulation, assessment and amendment of fertilizer policies and rules by which the use of chemical fertilizers can be judiciously regulated for conservation of economy and ecology.

Fertilizer is one of the costliest inputs in agriculture. So under different soil climate conditions, it is necessary to have information on optimum doses for fertilizer use. The first step in managing fertility is through soil testing and is effective in increasing productivity. One of the reasons for lower production of rice is imbalanced fertilization of N, P and K nutrients<sup>3</sup> (Reddy and Ahmed, 2000). The most comprehensive approach of fertilizer application by incorporating soil test values, nutrient requirement of the crop, contribution of nutrients from soil, manures, fertilizers and fixing

yield-targets is possible only through Soil Test Crop Response (STCR) approach. <sup>4</sup>In Asia, adverse effects on soil health and soil quality arise from nutrient imbalance in soil, excessive recovery equal to 50% to 70% of what is applied can be achieved when N is applied in the proper amount, in the proper form, and at the proper time. <sup>5</sup> Raun *et al.* <sup>6</sup>have calculated that the 67% loss of applied N to cereal crops globally is equivalent to \$15.9 billion.

Soil health management (SHM) is an important intervention under National Mission for Sustainable Agriculture (NMSA). Its main objective is judicious use of fertilizers and chemicals and incorporation of organic and biofertilisers for improving soil health and productivity. The NMSA aims at creating awareness about optimum use of fertilizers to maintain soil health for sustainable crop production and also to impose regulations on use of fertilizers based on soil test data. For this soil health cards are being generated and distributed to each farmer plots as a joint effort of Central and State institutions and National Informatics Centre (NIC). The Mission also aims at keeping a digital record of the nutrient status of each and every cultivated field in the entire country. An experiment cum demonstration was conducted in Thiruvareppu panchayath of Kottayam District in Kerala as part of this mission.

Rice (*Oryza sativa* L.) is one of the most important food crops of the world and is the primary staple food for millions of people in different continents. As far as Kerala is considered the cultivation of rice has occupied pride of place in the agrarian economy of the State. But the area under paddy cultivation has been drastically decreasing over the year's even though it is considered as a deficit state for its annual requirement. According to state planning board, Kerala lost about 5,00,000 hectares of paddy lands

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4 Anand Kumar M et al. *Influence of Soil Test Based Application of Phosphorus Fertilizers on Yields of Paddy: A Case Study in Khammam District of Andhra Pradesh.*, 8 J. Rice Res.48, 48-52 (2015)

5 Peng, S. & Cassman K.G.. *Upper thresholds of nitrogen uptake rates and associated N fertilizer efficiencies in irrigated rice.* 90, Agron. J, 178, 178-185. (1998)

6 Raun, W. R., J. B et al. *Improving nitrogen use efficiency in cereal grain production with optical sensing and variable rate application.* 94, Agr. J. 815, 815-820 (2002).

between 1980s and 2007 after that was at diminishing rates. There are many reasons behind the decreasing trend in paddy cultivation in the State and one of the main factors is the increased cost of cultivation. Ensuring food security for escalating population necessitates the production of additional food grains from the same land without losing the production potential of the soil.

Kuttanad is one of the largest wetlands of the country and is a unique ecosystem. A major portion of wetland of Kuttanad is acid sulphate soils generally referred as 'Kari soils'. Acid sulphate soil is the common name for soils that contain metal sulfides. In an undisturbed and waterlogged State, these soils may pose no or low risk. But when disturbed or exposed to oxygen, acid sulfate soils undergo chemical oxidation, produces sulphuric acid which has led to these soils being called acid sulphate soils.<sup>7</sup> They are characterized by extreme acidity and toxic levels of iron, aluminium and sulphur ions. These have serious limitation in crop production and even there is a downward trend in total rice production due to soil deterioration. Due to the inherent characters of acid sulphate soils, fixation of nutrients may occur and hence judicious use of fertilizers is very important for yield and profit maximization.

For the present study, the season of the crop was from second half of November to second half of March, considered as early Punja crop. The area belongs to Upper Kuttanad, and the inherent properties of acid sulphate soils influence crop production here. The soils of the area are very dark grayish brown, strongly acidic, with clayey texture. The climate of the soil is humid tropical with a mean annual temperature of 27.320 C. During monsoons these soils are frequently flooded. Poor drainage and poor aeration are the other drawbacks of these soils. Overdose of fertilizer application is a cause of concern in the area in terms of profitability and also with respect to soil and water pollution. The rice fields are directly connected to water bodies and excess chemicals drains finally into the Vembanad backwaters.

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<sup>7</sup> Arya Nath V et al. *Chemical and biological characterization of acid sulphate Kuttanad soils*, 11 Asian J. Soil Sci. 269, 269-276 (2016)

## METHODOLOGY

The field level demonstration was conducted in 50 cents of paddy based on soil test results and crop response to fertilizers. The effect of Plant Growth Promoting Rhizobacter (PGPR) mix (1) (biofertilizer) and *Pseudomonas fluorescence* (biofungicide) was also demonstrated in the experimental field. The intention was to demonstrate the increase in yield and profitability in paddy with the adequate use of fertilizers based on soil health card data. This was compared with two control plots of 50 cents each with usual practices of farmers in which indiscriminate use of fertilizer application was followed. Use of PGPR was also not a conventional practice in the farmers' field.

### Soil sample collection

The soil samples from surface were collected at a depth of 0-15 cm according to standard soil sampling procedures followed by the Department of Soil Survey and Soil Conservation, Kerala. They were analysed for P<sup>H</sup>, EC, N, P, K, Ca, Mg, S, Fe, Mn, Cu, Zn, B at the Central Soil Analytical Laboratory, Parottukonam, Thiruvananthapuram. The soil analytical results revealed that the nitrogen in soil was high, phosphorous was low and potassium was medium. All the micronutrients were found to be sufficient while the iron concentration was in toxic levels.

### Preparation of fertilizer calendar

A crop calendar was prepared for the time of application of fertilizer along with quantity (KAU, Package of practices) . Based on the soil test results, a soil health card was generated, for which the quantity of nutrients needed for the crop was calculated for one hectare. Straight fertilizers viz; Urea (100 Kg in two split doses), Rock phosphate (250 Kg as basal dose), and Muriate of Potash (50 Kg in two split doses) were applied in the field for the supply of major nutrients instead of farmer practice of providing complex fertilizers viz; Ammonium phosphate sulphate(270 Kg), and also Urea(84 Kg), Muriate of Potash(125 Kg) . Foliar application of micronutrients

(B and Zn) was also undertaken considering the special characteristics of acid sulphate soils. The farmers practice was followed for time and split application of fertilizers.

### **Leaf Colour Chart (LCC)**

Leaf Colour Chart (LCC) was used for detecting the nitrogen fertilizer needs of the crop. The greenness of the leaf colour indicates the nitrogen content of the leaf. The topmost youngest fully expanded leaf was checked with leaf colour chart from tillering stage onwards at 20 days interval.

### **Sowing of seeds**

Direct seeding practice was followed in the area with a seed rate of 100kg/ha. Seeds were treated with *Pseudomonas fluorescence* before sowing in the demonstration plot based on Package of Practices recommendations, Kerala Agricultural University, which was not a done in control plots. All other agronomical and plant protection practices of farmers were practiced in the demonstration plot also.

### **Data collection**

Data were collected from both demonstration plots and farmers' plot on root length and health (23 days after sowing), plant height, number of tillers and productive tillers, 1000 grain weight and total yield. Economic analysis was also taken up to calculate B:C ratio of the module to know the profitability of the technology.

## **RESULTS AND DISCUSSION**

### **Effect of seed treatment with *Pseudomonas fluorescence* on root growth**

It was observed that the root growth measured in terms of root length and number of healthy roots was more for the treatment plot compared to two control plots of the farmer. The roots in treatment plot were healthy and whitish while that of the control plots were unhealthy and discolored.

Several studies in different crop plants reveal enhanced growth parameters with the application of *Pseudomonas fluorescense*. It is interpreted that these bacteria have promoted better root growth that enhanced the uptake of nutrients resulting in improved plant growth.

### **Effect of optimum fertilizer dose on plant height and leaf colour**

The average plant height was 88 cm in the treatment plot compared to the farmer field while that of farmer plot was 110 and 112 respectively. The luxuriant vegetative growth of the plant and lodging in the farmers field happened due to succulent shoots that can be attributed to surplus amount of nitrogen. Moreover, weeds in paddy fields especially grass weeds have better intake of nitrogen resulting in more competition with rice plants. The colour of the leaf was also an indication of correct dose of nitrogen in the treatment plot tested using Leaf Colour Chart (LCC). The LCC panel of the demonstration plot was between 3 and 4 while the farmer plot was indicating darker than panel 4. The value between 3 and 4 is an indication of the better canopy while more than 4 indicates surplus nitrogen uptake.

### **Effect of optimum fertilizer dose on number of tillers and number of productive tillers per plant**

In the treatment plot, it was observed that the productive tiller percentage was 88%, while with the control plots it ranged from 45-72%. The results may be attributed to the better intake of nutrients and less adverse interactions. In the control plot excessive dose of major nutrients should have inhibited the absorption of other elements. Several studies suggest that there is nutrient antagonism especially with high nitrogen content inhibiting effective utilization of P and K.

### **Effect of optimum fertilizer dose on 1000 Grain weight and Total grain Yield**

It was observed that the 1000 grain weight in the treatment plot was 26 g which is the potential grain weight of variety Uma. The total yield of the

demonstration plot was 6.83 tonnes/hectare while that of the control plots without nutrient management was 6.43 and 6.25 tonnes/hectare respectively. The yield difference between demonstration plot and control plot was found to be significant (t value, 7.92).<sup>8</sup> Ujwala<sup>9</sup>(2011) in a study on nutrient interactions suggests that excessive amounts of nitrogen reduce the uptake of phosphorus, potassium, iron and almost all secondary and micronutrients like calcium and magnesium iron, manganese, zinc and copper. The study reveals a strong antagonistic interaction between excess nitrogen and non exchangeable potassium in the soil. Potassium is an important element in enzyme activity triggering protein and starch synthesis. In the farmer's plots, 77 Kg of nitrogen and 45 Kg of potassium was in excess compared to the demonstration plot. It was assumed that correct dose of nitrogen along with adequate dose of potassium as  $\text{KNO}_3$  through foliar application should have resulted in the increased grain weight and total yield in the demonstration plot. The same study by Ujwala (2011) also indicates the antagonistic interaction between magnesium and potassium also. In the treatment plot magnesium was also supplemented as  $\text{MgSO}_4$  foliar spray which in turn increased the grain yield and total yield. Similarly the correct dose of foliar spray of micronutrients Zn and Boron also contributed to the increase in yield. In the demonstration plot, pseudomonas fluorescence was sprayed and could avoid the use of fungicide application.

### **Economic benefits of nutrient management based on soil testing**

The economics of the present practice was calculated based on Benefit/Cost (B/C) ratio. It was found that the cost of cultivation per hectare in the control plots (1 and 2) without soil nutrient management was Rs. 60106, 60981 respectively while that of the demonstration plot was Rs.54792. The income obtained from the control plots and demonstration plots were respectively Rs. 1,44,675, 1,45,200 and 1,53,675. The B/C ratio was found

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8 Beena V I et al, *Characterization of Acidity in Acid Sulphate Soils of Kerala*. 8 J. Life Sci 907, 907-912 (2012)

9 Ujwala R M. *Interaction of micronutrients with major nutrients with special reference to potassium*. 24, Karnataka J. Agric. Sci. 106, 106-109. (2011)

to be 2.4, 2.4 and 2.8 respectively. The effective additional income of the farmer using the soil health management practice from both increase in yield and reducing cost of fertilizer was found to be Rs. 14314/hectare and Rs.11334/hectare compared to the control plots.

## **Conclusion**

The present study indicates that application of recommended doses of fertilizers based on soil test values recorded more grain yields in paddy as that of farmers practice and there was a net savings in the cost of fertilizers applied per hectare to the extent of Rs.4289 (about 52%) The reduction in cost of inputs is the initial step in profit maximization. In reality, yield optimization consists of adequate supply of nutrients so that any nutrient may not be a limiting factor. Cultivation practices based on soil test results combined with proper recording of crop response is important for yield maximization.

Unbalanced and excess use of fertilizers especially nitrogenous fertilizers also pose serious threat to ecology. Nitrates (as in fertilizers) are highly water soluble and move with surface runoff into water bodies. The pollution of water bodies especially with excess dose of nitrogen results in the process of eutrophication which is hazardous to many aquatic lives. Excess nitrates, can also cause health problems in humans also. When ingested, nitrates are converted into nitrite in the intestine, which then combines with hemoglobin to form methemoglobin. It is particularly problematic in children, referred as “blue baby syndrome.”

Scientific background is essential for formulation and enforcement of rules and regulations for the use of agricultural chemicals and fertilizers. This experiment provides a scientific basis for the adoption of laws regarding the optimum use of fertilizers for a sustainable environment and also for developing economic guidelines for agricultural policies such as fertilizer subsidy norms.



## **Sustainable Development: A Conceptual Revisit**

*Dr. Preetha S\**

*The paper analyses the concept of sustainable development as defined in various international documents on Environment. The inherent ambiguity in the concept of sustainable development and resultant dilemmas in the strategies to be adopted to achieve sustainable development is examined. It points out the need for redefining the concept of sustainable development in tune with the ecocentric approach which mandates respect for the intrinsic value and integrity of all forms of biotic and abiotic components of nature. A better solution to the environmental problems that we face today could be solved by endowing nature with legal rights.*

Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition was adopted by the World Commission on Environment and Development (Brundtland Commission) initiated by the United Nations in 1982. The Commission published its report, *Our Common Future* in 1987 and the term ‘sustainable development’ was coined to signify the need for a change in our ways of living and governing. <sup>1</sup>The

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1 See Chapter 2 of the Report of the World Commission on Environment and Development: *Our Common Future* available at <http://www.un-documents.net/our-common-future.pdf> (visited jan 24,2018)

definition adopted by the Bruntland Commission was reaffirmed in the United Nations Conference on Environment and Development held at the Rio De Janeiro, 1992 (the Earth Summit), the Johannesburg Declaration of 2002 and the Rio Declaration of 2012. The divergence of opinion between the developed and developing nations on the question of environment and development was acknowledged in the Stockholm Conference on Human Environment, 1972. The Bruntland Commission was committed to bringing in a consensus among the nations and tried to define the concept of sustainable development in a way that balanced the demands of environmental protagonists and development advocates. Bruntland expressed the inseparability of environment and development in the following words:

*The environment does not exist as a sphere separate from human actions, ambitions, and needs, and attempts to defend it in isolation from human concerns have given the very word “environment” a connotation of naivety in some political circles. The word “development” has also been narrowed by some into a very limited focus, along the lines of “what poor nations should do to become richer,” and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of “development assistance.” But the “environment” is where we live; and “development” is what we all do in attempting to improve our lot within that abode. The two are inseparable”.<sup>2</sup>*

The satisfaction of human needs and aspirations is the major objective of development. The basic needs of vast number of people in developing countries for food, clothing, shelter, jobs are not being satisfied. Beyond their basic needs these people have legitimate aspirations for an improved quality of life. Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better and fulfilling life. A world in which poverty and inequity are endemic will always be prone to ecological and other crises. Poverty forces the poor to deplete the resources for survival and the degradation of environment further impoverishes the people.

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2 World Commission on Environment and Development, Our Common Future (Oxford University Press 1987).

The call for sustainable development was born of conflicting realities. On the one hand, economic growth was essential to wipe out the malaise of poverty. On the other hand expansion of economic activity was resulting in deterioration of environmental quality. So a development path that alleviates poverty and sustains environmental resources was the need of the hour. This led to the coining of the concept of sustainable development. It served as a grand compromise between those who are principally concerned with nature and environment, those who value economic development, and those who are dedicated to improving the human condition. The inseparability of environment and development is the core of this compromise that is sought to be achieved by the sustainable development model of growth.

### **Sustainable Development as a Process of Change**

The Bruntland Commission used the concept of sustainable development to articulate the change required in our perspective of how we use the natural resources for realisation of human development. The idea of sustainable development required policy makers to consider the long term impact of a given choice on the society, environment and economy which constitute the three pillars of sustainable development.<sup>3</sup> The society, the economy and the environment are interdependent on each other. The society is dependent on its environment and its ecosystem for economic development. A healthy society free from diseases, poverty and unrest is sine qua non for economic development. Social development and economic development ultimately depends on a clean and healthy environment. Hence it is the responsibility of mankind to leave a clean and healthy planet for future generations.

The Bruntland Commission used the concept of sustainable development as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future as well as present needs. The

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3 Id.

Commission recognised that the process is not easy or straightforward. Painful choices have to be made. Sustainable development requires that those who are more affluent adopt life-styles within the planet's ecological means. Thus the goal of sustainable development ultimately rests on political will. The Commission laid down a strategic framework for achieving sustainable development. Sustainability requires integration of economic and ecological considerations in decision making. Individuals are to be persuaded or made to act in the common interest. Sustainable development involves more than growth. It requires a change in the content of growth, to make it less material- and energy-intensive and more equitable in its impact. These changes are required in all countries as part of a package of measures to maintain the stock of ecological capital, to improve the distribution of income, and to reduce the degree of vulnerability to economic crises.

### **The Failure of Sustainable Development paradigm**

The concept of sustainable development had great human appeal when it was initially coined. Perhaps the term was defined in the best possible way by the Brundtland commission. But over a period of time it was realised that the definition and strategies adopted to achieve sustainable development had largely failed in achieving the desired result of making our mother earth a better place to live in and in achieving a balanced development. The failure of sustainable development paradigm can be attributed to many factors.

The sustainable development paradigm largely failed because of the intense competition from the countervailing paradigm of globalisation.<sup>4</sup> Globalisation is a multifaceted phenomenon which encompasses integration of markets, growth of international trade, exchange of ideas and culture & sharing of technology. Globalisation has potentially beneficial consequences as well as potentially devastating effects on the economy and society. It

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<sup>4</sup> Martin Thor, *Globalisation and The Crisis of sustainable Development, Third World Network* available at <https://www.twn.my/title/end/pdf/end01.pdf>(visited Dec 10,2017)

was believed to bring in better opportunities for developing nations in terms of better productivity and better living standards for people. However the market globalisation agenda (the one-sided neo-liberal economic aspect) was vigorously pursued by the industrialised North and the governments of the G-7 countries were serving the private commercial interests of the global corporate.<sup>5</sup> The sharing of financial resources and technical know-how for promoting sustainable development (which was highlighted as the beneficial consequences of globalisation) did not happen. Globalisation did not and is not working for the environment. Nor did it work for the world's poor. Conscious management of the globalisation process for the betterment of the people and the environment requires a lot of political will on the part of the governments in developing nations. The multinational corporations that sprouted in the wake of globalisation are plundering the natural resources at an unprecedented pace.<sup>6</sup> The life support system has been overburdened as a result of plundering of the planet.<sup>7</sup> International investment must be made conditional on a demonstrated commitment to environmental protection to promote the greening of globalisation process and to give it a human face. A political intervention of this kind did not happen in any of the developing nations.

### **Anthropocentric Approach of the Definition**

The sustainable development framework is very much anthropocentric and places human beings at the centre of concerns for sustainable development. The whole idea of environment protection is based on the premise of human welfare and happiness. The very first principle of the international conference on the Human Environment held at Stockholm in 1972 emphasised the responsibility of human kind to protect and improve the environment for present and future generations. The natural resources of the earth, including

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5 James Gustav Speth, *Global Environmental Challenges: Transitions to a Sustainable World* 147(Orient Longman 2004).

6 David Korten, *When Corporations Rule the World*,34(Kumarian Press 2001)

7 Sarah Joseph, *Corporations and Transnational Human Rights Litigation*, 12 (Hart Publishing 2004)

the air, water, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management and adequate policies and measures should be adopted to face these problems.<sup>8</sup> The Stockholm conference laid emphasis on preserving natural ecosystems for the benefit of present and future generations of mankind.

It is seen that most of the international documents have adopted an anthropocentric approach in defining sustainable development. The idea that natural ecosystems should be maintained and preserved for the benefit and sustenance of human kind is referred as the ‘anthropocentric approach’.<sup>9</sup> Anthropocentrism regards human being as the sole bearers of intrinsic value and all other species and components of nature are there to sustain humanity’s existence. The anthropocentric approach is flawed as it considered human beings as superior to other living beings and gives an unjustified preference to human species.<sup>10</sup> This approach has failed in achieving the balance of nature and we find this imbalance being manifested in the form of many catastrophes like draughts, floods, cyclones, thunderstorms and avalanches all around the world.

The prodigious expansion of human population and consumption resulted in pollution, depletion of biological diversity and energy sources. Every individual is entitled to an equal right to basic necessities and amenities of life. The goal of development intends to improve the quality of life of all human beings. Equitable access to basic resources is an essential ingredient of right to development.<sup>11</sup> Every human being born on earth, whether rich or poor, whether living in urban areas or villages have an equal right to

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8 The UN Conference on Human Environment, 1971, Article 2.

9 Kortenkamp & Moore, ‘*Ecocentrism and Anthropocentrism: Moral reasoning about Ecological Commons Dilemmas*’, 21 *Journal of Environmental Psychology* 261 –272. (2001)

10 Onora O Neill, *Environmental Values, Anthropocentrism and Speciesism*, available at [http://www.environmentandsociety.org/sites/default/files/key\\_docs/ev6\\_2\\_oneill.pdf](http://www.environmentandsociety.org/sites/default/files/key_docs/ev6_2_oneill.pdf) (visited Dec 15,2017)

11 United Nations Declaration on Right to Development, 1986, Art.8.

development.<sup>12</sup> It is the responsibility of nation States to take all necessary measures for realisation of right to development. Right to development implies access to all resources which ensure economic, social, cultural and political wellbeing. Every human person is entitled to contribute and enjoy the processes of development. Catering to economic, social, cultural and political wellbeing of each individual requires exploitation of natural resources on a larger scale thereby increasing the human impact on environment.

The ecological footprint method is being increasingly used to assess human impact on environment.<sup>13</sup> The ecological footprint calculations have found that human beings are living beyond their biophysical means.<sup>14</sup> Ecological footprint is a measure of the amount of bio-productive land and sea required to support a person's lifestyle. It includes the land needed to grow their food, dispose of their waste and absorb their carbon emissions. This method uses social, economic and environmental indicators to determine whether development is sustainable. The footprint counts all the impacts of personal spending as well as the business and government expenditure on their behalf. People living in cities have large footprints whereas people in villages have smaller footprints. The ecological footprint calculations have reinforced the view that if everyone enjoyed an American standard of living then globally this would require three earths. A 2008 report suggests that India has the world's third biggest ecological footprint, that its resource-use is already twice of its bio-capacity.<sup>15</sup>

The choice we make every day in our life about our food, homes and transport definitely has an impact on the environment. Using the public

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12 P.Leelakrishnan, *Environmental Law in India*, 101. (Lexis Nexis 2005)

13 The Ecological Footprint method was first proposed by Mathis Wackernagel and William Rees at the University of British Columbia in 1990. It was propagated worldwide by the Global Footprint Network ([www.footprintnetwork.org](http://www.footprintnetwork.org)). This tool calculates the ecological impact of a unit of population.

14 Ian Moffatt, "Ecological Footprints and Sustainable Development", 32*Ecological Economics* 359-362 (2000).

15 India's Ecological Footprint: A Business Perspective, available at [https://issuu.com/globalfootprintnetwork/docs/india\\_report\\_2008](https://issuu.com/globalfootprintnetwork/docs/india_report_2008) (visited Dec 15,2017)

transport system instead of using our car can reduce our ecological footprint to a great extent. As responsible citizens we should be aware of the impact of our actions on the climate and biodiversity and change our patterns of consumption. A conscious choice needs to be made between survival emission and luxury emission. Even in Indian cities having cool and moderate climate, we tend to sit in air conditioned office rooms. At the same time we blame the village farmers for causing smog in cities by straw burning in fields.<sup>16</sup> We are intolerant towards burning of straw by farmers but are least bothered about the excess energy consumed by luxurious electronic gadgets. Even the Government policies and programmes are piecemeal responses to the immediate problems facing the country. In the name of food security we go in for chemical intensive technology ignoring its environmental impact. The theme of long term sustainability must be built into each and every policy of government.<sup>17</sup> Individual actions will make a great difference and they should feel that it is their responsibility to make changes in their lives to reduce human impact on environment. Change in lifestyle and consumption pattern can bring down the human impact on environment. We are almost in a race to the finish and it is high time we effect the needed changes.

### **Inherent Ambiguity in Definition**

The failure of sustainable development paradigm can also be attributed to the ambiguity inherent in the concept of sustainable development. Sustainability is used to mean the ability of the resources to sustain life in general and human development in particular. Life is to be sustained and at the same time development is to be promoted to ensure a fulfilling life for all human beings. The sustenance of life requires the conservation of the life support system which includes a variety of biotic and abiotic

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16 Available at <https://timesofindia.indiatimes.com/city/chandigarh/punjab-haryana-refuse-to-take-blame-as-smog-envelopes-delhi-again/articleshow/61922231.cms> (visited on Dec 10,2017)

17 Ashish Kothari, *Development and Ecological Sustainability in India*, available at [https://www.oxfamindia.org/sites/default/files/Working%20paper%2016\\_0.pdf](https://www.oxfamindia.org/sites/default/files/Working%20paper%2016_0.pdf) (visited Dec 15,2017).



components of the planet. But developmental activities lead to destruction of the ecosystem. There is a wide divergence as to the items to be sustained. There seems to be no consensus as to what all is to be developed. It may be because of varied aspirations of people. Food, shelter and clothing are recognised as human needs which are very basic and essential and without which it is not possible to lead a dignified life. But a bare satisfaction of these basic needs is not what a modern society aspires for. Large scale projects are undertaken to provide basic amenities to the vast section of people. Big dams are constructed to provide water to people living in urban areas which in turn lead of environmental degradation.

Lack of tools and indicators to measure sustainability of development is another factor that contributed towards the failure of sustainable development model. Indicators of development are necessary for planning and decision making. Indicators of sustainable development are necessary to measure progress, to develop strategies and prioritise policy interventions. Sustainable development is difficult to measure, but some tools and measures are necessary to ascertain whether we are marching in the right direction towards sustainable development. The international community started thinking about tools and measures to evaluate sustainability of development in late 1990's.

The 1992 United Nations Conference on Environment and Development (UNCED) at Rio recognized the important role that indicators can play in helping countries to make informed decisions concerning sustainable development. Agenda 21 calls on countries, governmental and non-governmental organizations to develop and identify indicators of sustainable development that can provide a solid basis for decision-making at all levels. Harmonization of efforts at developing sustainable development indicators at the national, regional and global levels was also called for. The World Commission on Sustainable Development approved its work programme on Indicators of Sustainable Development in 1995. It was widely accepted by the world community that development is not to be measured in a narrow sense to cover growth in 'income' alone. Sustainable development has to be viewed in a wider perspective to cover improvement in quality of life and wellbeing. With this perspective in mind the first edition of 134 indicators were developed in 1996 based on themes such as management of natural

resources and energy, food security, public health, social inclusion, education, green house gas emission, water quality, good governance and consumption pattern. The first set of indicators was developed after discussions with a wide range of stakeholders. There were significant differences in the way each group of stakeholders conceptualised sustainable development and this called for dividing indicators based on various dimensions of sustainable development. Hence the indicators were again grouped on basis of social, economic, environmental and institutional dimensions of sustainable development. So the second edition was brought in based on the above four core themes with 58 indicators. The third edition with 50 indicators was developed in response to the demand for developing indicators at country level in line with national conditions and priorities. These indicators are used by nations to assess the overall progress towards sustainable development. Thus world community has of late started tracking the progress towards the goal of sustainability of development.

## **Ecocentrism**

The concept of sustainable development is to be redefined in tune with the ecocentric approach which mandates respect for the intrinsic value and integrity of all forms of life and abiotic components of nature. It is suggested that the unprecedented environmental crisis can be addressed by following the ecocentric approach. Our aim should be to ensure a decent quality of human life without endangering the planetary life support system. Environment is to be protected not for the conservation of human life on earth alone, but rather environment is to be protected for its own sake, for the survival and sustenance of all life forms. It is ultimately the eco-centric approach that can sustain the balance of nature. Law and policies based on eco-centric approach is central to solving the unprecedented environmental crisis.<sup>18</sup>

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18 Hayden, *Why Ecocentrism is the Key Pathway to Sustainability*, available at [https://www.researchgate.net/profile/Helen\\_Kopnina2/publication/315580893\\_Why\\_ecocentrism\\_is\\_the\\_key\\_pathway\\_to\\_sustainability/links/58d4f3504585153378514750/Why-ecocentrism-is-the-key-pathway-to-sustainability.pdf](https://www.researchgate.net/profile/Helen_Kopnina2/publication/315580893_Why_ecocentrism_is_the_key_pathway_to_sustainability/links/58d4f3504585153378514750/Why-ecocentrism-is-the-key-pathway-to-sustainability.pdf) (visited Dec 15, 2017)

The ecocentric approach gained international recognition for the first time in the World Charter for nature adopted by the UN in 1982. The preamble states that every form of life is unique, warranting respect regardless of its worth to man, and, to accord other organisms such recognition, man must be guided by a moral code of action. It recognised that Lasting benefits from nature depend upon the maintenance of essential ecological processes and life support systems, and upon the diversity of life forms, which are jeopardized through excessive exploitation and habitat destruction by man. The degradation of natural systems owing to excessive consumption and misuse of natural resources, as well as to failure to establish an appropriate economic order among peoples and among States, leads to the breakdown of the economic, social and political framework of civilization. Competition for scarce resources creates conflicts, whereas the conservation of nature and natural resources contributes to justice and the maintenance of peace in society.

The Earth charter proposed for United Nations endorsement at the World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa in 2002 strongly advanced an ecocentric view. The very first principle of the charter recognized that all beings are interdependent and every form of life has value regardless of its worth to human beings. The resilience of the community of life and the well-being of humanity depend upon preserving a healthy biosphere with all its ecological systems, a rich variety of plants and animals, fertile soils, pure waters, and clean air. The challenge ahead is to form a global partnership to care for earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living. We must realize that when basic needs have been met, human development is primarily about being more, not having more. We have the knowledge and technology to provide for all and to reduce our impacts on the environment. The emergence of a global civil society is creating new opportunities to build a democratic and humane world. The Earth charter required people to accept that with the right to own, manage, and use natural resources comes the duty to prevent environmental harm and to protect the rights of people

and that with increased freedom, knowledge, and power comes increased responsibility to promote the common good. However the charter was not endorsed at the Johannesburg Summit. The UN Rio Summit failed to endorse the intrinsic value of nature. The UN Sustainable Development Goals, 2015 also failed to acknowledge ecocentrism, the intrinsic value of nature and the rights of nature.

### The Indian Judiciary

The Indian judiciary played a sentinel role in developing environmental jurisprudence in our country. The principles laid down in the International Conventions on Environment such as the precautionary principle, polluter pay principle, principle of inter-generational equity were adopted as part of domestic law by the Indian judiciary to protect the environment. Recently we find the judiciary taking a progressive and eco-centric approach to address the environmental concerns facing the nation.

The Supreme Court of India adopted the eco-centric approach in *T.N. Godavarman Thirumulpad v. Union of India*<sup>19</sup> to protect and preserve the Asiatic wild buffalo. In *T.N. Godavarman Thirumulpad v. Union of India-II*,<sup>20</sup> based on eco-centric principles, orders were issued for preservation of endangered species of 'Red Sandalwood' which is found in Andhra Pradesh. In *Centre for Environment Law, WWFI v. Union of India*,<sup>21</sup> the Supreme Court reiterated that every species has an inherent right to live and shall be protected by law. The case involved protection of Asiatic wild lion, an endangered species. Again in *Animal Welfare Board of India v. Nagaraja*,<sup>22</sup> the Supreme Court deprecated the practice of using bullocks for *Jallikettu* and held that non-essential human activities like bullock-cart race and *Jallikattu* should be avoided. Using bulls for racing solely for human pleasure is a violation of their right to life. The Supreme Court

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19 (2012) 3 SCC 277.

20 (2012) 4 SCC 362.

21 (2013) 8 SCC 234.

22 (2014) 7 SCC 547.

held that right to dignity and fair treatment is not confined to human beings alone, but to animals as well. No one species shall have a right to encroach upon the rights and privileges of another species. Law and policies based on eco-centric approach would be the best guarantee for sustenance and wellbeing of life on earth. Nature has an intrinsic value apart from its usefulness to humans and nature needs to be protected for nature's sake.

The judiciary has played its part well and now it is for policy makers and political leadership in India to come up with strong policies to reduce spiralling population growth and increasing pressure on ecosystem for more and more exploitation of resources. The two competing claims of the need for development and protection of environment have to be balanced in the most effective manner through judicious use of natural resources. It is neither feasible nor practicable to have a negative approach to the development process but that does not mean, without any consideration for the environment. There should be a proper balance between the protection of environment and the development process. The society should prosper, but not at the cost of the environment and in the similar vein, the environment shall have to be protected but not at the cost of the development of the society. There shall have to be both development and proper environment and as such, a balance has to be found out and developmental actions ought to proceed in accordance therewith and not *d'hors* the same.

### **Nature as a subject of its own rights**

A better solution to the environmental problems that human beings face in the 21<sup>st</sup> century can be found by treating nature as a subject or legal person that can exercise its own rights rather than treating nature as an object which has to be protected.<sup>23</sup> The ecological conflicts could be solved by conferring personhood on nature and giving subjective rights to nature. This kind of thinking is slowly becoming part of the legal discourse and

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23 Tabios Hillebrecht, Anna Leah and Berros, María Valeria (Eds). *Can Nature Have Rights? Legal and Political Insights*, RCC Perspectives: Transformations in Environment and Society (2017) available at [doi.org/10.5282/rcc/8164](https://doi.org/10.5282/rcc/8164)(visited Feb 3,2018)

the duty is cast on the environmentalists and lawyers to develop and extend the concept of 'personhood' to nature. The traditional approach has treated nature as a thing or property to be used, polluted and exploited for human happiness. In contrast the right based approach considers nature as a person capable of having rights on its own. Legal personhood is a promising tool for protecting nature.<sup>24</sup> Each time an attempt to confer rights onto some new entity is made, the proposal is bound to sound odd, frightening and laughable. Giving rights to the environment does not mean that the environment will have every right one can imagine.<sup>25</sup> The legal system has to explore the implications such a notion would hold for nature and its components. Whether parts of nature such as animals, rivers, the landscape and the topography are entitled to claim rights of nature and the question of who shall represent the rights of nature are some of the legal issues to be answered in the process of treating nature as a right holder.

The inclusion of Rights of Nature in Ecuador's Constitution in 2008 and the passing of the Law of Mother Earth in Bolivia in 2010 were the most radical advancements in the rights of nature movement of this century. These laws provide a powerful opportunity to reshape our uncritical models of economic development and challenge our understanding of what it means to live a fulfilling life. In 2014, Te Urewera, formerly a New Zealand national park, was declared to be a legal entity.<sup>26</sup> The legislation transformed the land from a government owned national park to freehold land owned by itself. Whanganui River of New Zealand was conferred personhood in 2017.

The right based juridical view is evolving in India also. In a recent case of the High Court of Uttarakhand, the river Ganges and the Yamuna was accorded the status of living entities and granted the rights of a juristic

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24 Gwendolyn J. Gordon, *Environmental Personhood*, 43 Columbia Journal of Environmental Law 49 (2018).

25 Christopher D. Stone, *Should Trees have Standing: Law, Morality and the Environment*, (Oxford University Press 2010)

26 Te Urewera Act, 2014 (New Zealand)

person.<sup>27</sup> Personhood was conferred for subserving the need for protecting the river from pollution and further degradation. However this case was overruled by the Supreme Court of India. It is expected that the Supreme Court would articulate on the question of nature as a subject of rights in the days to come.

## **Conclusion**

In India we have a plethora of legislations for protecting the environment. In addition to these, we have accepted principles such as precautionary principle, polluter pay principle, and doctrine of public trust as part of our domestic law. In spite of having all these laws, our environmental quality is on the decline. This is primarily due to our approach towards development and strategies adopted for attaining development. The sustainable development model has failed to a large extent because of its anthropocentric methodology which permits destruction of natural ecosystems and exploitation of natural resources for the sake of human happiness. The sustainable development model does not speak about the need for curtailing the endless list of human needs. It does not take into account the finiteness of natural resources. It is silent about the sacrifices that ‘homosapiens’ need to undertake to make nature more sustainable. It is high time for us to consider subordinating some human claims to those of the environment. Sustainable development model would continue to be a sham unless and until concrete measures are taken to bring down the spiralling population growth. Concrete strategies including reduction of population, change in consumption pattern and wise use of technology are to be followed for achieving a balanced growth with equal respect to the rights of all species including the biotic and abiotic components of nature. In developing the strategies to achieve development, societies have to choose the technologies which produce more resources with minimum harm to the ecosystem. It requires efficient use of water, land, forest, fisheries, and biodiversity. Every individual, family, organization,

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27 *Mod. Salim v. State of Uttarakhand*, High Court of Uttarakhand, available at [http://lobis.nic.in/d\\_dir/uhc/RS/orders/22-03-2017/RS20032017WPPIL1262014.pdf](http://lobis.nic.in/d_dir/uhc/RS/orders/22-03-2017/RS20032017WPPIL1262014.pdf) (visited on Jan 5, 2018)

and community has a vital role to play. Advocating plundering of nature and its resources in the name of advancing the greatest happiness of the greatest number of people can lead to ruthless destruction of nature and gradual elimination of human from earth. Nation states and governments have been following a strictly utilitarian view of nature and were guided by the principle of greatest happiness of greatest number of people in the decision making process. The Rights of nature discourse is an alternative framework that should be taken up to protect our planet from further destruction. The educational institutions, media, businesses, nongovernmental organizations, and governments should offer creative leadership in saving our mother earth from such destruction. The legal academia can play a lead role to forestall the dominance of anthropocentrism and re-evaluate the place of human interests in relation to nature. The partnership of government, civil society and business is essential for effective governance and judicious management of natural resources.



## **Environmental Protection under Tort Law**

*Dr. A.P. Rajeesh\**

### **Introduction**

Earth is the only known planet where life exists. Scientists believe that in the whole life of earth, on many occasions life has totally vanished from earth and revived later. There may be various scientific theories and reasons for this phenomenon. But in simplest words this is because of the unique environment which prevails in earth. When all other organisms in the earth adapt themselves to the environment, man is the only animal which changes the environment for his convenience. Changing the environment, we conveniently call development, may be the real threat to environment. Environmental pollution in the present sense of the term has been seriously noticed only after 1960. It is true that our present environmental protection strategies are the contributions of 1960s and 1970s. Surprisingly the environmental strategies and policies have created an impression that environmental protection laws are sui generis and independent. But this may not be the realistic way of approach. As a matter of fact, environmental law is not a sui generis branch of law and it is not an independent discipline as often suggested to be. Actually one of the major dormant objectives of tort law is the protection of environment. It further seems that, importance

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given to environmental protection under tort law may be much higher and venerable than what has been envisaged under different present statutes dealing with environmental protection. However, the importance of tort law in environmental protection and the way in which environmental protection is dealt under tort law has not been taken seriously. It is to be noticed in this regard that protection of environment under tort law is not direct but it is the offspring of protection of property and various rights related to property. Thus the role of tort law in the protection of environment could be analyzed only after scrutinizing concept of property under tort law.

### **Property under tort law**

Broadly one can say that law of tort deals with protection of rights<sup>2</sup>. But on a close analysis only property rights has been recognized as source of right under tort law. The origin of tort law from writs will indicate the approach of tort dealing with property rights of both movable and immovable. But at the same time, the conventional meaning of property may not be suitable to explain property rights under tort law. The approach of tort law that it is for the protection of property and to vindicate loss caused to property led to the recognition of some other rights also within the term property though conventionally could not be treated as property. Thus there was a tendency to link more and more rights with property and interference with these rights were treated as torts. Thus the body of a person was treated as his property giving rise to various torts including assault, battery, false imprisonment. Treating reputation of a person as property, the tort of

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2 According to Salmond tort is a civil wrong for which remedy is a common law action for unliquidated damages, and which is not exclusively the breach of contract or breach of trust or other mere equitable obligation. R.F.V. Heuston and R.A.Buckley, *Salmond & Hueston, Law of Torts*, 14 - 15 (Universal Law Publishing Co. Pvt. Ltd., 1998). Though there are some fundamental differences in the approach with respect to the extent of application of tortious liability Winfield also agrees with Salmond by saying that tortious liability arises from breach of a duty primarily fixed by law; this duty is towards persons generally and its breach is redressible by an action for unliquidated damages. W.V.H. Rogers, *Winfield & Jolowicz on Tort*, 4 (Sweet & Maxwell 16<sup>th</sup> ed. 2002).

defamation found its place in civil law. One's wife, children and servants were also treated as his properties. Thus enticing or taking away of a person's wife children or servants<sup>3</sup> were treated as actionable wrongs<sup>4</sup>. Only very recently the independent status of wife, servants or children has been recognized that too by the intervention of Parliament<sup>5</sup>.

## **Protection of property rights under tort law and environmental pollution**

Attempts to recognize interest of a person in terms of property was much seriously reflected in the concept of environmental protection. Rather than appreciating pollution free environment in the stand point of society or public, tort law appreciates the matter on the stand point of individuals and appreciates pollution free environment as a matter of private interest related to his property rights.

Tort law in its different respects ensures pollution free environment for the peaceful enjoyment of his different rights and thus pollution free environment turns to be a civil right attached with many other rights. Some of the principles developed in tort law in this regard were much deeper and sound than the present environmental policies and strategies contained under the relevant laws. Unfortunately this task of tort law has not been given adequate importance and significance and much of the attempts under tort law to ensure pollution free environment has been disregarded or neglected.

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3 Until the action was abolished by Administration of Justice Act 1982, Sec. 2 (c) (i), it was a tort actionable at the suit of a master to take away, imprison, or cause bodily harm to his servant, if (1) it was a tort as against the servant, and (ii) the master was thereby deprived of his servant's service. Heuston and R.A.Buckley, *Salmond & Heuston, Law of Torts*, (twentieth law of Torts 347 (Universal Law Publishing Co Pvt.Ltd., 20th Edition 1998) Ed. Fourth Indian Reprint 1998, Universal Law Publishing Co. Pvt. Ltd.

4 See Heuston, *Law of Torts* at 349 (cited in note 1).

5 See Sec.4 & 5 of Law Reform (Miscellaneous Provisions) Act 1970 and S.2 (a) of Administration of Justice Act 1982.

## Environmental protection and tort of nuisance

Most important tort which is linked with environmental protection is the tort of nuisance. Nuisance can be classified into public nuisance, private nuisance and statutory nuisance<sup>6</sup>. Public nuisance is something which is committed against the public and unless and until some person has suffered an additional loss in addition to the loss suffered by the public as a whole it is only a crime. When the act of the defendant is not affecting the society but only a particular individual or a few individuals or the claimant suffered an additional loss than the loss suffered by the society it assumes the status of private nuisance and turns to be violation of legal right attracting the tort of private nuisance. Thus obstructing a high way is a public nuisance but when it affect the right of a particular individual it turns to be a private nuisance so far as that individual is concerned. Statutory nuisance is something which is created by statute. Whether it causes any inconvenience to a particular individual or to the society is not a criteria and the only question is whether it is prohibited by a statute or not. Here the concern is violation of statutory provisions. Norms regarding emission of sound, Carbon Dioxide, Carbon Monoxide etc. from motor vehicle turns to be a typical example for statutory nuisance. Thus in civil law the relevance of nuisance is confined solely to private nuisance. Most of the environmental pollutions through sound, smoke, light, smell etc could be the cause for nuisance also. It is to be noticed in this regard that what is protected under nuisance is the right of enjoyment of land. Any unreasonable interference with enjoyment of land could be treated as nuisance. To initiate a proceeding for private nuisance and getting appropriate remedy, the claimant need not be the owner of the land. The possessor, licensee, or even a tolerated trespasser can initiate civil proceeding for nuisance<sup>7</sup>. Any conduct from the part of the defendant like running a factory which emit sound or smoke<sup>8</sup>, maintaining a stadium using high voltage light which makes normal life difficult for the claimant

6 See Heuston, *Law of Torts* at 57 - 59 (cited in note 1).

7 *Hunter v Canary Wharf Ltd.*, [1997] A.C. 655. See also *Khorasandjian v Bush*, [1993] Q.B. 727.

8 *St. Helen's Smelting Co. v Tipping*(1865) 11H.L.C. 642 .

residing near to the stadium, a cricket stadium where competition matches are often conducted interfering the normal life of inhabitants of that locality, running a fish market, or even permitting an unruly family to dwell in a building, could be the cause of nuisance. It is to be noticed that all these are causes of environmental pollution also. Thus it is clear that the causes of environmental pollution and the causes of private nuisances turn to be same.

Compared to other torts, law of tort appreciates initiation of proceedings for private nuisance leniently. Any unreasonable interference with enjoyment of land could be treated as nuisance. The whole question in this regard is whether a reasonable person will tolerate the cause of the nuisance or not. License from the concerned authority<sup>9</sup>, reports of experts or the town planning permission cannot be a defense in a proceeding for private nuisance<sup>10</sup>. The whole question is whether the interference is reasonable or not. In assessing whether the interference is reasonable and to be tolerated by the claimant, the matter is to be appreciated on the stand point of a reasonable thinking man in that locality. Thus something which is a nuisance in one locality may not be nuisance in another place. Whether the interference is reasonable or not depends upon a lot of factors where the activity is carried on including the density of population, residential area or non residential area, urban area or rural area and a lot of other factors. Applying the same principle oversensitive activities and oversensitive persons cannot initiate tortious proceedings under private nuisance<sup>11</sup>. Making tortious proceeding under private nuisance more flexible, even coming to nuisance which means the plaintiff has been coming to a place and occupying a property where the cause of nuisance was already there is not a justification for the defendant. The only question in this regard is whether the interference is reasonable or not.

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9 See *Halsey v Esso Petroleum Co.*, [1961] 1 W. L.R 683.

10 *Gillingham Borough Council v Medway (Chatham) Dock Co. Ltd.*, [1993] Q.B 343.

11 *Heath v Mayor of Brighton*, (1908) 98 L.T. 718. In this case the suit for injunction of the trustee of a church alleging that noise from defendant's electric power station is to be treated as a nuisance was rejected on the ground that there was no proof of annoyance to anybody else other than the plaintiff. Thus the plaintiff was treated as a person with abnormal sensitivity and not entitled to get remedy. See also *Robinson v Kelvert*, (1889) 41 Ch.D. 88.

It is to be noticed that after tolerating nuisance for a prescriptive period no proceeding for nuisance will be maintainable under civil law. The prescriptive period under common law is twenty years<sup>12</sup>. Thus the plaintiff cannot initiate a tortious proceeding under the head of nuisance after tolerating nuisance for twenty years. But prescriptive period starts not from the cause of nuisance but from the date on which it turns to be an actual nuisance to the plaintiff<sup>13</sup>. Thus if the plaintiff owns a vacant land and the defendant starts a factory or any such other enterprise which could interfere with the normal enjoyment of plaintiff's land, the prescriptive period starts only from the date on which he starts to enjoy the land and not from the date of cause of nuisance. This principle put every person who is the author of the cause of nuisance under threat throughout the period to ensure that his activities are only reasonable with respect to the enjoyment of land of other peoples of that locality.

It is one of the settled principles of common law that if a person has legal right, even a malafide exercise of the legal right cannot be a cause of civil proceeding. Thus if a person has a right to dig a well in his property, he will not be liable even if he is digging the well to compel his neighbor to purchase his land<sup>14</sup>. However, tort of nuisance turns to be an exception to this general principle. In tort of nuisance, an otherwise reasonable act can turn to be unreasonable if there is malice. Thus in *Christie v Davie*<sup>15</sup>, apparently the defendant was using the property for reasonable purposes and the plaintiff has to tolerate. But negativating the contention of the

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12 Rogers, *Winfield on Tort* at 536 (cited in note 1).

13 See *Sturges v Bridgman* (1879) 11 Ch. D. 852, 863.

14 See *Bradford Corporation v Pickles* [1895] A.C. 857.

15 The plaintiff and defendants were residing in semi detached rooms. The plaintiff and his family members are musicians. They used to practice music in the early morning. The defendant used to cook in the same time. When it turned to be nuisance for the plaintiff, the plaintiff changed the time of his musical lessons. To cause annoyance to the plaintiff defendant changed the time of cooking. When the proceeding was initiated the defendants argument was that cooking is to be treated as a reasonable act. But the court decided that though cooking could be treated as a reasonable use of property the conduct of the defendant turns to be unreasonable because of the presence of malice.

defendant, court reached the conclusion that an otherwise reasonable act can turn to be unreasonable if there is malice. This principle has been later applied in different cases and this has turned to be the part of common law for tort of nuisance though it is not applicable to other tortious proceedings. Its advantage is that malice turns to be an ingredient in assessing whether the conduct of the defendant is reasonable or not in environmental pollution cases.

Thus the tort of private nuisance accommodates public interest and private interest enviously and some of the general principles of tort law have got modified to accommodate the interests of the public when a person is enjoying his land. The point to note in this regard is that the protection was basically based on property interests of the plaintiff as well as the defendant. The defendant's right to enjoy his land in a reasonable manner and the plaintiff's right not to be unreasonably interfered by the defendant by the use of his land. It seems that the very basis of environmental pollution is the same principle. A person's right to enjoy his land without causing serious damage to the environment. Perhaps the only difference in this regard is that under tort law the matter is appreciated in the stand point of individual and in environmental law the matter is appreciated in the stand point of public. However, it seems that the tool of private nuisance has not been properly linked with laws relating to environmental protection and if such an interrelation has been properly invoked the laws relating to environmental protection would have been more lucid and systematic.

### **Trespass to land and environmental pollution.**

Another area in tort which protect environment is the tort of trespass to land. Originally it was thought that indirect interference with land is nuisance and direct interference with land is trespass. Now the distinction is mentioned as interference with enjoyment of land and interference with possession of land. Thus if something like fume, gas, poisonous waste etc emit from a factory affects the property, building or any other tangible object, it could be treated as trespass to land. But if the fume, gas, emission of waste etc. only affects the enjoyment of land it will only lead to nuisance.

Thus the bifurcating line between trespass and nuisance may not be clear. As trespass by emission of gas, fumes, waste etc. could also amount to environmental pollution, trespass to land and environmental pollution merges at some point. As in the case of nuisance trespass to land is also placed in a unique position in tort law. It is a tort actionable *per se*. If trespass is committed, the plaintiff need not prove any damage. Thus any conduct of the defendant which affects the property or its value is a clear case of trespass. The conduct of others which cause trespass to land is a case of environmental pollution also.

### **Environmental pollution and strict liability principles**

Another area of civil liability which has got immense importance in protection of environment is strict liability principle. The origin of strict liability as a separate tort itself is fully immersed in environmental pollution. It was the response of civil law towards 19<sup>th</sup> century industrial revolution which was a serious threat to environment and which ultimately led to the thwarting of individual's right through new scientific technologies. The development of science and technology led to the situation of interference with civil rights without negligence as the defendant might have taken all precautions which science and technology could offer. In such a situation as there was no negligence on the part of the defendant, a normal civil proceeding may not be possible. The origin of strict liability was to counter such situation. To find out an answer to the question, even without negligence, how the escape of accumulated dangerous things which interfere with another's right and property interest could be dealt with, led to the development of strict liability. It may be further noted that the immediate cause for the decision is the collapse of a dam which led to the death of 250 persons and vast property damage<sup>16</sup>. *Ryland v Fletcher*<sup>17</sup> was decided in the light of this case and it formed the foremost major attempt in the domain of

16 See Brian Simpson, *Legal Liability for Bursting Reservoirs: The Historical Context of Rylands v Fletcher*, 13 J Leg Stud 209 (1984) See also Dr. M.C. Pramodan, *Varghese v Kerala State Electricity Board: Thinking of Alternatives to Strict Liability*, 1 Regal Law Journal, 102 – 190 (2013).

17 [1886] L R 1 Ex 265.



protection of environment pertaining to escape of accumulated dangerous thing. The crux of the decision that anybody brings and accumulates any dangerous thing, if it escapes the defendant shall be liable even without negligence<sup>18</sup>. Though this can be treated as the major attempt in civil law to protect environment, it was never treated as an attempt to preserve the environment rather than creating strict liability principle which is a distinct type of liability under tort law.

Going one more step ahead and influenced by the spirit of the principle laid down in *Ryland v Fletcher*, the Indian Supreme Court reached the concept of absolute liability in *M.C. Mehta v Union of India*<sup>19</sup> and *Union Carbide Corporation v Union of India*<sup>20</sup>. Under the absolute liability principle, for extra hazardous activities undertaken by the defendant the liability will be absolute. Thus even the limited defenses available in strict liability will not be available in absolute liability. The only point to be proved by the plaintiff in absolute liability is the extra hazardous activity undertaken by the defendant which causes damage to the plaintiff. Actually this decision is the major thrust to prevent environmental pollution in India. But surprisingly even the absolute liability principle has not been seriously linked with environmental pollution.

The origin of absolute liability in *M.C. Mehta v Union of India* is also a response of the judiciary to ensure pollution free environment. The case directly relates to the emission of Caustic Soda a gas which is not poisonous but causing environmental problems. Later the matter was seriously considered in *Union Carbide Corporation v Union of India*. The principle evolved in this case was the practical application of extra hazardous operations. It is

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18 The Court observed that the true rule of law is, that the person who, for his own purposes, brings on his land, and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he fails to do so, he is prima facie responsible for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to plaintiff's default, or, perhaps, the escape was the consequence of *vis major*, or the act of God. Id at 279

19 A.I.R. 1987 S.C. 1086

20 A.I.R. 1990 S.C. 273.

a fact that the problem of environmental pollution is also closely linked with extra hazardous activities of man. The law which got settled in this case was that any person or industry involved in extra hazardous activity has to meet the consequence.

## Conclusion

Thus it could be concluded that tort law is highly concerned with environmental pollution. In contrast with the modern approach which deals with environmental pollution as a public issue, tort law approaches environmental pollution as a private matter linked with property rights. Instead of theoretical dialogues like preserving the earth for future generation or sustainable development, the civil law approaches environmental pollution quite practically linking it with property rights. But the unfortunate thing in this regard was that the attempts of the civil law to deal with environmental pollution linking it with property rights got hampered by separating environmental pollution from civil law and placing it as a separate branch of law. Separate theories, separate approaches and separate principles were developed for the protection of environment. This led to the situation of poor development of laws in this regard. It is unfortunate to note that the theoretical approach to environmental pollution was completely disregarding civil law relating to environmental protection.

There are lots of instances where from tort law, separate branches of law have emerged. The development of intellectual property law from tort of passing off development of consumer protection laws from the principles of *Donoghue v Stevenson*<sup>21</sup> development of medical negligence from the principles of tort of negligence are all instances where specific branches of laws have developed from tort law. In all these contexts the specific branches of law accepted the spirit from the tort law principles and modified the principles to cope up with the changes as what had happened in consumer protection laws or intellectual property laws.

But the problem with the environmental law is that the principles are

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21 [1932] A.C. 562.

being developed neglecting its basis from tort law principles. Tort law is like Indian parents. They will bring up their girl child; provide them with proper education and all mechanisms for their personality development. After they entrust their girl child with a proper hand though the process of marriage the parents are reluctant to interfere. The marriage here means the legislation. If the legislations are not sound enough, everything which was contributed by the parents turns to be insignificant. The law relating to consumer protection, the law relating to intellectual property was taken up by strong families fully based on their civil foundation. But unfortunately this is not the development in environmental protection. The laws relating to environmental protection are being developed on separate principles disregarding the basic principles behind environmental protection which is fully embedded in tort law principles. This is why environmental protection laws struggles to find a rationale basis for its survival and structured growth.

## **Hospital Waste Disposal and Environmental Sustainability- Need for Strict Implementation of Laws in India**

*Dr Gigi P.V\**

Hospitals generate enormous amounts of waste. In India studies shows that large hospitals generate 2.0 kg of waste per bed per day. Of this, 0.5 kg can be categorized as biomedical waste. If hospital waste is not properly managed and disposed of, it can result in injury by contaminated sharps and infection with Hepatitis B, C, and HIV. Daily medical waste generation from both public and private sector hospitals in India amounts to 0.8 million tons.<sup>1</sup>

Improper disposal practices results in reuse of discarded syringes, IV tubes, blood bags and other equipment which is not designed for either sterilization or reuse.

The problem related to treatment and disposal of hospital waste can be effectively solved only by dividing the waste into different categories and using different pragmatic methods of treatment and disposal. When compared

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1 Available at <https://www.ev.go.jp/3r/en/asia/02-03-2/04.pdf>. (visited June 6, 2018). It is pointed out that between 0.5 and 0.6 kg of waste per bed is generated by hospital every day. According to the Department of Health Press Release H 91/616, an estimated 1,00,000 tones of waste were generated in British National Health Service Hospitals in the year 2015.

with other countries, in India, hospital waste is alarming. Apart from the direct biological consequences, great is the risk presented by the hospital waste to the general public, by spreading contagious diseases. There is hardly any efficacious mechanism to exercise control in this respect. Even though voluntary and legal mechanisms can be devised to lay down standards of treatment and disposal, they have not yet been implemented in India.

### **The present Scenario**

It seems that the hospital authorities and local bodies have forgotten the statutory duty of care to dispose of hospital wastes under condition of close scrutiny and safety. Presently clinical wastes are being fed into the municipal system by almost all the government and primate hospitals, doctor's consulting rooms, clinics and laboratories. But can this be done without the sanction of the municipal authorities? No. In such eventuality municipal authorities can take stern action against the hospital for illegally feeding hospital wastes into the municipal waste or sewage system. The decision of the Orissa High Court in *M.C. Mehta*<sup>2</sup> is an eye opener in this regard. In this case public interest litigation was filed alleging that the discharge of sewage from S.C.B Medical College Hospital, Cuttack had polluted the water of the rivers- Mehandi and Kathayodi and Taladanta Canal. The pollution caused health injuries to thousands of innocent people by forcing them to drink contaminated water. The court directed the authorities including the State and the Pollution Control Board to take immediate remedial action to control and prevent water pollution.

The approach of the functionaries and authorities are very often erasure. The Supreme Court got an opportunity to give a total blow to the Municipalities in *Ratlam.v. Vardhi chand*.<sup>3</sup>

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2 *M.C. Mehta v State*, AIR 1992 Orissa.225 per A. Prasayat and S.K. Mohanly.J.J.

3 AIR 1980 SC 1622. We are left wondering whether our municipal bodies and government departments are functional irrelevancies, banes, rather than bonus and 'law less' by long neglect. A responsible Municipal Court is constituted for the purpose of preserving public health. Provision of proper drainage system in working conditions cannot be avoided by pleading financial instability."

Waste disposal systems are inadequate or non-existent in most of the hospitals. The waste dumped into landfills next to the hospital results in land and groundwater pollution. It is at this stage that one has to evaluate the necessity of a proper strategy document that would lay down standards for categorization of hospital wastes and methods of their treatment and disposal. There are different categories of hospital wastes.

### **Categories of Hospital Waste**

The first step towards a sound workable method of treatment and disposal is to identify the categories of hospital waste which are (a) Clinical Waste, (b) Non-clinical waste, (c) Needles and sharps, (d) Laboratory waste, (e) Human tissue and (f) Kitchen waste.

### **Method of Categorization of Hospital waste colour coding**

A sample color-coding system can be used to separate hospital waste. A National colour coding system exists in U.K as a visible method of demarcating different wastes which are categorized and kept in the different colored containers for the purpose of disposal. This method can easily be related to by the hospitals in India without much economic burden.

Any method of waste disposal should eliminate all inherent risks associated with it and bring out a healthy hospital environment. There are different methods of disposal of hospital waste. The most notable among them are incineration and liming. Apart from these two methods, special methods are being followed in developed countries for the disposal of faeces and urine, mercury, chemical waste, acids, alkalis, cyanides, carcinogenic substances and radioactive substances. A brief outline on these widely used methods are stated below:

#### **(a) Incineration**

Incineration is the most visible method of disposal of clinical and surgical wastes. To incinerate clinical waste, it should be enclosed in a plastic bag and transported to an operating incineration under the supervision of a responsible person and placed directly into the incinerator. But, where an

operating incinerator is not immediately acceptable, it should be stored in a mortuary until incineration can be arranged. If these facilities are not acceptable, it became necessary to transport clinical waste outside the hospitals under conditions of extreme safety.

**(b) Liming**

Clinical wastes except sharps can also be treated with lime and buried in the hospital grounds. This process is known as liming or land filling.<sup>4</sup> Pre-treatment of waste by appropriate methods can make clinical waste, which is not suitable for liming in its untreated form suitable. The economics depends on balancing pre-treatment costs and disposal costs.<sup>5</sup> Liming is the cheapest and most effective mean of getting rid of clinical waste in areas where incineration facilities are not available.

**(c) Method of disposal faeces, urine, wastewater, etc...**

Faeces, urine and waste water contain extensively pathogenic microbes which may cause hazardous infections like lassa and hemorrhagic fevers and hence should be disinfected before discharging into the sewage system.

Similarly, carrying used bedpans from patients with enteric infections from one ward to another should be avoided and the contents should be disposed off promptly. The disposal of urine, faeces or other contaminate fluid should always be into a sluice, sink or lavatory.<sup>6</sup>

**(d) Method of disposal of Mercury.**

Mercury is a potentially hazardous metal as it can be absorbed through

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4 To do this safety:

- 1) Dig a pit, approximately 2.5 m deep.
- 2) Spread a layer of up to 75m of clinical waste across the bottom of the pit;
- 3) Add a layer of lime;
- 4) Continue layering every 75 am until the pit is filled top within 0.5m of the ground;
- 5) Fill the pit with earth before starting another;

5 J.M. Mortiz, *Current legislation governing clinical waste disposal*, 30 Journal of Hospital Infection 521-527 (2005)

6 S. Nelson, *Infections hospital waste. A troublesome costly problem*, 17 Journal of Modern Healthcare 627-650 (2007)

the skin of adequate care is taken during the dispensing handling and disposal of mercury, any potential hazard can be avoided. For that waste mercury should not be poured down the sink or placed in open waste bins or kept in other open containers. It would be safe if all waste mercury, including pieces of amalgam and the results of spillages are kept in a labeled sealed container preferably under potassium permanganate. All articles contaminated with mercury, eg., Squeeze cloths, cotton wool rolls and paper towels should also be kept in a labeled sealed container until disposal is possible. When aspirator both is cleaned, the wash should be poured down into a open external drain and not down the surgery sink drain.<sup>7</sup>

**(e) Method of disposal of sharps.**

All needles and sharps instruments for disposal should be safely kept in a sharp box. This has been made obligatory in England through specific instructions issued by the Department of Health Services.<sup>8</sup> They must be leak- proof and puncture –proof. They must have a handle that allows lifting with one hand so that the container falls away from the body when it is carried. A biological hazard sign is also necessary. All sharps containers should be incinerated.

There must be a clearly defined policy on the actions to be taken when a sharp injury occurs and all staff should be aware of this policy. Immunization should have been made available to all staff considered to be at risk of a sharp injury.<sup>9</sup>

**(f) Method of disposal of clinical waste.**

In England, there are specific legal requirements for the disposal of chemical waste when they are discharged into the public sewers. All trade effluents are covered by the Public Health Act 1961 which requires consent

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7 John Seear and Lynn Waltess, *Law and Ethics in Dentistry*, 211-236 (Cambridge University Press, 2nd ed 2001)

8 Id at 288

9 L.J. Taylor, *Collections and disposal laundry and Waste* 33 *Journal of Hospital Infection* (Supplement A), 57-86 (2008)



by the Water Authority before they are discharged into servers. Similarly, there are other legislation like the Deposit of Poisons Act 1972, the Control of Pollution Act 1974, the Control of Pollution (special waste) Regulations 1980, the Control of Pollution (Amendment) Act 1989, Hazardous Waste Management Act 1989, Hazardous Material (Management, Handling and Transboundary Movement) Rules 2007 and Bio-Medical Waste Management Rules 2005 that regulate the disposal of laboratory waste including radioactive materials. Those legislators impose a duty of care on the hospital authorities and Local Government Institutions in the matter of disposal of laboratory waste.

**(g) Method of disposal of acids, alkalis, cyanides and oxidizing agents.**

The items should be neutralized and washed down the laboratory sink with large volume of cold water.<sup>10</sup>

**(h) Method of disposal of carcinogenic substances.**

The list of carcinogenic substances that one may encounter in clinical and biomedical laboratories included a flatoxical, Benzidine, tolidines, sterigmatocysline, nitrosobenzene, etc.... Rubber or disposable gloves should be worn when dealing with these substances and washed well in cold running water before they are removed or discarded.<sup>11</sup>

Ordinarily, incineration should not be attempted in disposing of carcinogenic substances as some carcinogens are volatile and will contaminate the lower atmosphere. However, chemical method like kheldahal, digestion and dry combustion in silica tubes in a furnace could be relied on.<sup>12</sup>

**(i) Method of disposal of radioactive substances.**

Some of the most commonly used radioactive isotopes in clinical and biomedical laboratories are carbons 14, hydrogen 3 (tritium ) and phosphorous 32, all of which emit beta particles, and iodine 125 which emits X—rays

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10 Id at 62

11 D.B. Carter, *(Carcinogens, Mutagens and Teratogens Safety in Biological laboratories)*, Journal of Modern Healthcare, 47-58 (2007)

12 Id at 62

and gamma rays.<sup>13</sup> The hazards in handling such compounds included skin contamination and the deposition of isotopes in the body, spread of contamination as a result of spillage, careless handling, disposal and external beta and gamma radiations. Therefore radioactive materials should be washed down the sink with large volumes of water. The solid remnants, packing etc... should be autoclaved. The remaining of scintillation fluids should be stored in labeled containers. They must not be flushed into the public sewers. Volatile and flammable radioactive materials can be disposed of through incineration.<sup>14</sup>

### **Evaluation of the Statutory Scenario**

*(a) Regulation on disposal of hospital waste under the Hazardous Waste Rules 1989.*

The Hazardous Waste (Management and Handling) Rules defines ‘hazardous waste’ as covering only the categories of wastes including cyanide wastes and metal finishing waste hospital wastes which are by nature hazardous do not find a place there.<sup>15</sup> Thus, it expects the occupier or the hospital owner generating hazardous waste are properly treated and disposal of without any adverse effect resulting from such waste. The occupier is also free from the responsibility for proper collection, reception, treatment, storage and disposal of hospital waste.<sup>16</sup>

*(b). Regulation of disposal of Hospital Waste under the Rules for the manufacture, use, import, export and storage of Hazardous Micro-Organism/ Genetically Engineered Organism or cells 1989.*

These rules cover hospital only in matters such as manufacture, import and storage of micro-organisms and gene-technological products, expressing

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13 Id at 68

14 C.H. Collins, *Laboratory Acquired Infections* 48 -62 (University of California Press, 2nd ed 2008)

15 For details, see the Schedule appended to the Rules

16 The Gazette of India, Extra Ordinary, part-II, section 3 (1), dated 5-12- 2011.

omitting matters relating to treatment and disposal of human pathogens.<sup>17</sup> However the Genetic Engineering Approval Committee can give direction to the occupier to determine a take measures concerning the discharge new organisms including human pathogens or genetically engineered organisms from the laboratories hospital and other areas. The committee can also prohibit and lay down measures to prevent such discharges.<sup>18</sup> Further, the rules authorize District Collector to prepare off-site emergency plans to contain major accidents caused by the escape of harmful micro-organisms.<sup>19</sup> The rule stated that which prohibit deliberated or international release of genetically engineered organisms, hazardous micro-organisms or cells, including deliberate release for the purpose of experiment.<sup>20</sup>

### **Comprehensive Regulation on Disposal of Biomedical waste**

Bio-medical waste (Management and Handling) Rules 1998,<sup>21</sup> under the rules every institution generating bio- medical waste, including hospitals, nursing homes, clinics, dispensary and pathological laboratory is bound to take all steps to ensure that such waste is handled without any adverse effect to human health and environment.<sup>22</sup>

According to the scheme hospital waste are classified into 10 categories namely human anatomical waste, animal waste, bio- technological waste, work sharps, medicines and cytotoxic drugs, solid waste, chemical waste and incineration ash. Treatment and disposal varies depending on the category of waste and includes incineration deep burial, autoclaving, microwaving, disinfection and chemical treatment. It is the duty of the hospital to segregate bio-medical waste into bags at the point of generation.

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17 Rule 2

18 For details See Rule 7

19 Rule 17

20 Rule 9(1), Explanatory Note appended to the rule reads, “Deliberate release” means any international Transfer of genetically engineered organisms/ hazardous micro – organisms or cell to the environment or nature, irrespective of the way in which it is done”

21 Rule 9(2) Bio-Medical Waste Management Rules

22 Rule 4. Bio-Medical Waste Management Rules

Color coding and nature of containers for different types of waste were also prescribed.<sup>23</sup>

According to the rules, institution providing treatment or service to not less than 1000 patient per month is required to obtain authorizations<sup>24</sup> from the prescribed authority.<sup>25</sup> Every hospital and other institution coming under the Rule is bound to submit an annual report to the authority by 31st January of every year. Information should include categories and quantities of waste generated and handled.<sup>26</sup> The authority will send report in a compiled form to the Central Pollution Control Board. It is also mandatory for every institution to maintain records relating to the generation, collection, reception, treatment and disposal of the bio-medical waste.<sup>27</sup> However except for hospital and institutions in towns with and population of 30 lakhs and having 500 beds, the requirement of waste treatment facilities came into effect only by 31st December 2012. For the first category the date was 31st December 2013.<sup>28</sup>

It can be seen from the above discussion that the Bio-medical Waste (Management and Handling) Rules 1998 is a statutory step to regulate disposal of hospital waste. But the delay in implementation is dangerous. Moreover most of the small clinics, nursing home, chemical laboratories and medical shops can escape from the rules because of the exclusion clause. Even big hospital in rural areas can resort to deep burial of most of the hospital wastes. Absence of adequately equipped inspection teams may make the rules redundant. Hence it is necessary to strengthen these rules and make it a strong instrument to protect public health and environment.

(a) *Regulation on disposal of hospital waste under the Water (Prevention and Control of Pollution) Act, 1974.*

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23 Id, Schedule 2

24 Id

25 Id, Rule 7. State Government has to establish an authority for this purpose

26 Id

27 Id at Rule 11

28 Id, Schedule 6

Although the water Act<sup>29</sup> was passed with the object of maintaining or restoring the whole someness of water and to prevent and control water pollution, the Act has remained ineffective in dealing with pollution of water caused by the discharge of hospital effluents. The definition of “Sewage effluent “contained in the Act is not comprehensive enough to cover hospital Waste.<sup>30</sup>

(b) The Atomic Energy Act 1962<sup>31</sup> is a harbinger in the area of disposal of radioactive substances discharged from hospitals. The Act confers power on the Central Government to take necessary steps to ensure safe disposal of radioactive wastes.<sup>32</sup> The Central Government can accordingly prohibit the transport and disposal of any radioactive substances, without its written consent.<sup>33</sup> The Central Government is also vested with the power to make radio rules for the transport of radioactive substances dangerous to health with a view to prevent injury being caused by such transport.<sup>34</sup>

(c) *Regulation on disposal of hospital waste under the Radiation Protection Rules 1971 and 2004.*

The Radiation Protection Rules 1971<sup>35</sup> and 1995 contain a number of provisions regulating the disposal of radioactive substances discharged from hospital.

d) *Regulation on disposal of hospital waste under the Atomic Energy Act, 1962.*

The Rule provides that is in radioactive installations where sealed or unsealed source are used is experiments on animals, appropriate facilities

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29 As amended by the Water (Prevention and Control of Pollution Amendment) Act 1988

30 Section 9(g) defines “System efficient to mean efficient from by sewerage system or sewage disposal works and includes sullage from open drains.”

31 Sec: 49 of Atomic Energy Act 1962

32 S.Nelson, *Infections hospital waste: A trouble some costly problem*, 17 Journal of Modern Healthcare, (2007)

33 John Seear and Lynn Walfers, *Law and ethics in Dentistry*, 211-232 (Cambridge University Press, 2nd ed 2001)

34 Section 17 (2) Radiation Protection Rules

35 Id

should be arranged for the safe disposal of waste containing radioactive materials.<sup>36</sup> Similarly, mining processing or fabrication of radioactive materials and the disposal of radioactive waste shall be done only in accordance with the approved by the competent authority.<sup>37</sup> The Rules also regulate the disposal of animal carcasses for foliage containing radioactive material.<sup>38</sup> Similarly, the rules prescribed that ultimate disposal of cadavers containing radioactive material shall be done only in accordance with the method. The rules also make of obligatory on person handling radioactive materials to obtain licenses. The central Government can appoint any officer as the competent authority by a notification in the Gazette.<sup>39</sup> These provisions were incorporated in the rule recognizing the fact that radioactive fall out have adverse effects like cancer, shortening of life span, genetic disorders and environmental imbalances.<sup>40</sup>

*(e) Regulation on disposal of hospital waste under the local self Government legislation*

The enactment of the Kerala Panchayath Raj Act 1994 has done a wonderful contribution by empowering the local bodies to take remedial action against unhealthy hospital waste disposal practices. It has thus provided effective provisions for booking those hospital entrepreneurs who leave hospital waste negligently unconcerned about that potential risks caused to the community. Under the Act, the mandatory function of the village panchayats include inter alia reclaiming of unhealthy localities, upkeep of environmental hygiene, and solid waste management.<sup>41</sup> Besides this, the village panchayath have general control and supervision over all

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36 Rule 48 Radiation Protection Rules.

37 Rule 50. Radiation Protection Rules

38 Rule 52 “The handling and ultimate disposal of animal car cases and foliage containing radioactive materials shall be done only in the manner approved by the competent authority”.

39 Rule 2 (d).

40 Dr. Gurbar Singh, *Government and pollution Laws of India* 27-42(Universal Publishing Co.,4th ed 2003)

41 Section 166 (1) Kerala Panchayath Raj Act, 1994.

kind of dispensaries and hospital at village panchayath level and preservation and improvement of public health.<sup>42</sup> Similarly, the functions of the Block panchayat include inter alia management and control of primary health centers, and taking steps to prevent infectious diseases.<sup>43</sup> The Act has conferred on the panchayath authorities the powers of entry and inspection to carry out the purpose of the Act.<sup>44</sup>

No one seems to be concerned about the social aspects of waste. The world over medical professionals are realizing that incineration is the costly way of disposing of medical waste as it releases harmful toxins into the air. There are several alternatives to this method of medical waste disposal such as shredding, autoclaving, and microwaving. We need to evolve a practical disposal strategy that would minimize risk and operate in a sustainable way. Such a general strategy should aim at the following things.

- Permanently minimizing contact with waste by patients and their relatives, other personal and population potentially affected.<sup>45</sup> The works handling hospital wastes must be provided with protective garments such as coats and gloves.
- Awareness and education programmes for medical and lay person to apprise them of the possible dangers posed by the inappropriate and careless handling of medical waste. This must include Orientation and continuing education program and training for all health care workers.
- To instill in the minds of medical personnel, hospital administrators and the government, the importance of tracking and disposal of infectious waste in hospital.

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42 For more information see Schedule III

43 Sec. Schedule IV

44 Sec. 241 of the Act.

45 For this purpose plastic bags and tins should be provided to all the wards in the hospitals. The World Health Organization has come out with a simple design for a waste pit which may be suitable for our hospitals and community health centers in the rural areas. For details, see H. Halbwegs, *Solid waste disposal in direct health facilities* 4 World Health Forum(2004)

- More exotic options can also be looked into<sup>46</sup>
- A ‘cradle to grave’ approach to clinical waste disposal that stresses on the importance of waste minimization as a form of waste prevention need to be educed.
- A duty of care should be imposed on hospital authorities to prevent the escape of the waste from their control.<sup>47</sup>
- A Waste Regulation Authority should be constituted and it is to be mandated that landfill sites and waste incinerators including other hospital disposal facilities should require a Waste Management License from the Waste Regulation Authority.<sup>48</sup> The disposal methods must represent the best practical environment option.
- In all hospitals, Waste Management Officers with a good working knowledge of disposal technology should be appointed.
- The regulatory legislation must provide for criminal sanctions with substantial fine.
- Steps should be taken to contain water pollution caused by the discharge of hospital wastes.<sup>49</sup>
- All medical Institutions where radioactive substances are used must have a Radiation Protection Officer endowed with the responsibility of affording protection in respect of radiation hazards. Such institutions should maintain a record of the quantities of radioactive substance purchased, used, stored and disposal of. Stringent action should be taken against the violators

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46 For instance, at Armed Forces Medical Collage, Pune a research on processing the hospital waste through vermin culture is being tried out.

47 Such a strategy is statutorily recognized in England under section 34 of the Environment Protection Act, 1990, see also Environmental Protection (Duty of care) Regulations 1991 and the Duty of care, Department of the Environment, “Environmental Protection Act, 1990, Code of practice,” in London

48 In England, the Waste Management Licensing provisions provided under part 11 of the Environmental Protection Act 1990 were brought into force on May 1, 1998

49 This is necessary because as has been rightly held by justice Vankataramaiah in *M.C Mehta v Union of India*, AIR 1988 SC 1037, there lies a constitutional duty on the state under Article 48 A and a statutory duty on the Pollution Control Board under section 17 of the water Act to halt water.



including with holding of permission to purchase, store or use radioactive substances.

- A flying squad should be set up within the Directorate of Health Service specially empowered to make spot investigations and supervise whether the aforesaid guidelines are being complied by the private medical institutions.

Hospital waste creates heavy environmental degradations. Environment is that which surrounds us. Without this Mother Nature, there is no life on this earth. Every society thrives for development and land is the base upon which all the developmental activities are carried out. Human activities often have adverse effects upon the environment which often lead to biological threat and environmental degradation. It will finally end up in deterioration of the whole eco system which is most unwelcomed for human beings as well as other plants and animals.

The concept of Sustainable Development on the other hand, has its birth in the 1972 Stockholm Declaration. It simply means, as Brundtland Commission Report defines, ‘using the resources to meet the needs of the present society, in such a way as to enable the future generations to meet their own needs’<sup>50</sup>. Preservation and conservation of the present resources and this environment is the major objective of the concept of sustainable development. The concept, though had its birth in 1972, was elaborated in the Report of the World Commission on Sustainable Development, 1987. The term was incorporated into the international legal regime by the Rio Declaration, 1992 which was further elaborated through a number of international conventions and reports, which extend up to the 2015 Paris Convention and its outcome. It is Transforming Our World: The 2030 Agenda for Sustainable Development.<sup>51</sup>

Environment includes water, air and land and the interrelationship amongst water, air, land and human beings, other living creatures, plants,

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50 Brundtland Commission Report 1987

51 Paris Convention 2015

micro-organisms and property.<sup>52</sup> This definition deciphered different visages of environment and its influence on human beings. In *KM Chinnappa v. Union of India*,<sup>53</sup> the Honorable Supreme Court of India opined that hygienic environment is an integral part of right to healthy life, and it would be impossible to live with human dignity without a humane and healthy environment. Environmental degradation has its own impact on public health.

Air pollution, water pollution, deforestation, uncontrolled use of pesticides and irrational land use are the major reasons behind environmental degradation. Obviously, the spectrum of diseases ranges from those that result from poverty and stark need, to those that are the result of prosperity, affluence and greed. Most of the epidemics emerging out in developing countries can be linked with water. Clean drinking water and sanitation must, therefore, get equal emphasis as number of hospitals and doctors.<sup>54</sup> Air pollution is the main reason behind the respiratory disorders in human beings. Deforestation, climate change and global warming even results in extinction of certain species of animals. It also contributes much to the transmission of diseases from animals to human beings. When man destroys and pollutes the gifted nature it will adversely affect the stability of public health.<sup>55</sup> Irrational use of technological advancement results in the exploitation of natural resources and pollution of environment and as a consequence strange diseases are coming out. However serious concern over the connection between clean environment and public health gained attention only after the initiation of United Nations Conference on Environment and Development (also referred to as the Earth Summit) held in Rio de Janeiro in 1992 and the ensuing Rio Declaration on Environment and Development and Agenda 21, Action programme on Sustainable Development. In India there exists a plethora of enactments for environmental protection including constitutional provisions. In spite of all these regulatory measures, environmental degradation is increasing day by day and the stability of public health is disturbed.

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52 Section 3 of the Environment protection Act

53 AIR 2003 SC 724

54 P. L. eelakrishnan, *Environmental case book*, 6- 18 (Lexis Nexis, 2nd ed 2004)

55 Id at 21

Therefore it is high time to revamp the existing legislations, several international Conventions and Protocols which intended to reduce the impact of environmental degradation in public health. But none of this planned Action Group committed to the cause of prevention of environmental degradation and improvement of public health at the instance of United Nations Organization, has been able to reduce environment degradation.

## **Conclusion**

A comparison of the Indian position with that of its counterpart in U.K. reveals that a commendable scheme for identification, categorization, management and disposal of hospital waste exist there. Similar is the case with U.S.A, with the enactment of the Solid Waste Disposal Act of 1988. India can learn much from these models.

The main campaign of the environmentalist against pollution is mostly limited to some couplets from poets against cutting trees. An occasional action by the Pollution Control Board takes the headlines. Visibly smoggy skies and murky streams catch the eyes of the few. But not the giant mass killer, hazardous wastes from the guardians of health, the hospitals. They remain out of sight and out of mind. Therefore, stringent measure to regulate hospital waste from generation to disposal is to be taken. They should be closely monitored for any infringement. Meanwhile, we have to search for a suitable technology which is relatively cheap, simple and eco-friendly.

# Conservation and Sustainable use of Medicinal Plants

*Dr. U Deepti\**

## Introduction

Undoubtedly, human societies have been in close contact with environment since the beginning of the civilization and used the ingredients of the environment to obtain food and medicine. Plants play an important role by providing essential services in ecosystems and provide predominant ingredients of medicines in most medical traditions. People have been depending on plants to cure diseases, promote healing of injuries, and alleviate pain and thus, they continue to be the first line of health care for most of the population.<sup>1</sup> In many parts of the world that has changed very little. However, in the past few decades herbal and botanical cures have been ignored in favour of scientific medicines. This was because the scientific achievements from the latest decades and their large socialization encouraged the monoculture of scientific knowledge in the health professional practices, which largely discredit other knowledge and practices in societies.<sup>2</sup> But the benefits of medicinal plants are being rediscovered in many countries, where consumers are turning to such therapies in place of, and in addition

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1. *Culture and Health, Orientation Texts-World Decade for Cultural Development, 1988–1997*, 129(UNESCO 1996), online at <http://unesdoc.unesco.org/images/0010/001035/103546E.pdf> (visited Aug 6, 2018).
2. Gisele Damian AntonioIli, Charles DalcanaleTesserII, Rodrigo Otavio, Moretti-PiresI, *Contributions of medicinal plants to care and health promotion in primary health care*, 17 Interface Botucatu 615 (2013).

to, western medical treatments. According to the World Health Organisation (WHO), the goal of 'Health for All' cannot be achieved without herbal medicines. It was reckoned by WHO that 80% of people worldwide still rely on herbal medicines for some aspect of their primary health care needs.<sup>3</sup> This may be attributed to a number of factors, most importantly, relatively good accessibility, local availability, affordability and existence of local knowledge and expertise among communities. In addition, in recent times there has been an increasing realization of the health hazards and toxicity associated with the indiscriminate use of synthetic drugs and antibiotics. Because of this resurgence of interest, the research on plants of medicinal importance is growing phenomenally at the international level, often to the detriment of natural habitats and mother populations in the countries of origin. In addition, studies indicate that several medicinal plant species has been listed as endangered due to over exploitation and due to impact of climate change.<sup>4</sup> This calls for immediate strategies for conserving medicinal plants through policies that encourage sustainable supplies to meet the growing demand. Moreover, medicinal plants are viewed as a possible bridge between sustainable development, affordable healthcare, and conservation of the vital biodiversity. Recently, a 75-year-old tribal woman, Lakshmikutty Amma from Kallar forest area in Thiruvananthapuram received the country's highest civilian honour Padma Shri for her breakthrough in practising traditional medicine<sup>5</sup>. This has also widely generated a renewed interest in the public for the use of traditional medicines and for the conservation and preservation of traditional medicines in India. This paper therefore, discusses the role, contributions and usefulness of medicinal plants in tackling the diseases of public health importance,

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3 Rajeswar Rao B.R. *et al.*, *Biodiversity, Conservation and Cultivation of Medicinal Plants*, 3 *Journal of Pharmacognosy*, 59(2012).

4 It is estimated that 4160 medicinal and aromatic plants are threatened with extinction. See generally, Walter, K.S. & H.J. Gillett, *1997 IUCN Red List of threatened plants* (IUCN 1998).

5 In countries where the dominant health care system is based on allopathic medicine, or where traditional medicine (TM) has not been incorporated into the national health care system, TM is often termed 'complementary', 'alternative', or 'non-conventional' medicine. Traditional medicines encompasses both plants and animal products.

with particular emphasis on the current strategic approaches to biodiversity conservation and sustainable utilization of medicinal plants.

### **What are Medicinal Plants?**

According to WHO, the definition of traditional medicine may be summarized as the sum total of all knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental, or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing.<sup>6</sup> WHO defines medicinal plant as herbal preparations produced by subjecting plant materials to extraction, fractionation, purification, concentration or other physical or biological processes that may be produced for immediate consumption or as a basis for herbal products.<sup>7</sup> WHO has further defined medicinal plants as plants that contain properties or compounds that can be used for therapeutic purposes or those that synthesize metabolites to produce useful drug.<sup>8</sup> In other words, the term medicinal plant refers to a variety of plants that have medicinal properties. These plants are also important for pharmacological research and drug development, when not only plant constituents are used directly as therapeutic agents, but also when they are used as basic materials for the synthesis of drugs or as models for pharmacologically active compounds.<sup>9</sup>

### **Role of Medicinal Plants in Healthcare**

The use of medicinal plants for the treatment of diseases dates back to

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6 *African Traditional Medicine. Brazzaville.*, AFRO Technical report Series, No. 1, Report of the Regional Expert Committee, WHO/AFRO3, 4. (1976).

7 *Legal Status of Traditional Medicine and Complementary/ Alternative medicine: A World-wide Review*, WHO Publishing Report No.1 (WHO 2001), available at <http://apps.who.int/medicinedocs/pdf/h2943e/h2943e.pdf> (visited Aug 6, 2018).

8 Id.

9 Rasool Hassan BA., *Medicinal plants (Importance and Uses)*, 3 Pharmaceut Anal Acta (2012), online at <https://www.omicsonline.org/medicinal-plants-importance-and-uses-2153-2435.1000e139.php?aid=10654> (visited July 12, 2018).

the history of human life, that is, since human beings have sought a tool in their environment to recover from a disease, the use of plants was their only choice of treatment.<sup>10</sup>Historically, all medicinal preparations were derived from plants, whether in the simple form of raw plant materials or in the refined form of crude extracts, mixtures, etc. Estimates suggest that several thousands of plants have been known with medicinal applications in various cultures.

Evidence indicates that plants have been cultivated as drugs approximately 60000 years ago.<sup>11</sup> Scripts about medicinal plants date back to almost 5000 years ago in India, China and Egypt, and at least 2500 years in Greece and Central Asia.<sup>12</sup> The earliest written evidence of the use of medicinal plants for preparation of drugs has been found on a Sumerian clay slab from Nagpur dating back to nearly 5000 years ago.<sup>13</sup> According to some inscriptions, Egyptians and Chinese who used plants as medicine were among the earliest human beings who did so.<sup>14</sup> Greeks were also familiar with the medicinal properties of plants. Hippocrates, the founder of Greek medicine and Aristotle, pupil of Hippocrates, used medicinal plants for the treatment of diseases. Theophrastus, a Greek scientist, founded the School of Medicinal Plants. Dioscorides, a physician and surgeon, wrote an encyclopaedia, called *De Materia Medica*, to describe 600 therapeutic medicinal plants in the form of a series of scientific studies on medicinal plants.

Medicinal plants play an important role in the development of potent therapeutic agents. Medicinal plants are used for treatment because they have certain properties, including synergistic actions. The constituents of

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10 Halberstein RA., *Medicinal Plants: Historical and Cross-cultural Usage Patterns*, 15 *Ann Epidemiol.*687 (2005).

11 Solecki R, Shanidar, *Neanderthal flower Burial in Northern Iraq*, 190 *Science.* 880,881 (1975).

12 Ang-Lee MK, Moss J, Yuan CS., *Herbal Medicines and Perioperative care*, 286 *JAMA* 210 (2001).

13 Qiu J., *Traditional Medicine: A Culture in the Balance*, 448 *Nature* 127, 128 (2007).

14 Schippmann UW, Leaman D, Cunningham AB., *A Comparison of Cultivation and Wild Collection of Medicinal and Aromatic Plants under Sustainability Aspects*, 17 *Frontis* 79(2006).

the plant may interact with each other, and this interaction can be beneficial for both or adverse or eliminate the harmful effects of both. Plant-derived compounds can dramatically improve hard-to-treat illnesses, such as cancer. Plant components are also characterized by their ability to prevent the development of certain diseases. The toxicity and adverse effects of conventional and allopathic medicines have also been important factors in the sudden increase in population demands and increase in the number of herbal drug manufactures as well as a reduction in the use of chemical drugs.<sup>15</sup>

Primary health care requires the utilisation of all appropriate and available local resources, which in developing countries like India usually include traditional medicines and its practitioners. The use of medicinal plants in traditional medicine finds its natural expression and further development in primary health care. It is at this level that the transition from traditional practice to medical care can most easily be made. For instance, in China medicinal plants are an integral part of the formal health system and are used in about 40 per cent of cases at the primary care level. According to reports in India, 65 per cent of the population in rural areas use Ayurveda and medicinal plants to help meet their primary health care needs.<sup>16</sup> Where traditional medicine is well patronized by communities, it makes good sense to adopt safe and useful traditional practices and incorporate them in the design and implementation of national health systems. However, this means putting traditional medicine on a scientific basis. Countries must make a critical examination of the local *materiamedica* and practices, accurately identify the plants and other natural substances employed, decide which remedies and practices are useful, and suppress those that are patently ineffective or unsafe. It is an undeniable fact that in today's world herbal medicines play a vital role in the healthcare for large sections of the population, especially in developing countries. In many cases, they bridge the gap between the availability of and demand for modern medicines.

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15 Rasool Hassan BA., *Medicinal plants (Importance and Uses)*, 3 Pharmaceut Anal Acta 139 (2012).

16 Id.



Moreover, it must be mentioned here that more than 85 per cent of herbal medicines used in traditional health care systems are derived from medicinal plants and ensures livelihood to innumerable people especially in Himalayan region in India.<sup>17</sup>In addition, recently medicinal plants and herbs are gaining popularity globally as a source of raw material for pharmaceuticals and traditional health care system.<sup>18</sup> Medicinal herbs are mainly collected from the wildlife population. Indeed, the demand for wildlife sources has increased by 8 per cent to 15 per cent per year in Europe, North America, and Asia in recent decades.<sup>19</sup> However, as more land is brought under cultivation, the natural resources are becoming depleted. Special encouragement has therefore, been given for the cultivation and conservation of medicinal plants.

## **Medicinal Plant and Biodiversity**

### **Medicinal Plant Resource Base**

Medicinal plants are distributed across diverse habitats, hence, there are no reliable figures available for the total number of medicinal plants on earth, and therefore, available figures, and percentages for countries and regions vary greatly .For instance, according to a report there are 11,250 varieties of medicinal plant species available in China, 2237 in Mexico etc.<sup>20</sup>The WHO, however, has listed over 21,000 plant species

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- 17 P C Phondani, R K Maikhuri, K G Saxena, *The Efficacy of Herbal System of Medicine in the context of Allopathic system in Indian Central Himalaya*, 4 Journal of Herbal Medicine 149 (2014).
  - 18 R K Maikhuri, S Nautiyal, K S Rai, *et al.*, *Role of Medicinal Plants in the Traditional Health Care System: A case study from Nanda Devi Biosphere Reserve, Himalaya*, 75 Current Science 152-157 (1998).
  - 19 Verma S, Singh SP., *Current and Future status of Herbal Medicines*,1 Vet World.348(2008).
  - 20 See generally, Schippmann, U., Leaman, D.J. and Cunningham, A.B., *Impact of Cultivation and Gathering of Medicinal Plants on Biodiversity: Global Trends and Issues*, Inter- Departmental Working Group on Biological Diversity for Food and Agriculture, Food and Agricultural Organisation of the United Nations, Rome, Italy (2002), online at <https://pdfs.semanticscholar.org/1699/83f9fd7e6fdbe74aa8748f14279b0aeeafb.pdf> (visited June 18, 2018).

used around the world for medicinal purposes.<sup>21</sup> India is a varietal emporium of medicinal plants and it is one of the richest countries in the world as regards genetic resources of medicinal plants. It exhibits a wide range in topography and climate, which has a bearing on its vegetation and floristic composition. More over the agro-climatic conditions are conducive for introducing and domesticating new exotic plant varieties.

The Botanical Survey of India records over 15,000 plant species in the country, of which at least 7,500 have been used for medicinal purposes.<sup>22</sup> Further, reports suggest that 7000 plant species are used in Ayurveda, 700 in Unani, 600 in Siddha, 450 in Homeopathy and 30 in modern medicines.<sup>23</sup> Around 1700 plant species have been documented for their biological properties and drug action and data is available for approximately 1200 species, especially those most frequently used in traditional Indian systems of medicine, resulting in a reasonable knowledge base.<sup>24</sup> However, there is still a lack of documentation relating to the properties, natural distribution, ecological tolerances, and uses of a number of valuable medicinal species. Around 70 per cent of India's medicinal plants are found in the tropical zone, mostly in the forests of the Western and Eastern Ghats, the Vindhyas, Chotta Nagpur plateau, Aravalis, the Terai region in the foothills of the Himalayas and the North East.<sup>25</sup> Less than 30 per cent of these medicinal plants are confined to the temperate and colder zones although species of great medicinal value occur in some of these habitats.<sup>26</sup> A quick analysis of the available data shows that the proportion of medicinal plants recorded in the dry and moist deciduous tropical forests is higher as compared to those recorded in the tropical evergreen forests. Forests are therefore, the

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21 Rajasekharan, P.E. and Ganeshan, S., *Conservation of Medicinal Plant Biodiversity- An Indian Perspective*, 24 J. Medicinal and Aromatic Plant Sciences 132 (2002).

22 Das JS, *The Largest Genetic Paradise of India lacks Biotechnological Implementation*, 94 Curr. Sci. 558-559 (2008).

23 Id.

24 Id.

25 Rajasekharan, P.E. and Ganeshan, S., *Conservation of Medicinal Plant Biodiversity- An Indian Perspective*, (cited in note 21)

26 Id.

primary source of a variety of medicinal plants, while a number of the medicinal plants are also cultivated.<sup>27</sup> Over 70% of the plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem, and the whole plant in case of herbs.<sup>28</sup> Moreover, supplies of wild plants in general are increasingly limited by deforestation from logging and conversion to plantations, pasture, and agriculture.<sup>29</sup> This poses a definite threat to the genetic stocks and to the diversity of medicinal plants. In addition, in recent years, medicinal plants have been gaining immense popularity not only in developing countries but also in developed countries due to various well-known reasons like side effects of synthetic drugs. It is estimated that there are over 7800 medicinal drug-manufacturing units in India, which consume about 2000 tons of herbs annually.<sup>30</sup> Therefore, the demand for the basic raw material has increased and forest areas are over exploited to meet the requirements of the pharmaceutical and allied industries. Consequently, many of the important plant species have been threatened and some of them are on the verge of extinction due to unscientific collection by untrained persons.<sup>31</sup> As per a recent report, about 112 species in southern India, 74 species in Northern and Central India, and 42 species

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- 27 Gerard Bodeker, K.K.S. Bhatet *al.*, *Medicinal Plants for Forest Conservation and Healthcare*, FAO (1997), online at <http://www.fao.org/3/a-w7261e.pdf>. (visited on 22th July 2018). It is estimated that more than 90% of raw material for pharmaceutical companies is drawn from wild, as less than 20 species of plants are under commercial cultivation.
- 28 Sudhir Sharma et al, *Conservation of Biodiversity of highly important Medicinal Plants of India through Tissue Culture Technology- A Review*, 1 Agric. Biol. J.N. Am., 828(2010).
- 29 Ahmad, B., *Plant Exploration and Documentation in view of Land clearing in Sabahi* in Nair, M.N.B. & N. Ganapathi, eds., *Medicinal Plants: Cure for the 21st Century*, Biodiversity Conservation and Utilization of Medicinal Plants, Proceedings of a seminar, 161,162 (1998).
- 30 Ramakrishnappa, K., *Biodiversity and the Ecosystem Approach in Agriculture, Forestry and Fisheries*, Impact of Cultivation and Gathering of Medicinal Plants on Biodiversity: Case studies from India, 210-215 (United Nations Publications 2003).
- 31 Ashish Kumar, Jnanesha A C, *Conservation of Rare and Endangered Plant Species for Medicinal Use*, 5 International Journal of Science and Research 1370(2016).

in the high altitude of Himalayas are threatened in the wild.<sup>32</sup> Therefore, there is an urgent need to conserve and to propagate some important medicinal plants species to save them from extinction and to ensure greater availability of raw material.

### **Conservation strategies for Medicinal plants**

Population growth, urbanization and the unrestricted collection of medicinal plants from the wild is resulting in an over-exploitation of natural resources.

Therefore, the conservation of medicinal plant resources has become a matter of urgency. The WHO, International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wide Fund (WWF) for Nature convened an International Consultation on the conservation of medicinal plants in March 1988 in Chiang Mai, Thailand. For the first time, the consultation brought together in the same forum, policy-makers and scientists from the two key areas of health care and nature conservation. The World Conservation Strategy of 1980 prepared by the IUCN defines conservation as ‘the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations’.<sup>33</sup>

The United Nations Convention on Biological Diversity (CBD), 1992 states that the conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population, for which purpose access to and sharing of both genetic resources and technologies are essential. Since its adoption in 1992, CBD has strived to implement its three major goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. Although

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32 Sudhir Sharma et al, *Conservation of Biodiversity of highly important Medicinal Plants of India through Tissue Culture Technology- A Review* (cited in note 28).

33 S.4, IUCN, UNEP and WWF, *World Conservation Strategy Living Resource Conservation for Sustainable Development*, (1980), available at <https://portals.iucn.org/library/sites/library/files/documents/WCS-004.pdf>. (visited Aug 3, 2018).

medicinal and aromatic plants (MAP) have not been explicitly on the agenda of the various CBD meetings, all three goals of the Convention are fully applicable to MAP resources. In April 2002, the CBD adopted the Global Strategy for Plant Conservation, which provides a policy environment that is particularly well suited to addressing the conservation challenges for medicinal plants in a coherent way. India is signatory to the CBD and therefore, responsible to promote the cause of protecting biodiversity for the posterity of the human race.

Strategies adopted for conservation of plant species need to be multi-faceted and focussed if sustainability is the goal. In addition, the geographic distribution and biological characteristics of medicinal plants must be known to guide conservation activities, e.g. to assess whether species conservation should take place in nature or in a nursery. The method to be adopted for conservation of a particular plant species depends largely on propagation cycle, seed behaviour, objectives of a particular conservation effort and technologies as well as funds available. Conservation methods vary with biological and environmental factors but, generally *in situ* and *ex situ*, conservation strategies for medicinal plants are vigorously pursued by all the nations irrespective of their biodiversity status.

### **In situ conservation**

*In situ* conservation involves conserving medicinal plants in their natural habitats either as wild plant communities or plants cultivated in farmers' fields as components of traditional agricultural system. *In situ* conservation of plant species is useful for protecting indigenous plants and maintains natural communities, along with their intricate network of relationships. Thus, it increases the amount of diversity that can be conserved, and strengthens the link between resource conservation and sustainable use. At present, about 4.5 per cent of the geographical area of India is under the *in-situ* conservation.<sup>34</sup> Further, the Ministry of Environment and Forest,

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34 Kala CP, Sajwan BS, *Revitalizing Indian Systems of Herbal Medicine by the National Medicinal Plants Board through Institutional Networking and Capacity Building*, 93 Curr. Sci. 797(2007).

Government of India has established 18 Biosphere Reserves, 41 Tiger Reserves, 102 National Parks and 516 Wildlife Sanctuaries, 4 Community Reserves and 49 Conservation Reserves for *in-situ* conservation of biodiversity, including the Ayurvedic plants.<sup>35</sup> Natural reserves and wild nurseries are typical examples to retain the medical efficacy of plants in their natural habitats. A network of 108 Medicinal Plant Conservation Areas (MPCAs) has been established focusing on conservation of prioritized wild medicinal plants occurring in different regions of the country across twelve States with technical support from Foundation for Revitalisation of Local Health Traditions (FRLHT).<sup>36</sup>

Domestication and cultivation of medicinal plants is another way of *in-situ* conservation. In the case of rare, endangered, or over exploited plants, propagation and cultivation is the only way to provide material without further endangering the survival of those species. Cultivation has pharmacological advantages over wild collection. Wild collected plants normally vary inequality and composition, due to environmental and genetic differences. In cultivation, this variation and the resulting uncertainty of the therapeutic benefit are much reduced. The plants can be grown in areas of similar climate and soil, they can be irrigated to increase yields, and they can be harvested at the right time. Cultivation also greatly reduces the possibility of misidentification and adulteration. It is to be mentioned that despite being one of the policy issues of both the Central and State governments, the response of farmers is not encouraging towards this type of conservation. The cultivated plants are considered qualitatively inferior when compared with wild gathered specimens and traditional medical practitioners generally do not accept cultivated material, as cultivated plants do not have the power of material collected from the wild. Another reason for less interest of farmers is the great fluctuation in demand and prices of medicinal plants. Moreover, medicinal plant species generally have long gestation period and exhibit high dependency on natural pollinators,

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35 Id.

36 Id.

unpredictable seed germination patterns, and poor seed viability.<sup>37</sup>In addition, agro-technology for large-scale cultivation is available for only few of rare and endangered medicinal plant species. Majority of medicinal plants are cultivated without any specific guidelines resulting in poor harvest. No national level statistics on the species wise cultivation of medicinal plants and production of botanical raw materials from cultivated sources is available. Thus, efforts are needed for training and guidance of farmers to motivate them towards medicinal plants cultivation. There is also a need for formation of rural traditional medical practitioners associations as they can be of great help for conservation of local medicinal plant resources and can be influential in changing local opinion. They can disseminate information to local communities on appropriate cultivation methods for medicinal plants, which are high in demand. Moreover, traditional medical practitioners associations or community leaders can play the role of forest guard and contribute towards conservation of endangered medicinal plant resources.

### ***Ex-situ conservation***

*Ex situ* conservation, aims to cultivate and naturalize threatened species to ensure their continued survival and sometimes to produce large quantities of planting material used in the creation of drugs, and it is often an immediate action taken to sustain medicinal plant resources.<sup>38</sup>*Ex-situ* conservation is effective for those plant species that are overexploited and endangered with slow growth, low abundance, and highly susceptible to diseases.<sup>39</sup>It includes methods, which involves conservation outside the native habitat like seed storage, DNA storage, pollen storage, in vitro conservation, field gene banks, and botanical gardens.

Botanic gardens play an important role in *ex situ* conservation, and they can maintain the ecosystems to enhance the survival of rare and endangered plant species. Botanic gardens play a further role in medicinal plant

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37 Id.

38 Swarts ND, Dixon KW, *Terrestrial Orchid Conservation in the Age of Extinction*, 104 Ann Bot. 543 (2009).

39 Havens K, et al *Ex situ Plant Conservation and Beyond*, 56 Bioscience 526 (2006).

conservation through the development of propagation and cultivation protocols, as well as undertaking programs of domestication and variety breeding.<sup>40</sup> Although living collections generally consist of only a few individuals of each species and so are of limited use in terms of genetic conservation, botanic gardens have multiple unique features. They involve a wide variety of plant species grown together under common conditions, and often contain taxonomically and ecologically diverse flora. India has currently a network of about 140 botanical gardens that include 33 botanical gardens attached to 33 universities botany departments.<sup>41</sup> Tropical Botanical Gardens & Research Institute (TGBRI), located in a degraded forest region of Western Ghats Mountains in Kerala has an excellent example in *ex-situ* conservation of plant diversity in India.

Seed banks offer a better way of storing the genetic diversity of many medicinal plants *ex situ*, and are recommended to help preserve the biological and genetic diversity of wild plant species.<sup>42</sup> Seed banks allow relatively rapid access to plant samples for the evaluation of their properties, providing helpful information for conserving the remaining natural populations. The challenging tasks of seed banking are how to reintroduce the plant species back into the wild and how to actively assist in the restoration of wild populations. The field gene bank programme launched by Tropical Botanical Garden Research Institute (TBGRI) from 1992-1999 is well acclaimed as a very effective method of conservation of medicinal and aromatic plant genetic resources. This field gene bank of medicinal and aromatic plants at TBGRI, Thiruvananthapuram is essentially a blend of the *ex situ* and *in-situ* conservations.<sup>43</sup> It is suggested that seed and gene banks of vulnerable

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40 Maunder M, Higgens S, Culham A., *The Effectiveness of Botanic Garden Collections in Supporting Plant Conservation: A European Case Study*, 10 Biodivers Conserv. 384 (2001).

41 Id.

42 Schoen DJ, Brown AHD, *The Conservation of Wild Plant Species in Seed Banks*, 51 Bioscience 962 (2001).

43 Akshay KR et al, *Biodiversity and Strategies for Conservation of Rare, Endangered and Threatened Medicinal Plants*, 2 Journal of Pharmacognosy and Phytochemistry 2347(2014).



medicinal plants species be maintained as a precaution and backup against extinction. The plants most likely to be collected for this purpose are the slow-growing species where commercial cultivation is unlikely and wild populations are jeopardised

An Ethno-medicinal plant garden is another form of *ex situ* conservation. This type of conservation involves creation of a network of regional and sub-regional ethno-medicinal plant gardens that should contain accessions of all the medicinal plants known to the various ethnic communities in different regions of India. This chain of gardens acts as regional repositories of our cultural and ethno medicinal history and embodies the living traditions of our society's knowledge of medicinal plants. There are estimated to be around 50 ethno-medicinal gardens in the country ranging from 20 acre to 40 acres some of them set up by an All India Health Network.<sup>44</sup> One such garden is located in TBGRI, Palode at Thiruvananthapuram in Kerala. In addition, the gene banks set up by the Department of Biotechnology, Government of India are conserving nearly a thousand accessions of important species from different bio-geographic regions of the country in the seeds banks, in vitro repository, DNA bank and under cryopreservation. This kind of conservation involves depositing and preserving seeds of wild medicinal plants with a first priority known as Red Listed Species and endemic species. The Department of Biotechnology in India has taken the initiative to establish three gene banks in the country. One is with ICAR at the National Bureau of plant genetic Resources(NBPGR) Campus, the second is with, Central Institute of Medicinal and Aromatic plants(CIMAPs), Lucknow and the third with TBFRI in Thiruvananthapuram. The gene bank of TBGRI has covered 30,000 accessions of 250 medicinal and aromatic plant species, which include 100 endemic, rare, and endangered medicinal and aromatic plants of the tropical region of India.<sup>45</sup> The plant species, which are sterile or do not easily, produce seeds, or produce recalcitrant seeds or crop plants which are clonally propagated are usually conserved

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44 Id.

45 Id.

in the field gene banks at IHBT and IIIM.<sup>46</sup> Although, field gene banks provide easy access to the conserved material for use, they run the risk of destruction by natural calamities, pests, and diseases, are associated with problems in terms of required land space, and labour input during annual and perennial replanting, testing, and documentation.

The biotechnology has provided some effective tools namely, micro propagation and cryopreservation, for the conservation of plant genetic resources. Biotechnology provides the possibility of large-scale production of bioactive compounds through suspension cultures or hairy root cultures. Unfortunately, these techniques have not been adopted for large-scale commercial production of high value bioactive compounds, rather, extraction is largely done from the natural tissue. There is no proper documentation of the commercial large-scale production using micro propagation. This method has largely been confined to publications and scientific discussions only. The DBT, GOI has set up two micro propagation technology parks at National Chemical Laboratory (NCL), Pune and Tata Energy Research Institute (TERI), New Delhi.<sup>47</sup>

There is a lack of proper documentation of the outcome of various schemes being implemented for biodiversity conservation by the above-mentioned respective bodies. Detailed information related to conservation, such as names of the plant under conservation, the types of measures followed, places where the practices are carried on, the names of the organisations involved in the various programmes and the addresses of the contact persons for correspondence are all necessary to those working in this field. Areas like the *in vitro* conservation of various threatened plants (pollenbanks, DNA banks, cryopreservation), mass multiplication by micro propagation and herbal formulations from *in vitro* regenerated plant sources, the information is completely or partially unavailable on the concerned website. The inadequate management system, related to plant germ plasm

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46 Manoj Siwach et al *Biodiversity Conservation of Himalayan Medicinal Plants in India: A Retrospective Analysis for a Better Vision*,<sup>5</sup> International Journal of Biodiversity and Conservation 537 (2013).

47 Id.

information, in India has been emphasized from time to time and building up of a national medicinal plant conservation database is need of the hour.<sup>48</sup> The government of India has set up a Traditional Knowledge & Digital Library (TKDL), an electronic database of traditional knowledge in the field of medicinal plants. Such a database enables the Patent Officers all over the world to search and examine any prevalent use or prior art, and thereby prevent incorrect grant of patent based on knowledge in public domain, including knowledge associated with medicinal plants. This documentation will help in opposing any piracy of patent as experienced in case of neem and turmeric. Recently, several institutes and organisations, involved in different aspects of medicinal plant conservation have initiated a network program namely, Indian Medicinal Plants National network of Distributed Databases (INMEDPLAN) to pool their resources.<sup>49</sup> Similarly, a number of online databases have been offered by many institutes but in all the available databases of the threatened medicinal plants do not find a satisfactory place. Collection, documentation, and validation of various folk medicines, in addition to other various traditional knowledge have been initiated by National Institute of Science Communication and Information Resources of Council of Scientific and Industrial Research and also by few other NGOs. Documentation and dissemination of the information on various conservation efforts of plants will in a way encourage many groups to initiate conservation efforts for those plants, which have not been covered yet. Further modifications in the existing strategies will be greatly benefitted by availability of such information.

## **Legal and Regulatory Framework**

Protection of species and habitats through the passing of laws by the State are vital to the preservation of biodiversity. Interestingly, there are

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48 Sobral BWS, *The Role of Bioinformatics in Germ plasm Conservation and Use* in J.M. Engels, R.V. Ramanatha, A.H.D. Brown, M. Wallingford (Eds), *Managing Plant Genetic Diversity*, 175(CAB international, 2001).

49 Manoj Siwach et al *Biodiversity Conservation of Himalayan Medicinal Plants in India: A Retrospective Analysis for a Better Vision*(cited in note 46)

no separate policies or regulations for conserving medicinal plants and there are no integrated national policies, which could facilitate drug regulators, health administrators, health professionals including traditional and modern practitioners to regulate the market and ensure consumer safety along with conservation, intellectual property protection, and sustainable use of medicinal plants in India.

Conserving and protecting medicinal plants is being generally covered under existing laws, such as the Forest Act, 1927, Wild Life (Protection) Act, 1972, Forest Conservation Act, 1980, Environment Protection Act, 1986 and National Biodiversity Act, 2002. More than 85 per cent of medicinal plants used by the Indian industry are collected from the wild or forests and about 70 per cent of the collection involves destructive harvesting from the wild.<sup>50</sup> Medicinal plants are said to be covered under s. 2(4)(b) of Indian Forest Act and are not subject to regulations unless extracted from the forests and items such as bark and wood-oil from certain trees are covered under s. 2(4)(a) and are subject to significant regulations regardless of origin. Generally, medicinal plants are considered as a component of non-timber forest products (NTFPs) under the provisions of the statute and considering the importance of medicinal plants they should be taken out from NTFPs and given due importance for their conservation and protection. The Forest Conservation Act, 1980 and the Wildlife Protection Act, 1972 facilitate only *in situ* conservation of medicinal plants. The Wildlife Protection Act provides regulatory mechanism for six endangered plant species mentioned under Schedule VI but out of the six only one species is of having medicinal value. In addition, a Wildlife Crime Control Bureau has been established under Ministry of Environment and Forests to check illegal trade and smuggling in wildlife including medicinal plants. The Biological Diversity Act, 2002, identifies the threatened species State wise to prohibit or regulate their collection from wild and suggests measures for their rehabilitation.<sup>51</sup> Further, export of 29 species of medicinal plants is regulated under the EXIM policy of the Indian Government.

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50 Id.

51 See, s.38, The Biological Diversity Act, 2002.

Medicinal plants signify not only a valuable part of India's biodiversity but are also a foundation of immense conventional knowledge. Medicinal plants and related traditional knowledge can also be subject matter of intellectual property. The patenting of indigenous knowledge by foreign corporations is a cultural threat to the country as well as contributes to economic loss. Further, developing countries increasingly face the issue of bio piracy<sup>52</sup> as a significant issue that immediately needs to be addressed. Since many of these countries are shelters of biodiversity and rely economically on their ability to export indigenous products and processes, they see the rising importance of protecting their traditional knowledge from unjustifiable foreign patenting. The Patents Act, 1970 is a comprehensive law that ensures patent rights are not worked to the detriment of the consumer or to the prejudice of trade or the industrial development of the country keeping in mind the World Trade Organization (WTO) obligations and commitments. In many countries, the plants and inventions directed to the plants and the plant products i.e., seeds, flowers, gums, and resins are not eligible for filing a patent. The Indian Protection of Plant Varieties and Farmers Rights Act, 2001 recognize the contribution of farmers who actively participate in the breeding programs. Furthermore, this Act contains provisions for benefit sharing whereby local communities are acknowledged as a contributor of plants. Further, the Geographical Indication of Goods (Registration and Protection) Act, 1999 is an important legislation for safeguarding the agricultural goods or for that matter, any other goods manufactured at a given location. The medicines prepared from certain genotypes and at a particular location, having a good quality can be protected after registering it under this Act with the Controller General of Patents, Designs and Trade Marks which has the quality related to that geographical location.<sup>53</sup>Hence, India as a biodiversity hotspot, is taking a leading role in committing to the protection of its knowledge base.

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52 Biopiracy describes a process in which living resources or traditional knowledge and practices are patented, thus applying intellectual property restrictions to their use.

53 See. s.3 (1),Goods (Registration and Protection) Act, 1999.

Besides statutes, effective implementation of various policies at national and State level will provide an opportunity in the conservation and promotion of medicinal plants. For instance, the Five Year Plans of India has identified medicinal plant sector as an integral part of the Indian system of medicine. Similarly, the National Health Policy, 1983 recognized that the large stock of health manpower in Ayurveda, Siddha, Unani, Homeopathy and Naturopathy had not been adequately utilized and called upon the respective agencies to take steps need for a meaningful integration of the indigenous and modern systems of medicine. The Planning Commission and the National Medicinal Plants Board (NMPB) of the Government of India have prepared a policy document on the promotional and commercial aspects of the medicinal plants. The National Medicinal Plants Board (NMPB) under Ministry of AYUSH is implementing Central Government's Scheme for conservation of medicinal plants carried out mainly through *in-situ* conservation by way of plantation, augmentation of species in their natural habitat and establishing Medicinal Plants Conservation and Development Areas (MPCDAs) through *ex-situ* conservation by developing herbal gardens. Further, the National Biodiversity Authority (NBA) in India oversees the conservation and utilisation of biological resources in sustainable manner taking care of ethics and equity issues. The biodiversity councils established under NBA mobilises local resources at the level of local bodies such as panchayats and municipal corporations. Besides, banking sector has also been providing financial aids to various projects involved in medicinal plant conservation and cultivation programs. The National Bank for Agriculture and Rural Development (NABARD) is supporting development of medicinal plant sector in coordination with NMPB.

## Conclusion

Medicinal plants is viewed as a possible bridge between sustainable economic development, affordable health-care, and conservation of vital biodiversity. The important role for medicinal plants in biological and ecological conservation stems from the foundations that they can provide for the involvement of people in conservation of natural habitats .Medicinal

plants are symbolically significant in all cultures, as they contribute to health, income, agro forestry system, cultural identity, and livelihood security. Therefore, the ‘biological beneficiaries’ of ‘medicinal plant conservation’ are not necessarily only the medicinal plants themselves.<sup>54</sup> The Government of India has formulated various schemes, policies and programmes for conservation of the medicinal plant wealth of the country, but policies and strategies to harness optimum potential of medicinal plants for sustainable development, are not addressed adequately. It is therefore, essential that India enact legislation that ensures protection and promotion of medicinal plants and lays down policy guidelines for the commercial use and exploitation of these plant resources that is both sustainable and equitable. Both *ex-situ* as well as *in-situ* conservation efforts need to be geared up to combat the existing challenges. Further, as Maheswari notes ‘India should aim to build a golden triangle between traditional medicine, modern medicine, and modern science, which will be a boon for developing the traditional herbal medicine and the medicinal plants sector’.<sup>55</sup>

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54 Alan C. Hamilton, *Medicinal plants, Conservation and Livelihoods* in Biodiversity and Conservation, 1478 (Kluwer Academic Publishers 2004).

55 J. Maheswari, *Patenting Indian medicinal plants and products*, 4 Indian Journal of Science and Technology 301(2011).

## **Sustainable Development and Gender Justice: A Comparative Study of Indian Standards with Acclaimed International Standards**

*Aneesha P.R\**

### **Introduction**

The protection of earth's life support system by balancing the social, economic development and protecting the environment for future generations is the goal of sustainable development. The idea and concept originated as an aftermath of the world's realisation about the massive exploitation and extractions of natural resources by a huge population would end up in turning earth an unfit place for living. World community accelerated the momentum of sustainable development goals with a view to make it a movement spread all over the world irrespective of the developed or under developed status of nations. Our reflections on sustainable development have been transformed into a progressive path in last 20 years. Many of the National Governments have already made the goals a part of their policies and people have been made aware and more cautious about keeping environment safe for future generations. Countries like India and China are undergoing rapid economic growth, but the development brings too much exploitation of nature and too much pollution and destruction of the environment along with the efforts of generating economic progress and amassing wealth.

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The long haul dependability and accomplishment of social orders depend on a solid and beneficial populace. A general public (or groups inside a bigger society) that faces distress, destitution and ailment won't develop in the long haul: social prosperity and monetary prosperity sustain off each other, and the entire amusement relies upon a sound biosphere in which to exist. With regards to enhancing economies, social orders and protecting the earth, women have a focal part. Over the globe, per capita pay is least in nations where women are fundamentally less taught than men, proposing that putting resources into women is an initial step to raising everybody's prosperity. Obviously, enhancing the circumstance of women worldwide is a critical first step for sustainable development and this influenced one of the Programmes of Action of Rio Earth Summit of 1992. The motivation was for expanding the monetary, social and ecological part of women. This paper is a comparative analysis of gender justice as one of the sustainability goals under International and Indian perspectives. It's an inquiry into the factual situations of achievements of India in realising the goals set through International initiatives.

### **International Initiatives on Gender justice - A programme of action for Sustainable Development Goals.**

In 1968-69, the General Assembly chose to gather a worldwide meeting in Stockholm, whose primary object was "to serve as a practical means to encourage, and to provide guidelines ... to protect and improve the human environment and to remedy and prevent its impairment"<sup>1</sup> The intergovernmental working gathering under United Nations figured out how to deliver a draft Declaration in the meeting, comprising of a preamble and 23 standards and later improved to 26 standards and known as Stockholm Declaration. Rio Declarations with a preamble and 27 principles have been yielded from a second global conference of United Nations on Environment and Development. As strategic gathering declarations out of diplomatic

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1 Resolutions 2398 (XXIII) and 2581 (XXIV) available at [https://rio20.un.org/sites/rio20.un.org/files/a\\_res\\_2581xxiv.e\\_0.pdf](https://rio20.un.org/sites/rio20.un.org/files/a_res_2581xxiv.e_0.pdf) (visited Apr 29,2018)

conferences, the two instruments are formally not binding still it serves as a standard to be followed by member countries. Aside from it, the General Assembly, in December, 1992 additionally embraced a determination accommodating the foundation of a Commission on Sustainable Development, to screen and encourage endeavours to execute the assorted objectives and proposals of the Earth Summit, specifically the Declaration on the Environment and Development or Agenda 21 and the Statement of Forest Principles. Agenda 21 is an exhaustive arrangement of a move to be made all inclusive, broadly and locally by organisations of the United Nations System, Governments, and Major Groups in each zone in which human effects are on the earth.

In continuation of the above discussed initiatives for sustainable development, gender justice have been made more prominent and connected issue with the sustainability through another global initiative of pioneers of 189 nations gathered at the United Nations headquarters and signed the notable Millennium Declaration, in which they resolved to accomplish an arrangement of eight quantifiable objectives that range from reducing extreme poverty and hunger into half to promote gender equality and reducing child mortality, by the deadline of 2015.<sup>2</sup>The Millennium Development Goal Targets were essentially identified with education, health, women's employment, political representation and access to water and sanitation. Besides, education and health rights of women had been prioritised against women's economic and political rights.

With an end goal to feature the inter - linkages between the three Rio Conventions, from gender-based viewpoints specifically, and how this adds to sustainable development, the Secretariat composed a high-level lunch-time panel discussion on Harnessing the gender dimensions of biodiversity, management of land in sustainable ways and climate change to accomplish a protected environment as a team with the Secretariat of the Economic and Social Council (ECOSOC), on 2 July 2010.<sup>3</sup>The discussion

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2 Goal 3, promote gender equality and empower women. available at <http://www.un.org/millennium/declaration/ares552e.htm> (visited Apr 28,2018)

3 ECOSOC Annual Ministerial Review 2010 available at <https://www.cbd.int/gender/activities/ECOSOC/default.shtml> (visited Apr 28,2018)

elaborated on the connection between the sustainable developments, climate change, and biodiversity. The discussions brought out a point that gender based approaches to these issues would yield better results of sustainability in livelihood, climate and environment. All these interventions made it clear that the political, economic, and social empowerment of women is of vital importance and that investing in women and girls is key not only for achieving the Millennium Development Goals and sustainable development as a whole but also for advancing global peace and security.

The world has effectively understood the primary MDG of reducing the extraordinary destitution rate by 2015, be that as it may, the accomplishments were observed to be uneven. The MDGs were set to terminate in 2015 and the discourse of a post-2015 agenda proceeded. The main focus of the new agenda was on erecting a sustainable world where environmental sustainability is to be equally esteemed with the inclusion of society and economic progress and development. The United Nations Conference on Sustainable Development in Rio de Janeiro, June 2012, excited a procedure to build up another arrangement of Sustainable Development Goals (SDGs) which will bear on the energy created by the MDGs and fit into a worldwide advancement system past 2015.<sup>4</sup> The duty to bend over backward to quicken the accomplishment of the globally concurred development goals, including the Millennium Development Goals by 2015 had been reaffirmed in the conference. This initiative has led to another worldwide web consultation for establishing a people-centred sustainable development plan with the inclusive participation of civil society organisations, scientists from all over the world, academicians who got expertise in the field, private sector and general public. They all participated very actively in the discussions and engaged in both thematic and national consultations. Intergovernmental discussions have been facilitated. Finally, a synthesis of all the consultations has been published by the UN Secretary-General.<sup>5</sup> In this way, the United

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4 Details of the meeting is available at <https://sustainabledevelopment.un.org/hlpf> (visited Apr 28,2018)

5 *Sustainable Development Goals: All you need to know* available at <https://www.theguardian.com/global-development/2015/jan/19/sustainable-development-goals-united-nations> (visited June, 8, 2018 )

Nations Summit on Sustainable Development 2015 met and it collected perceivability, political help and driving force for a genuinely transformative 2030 Agenda<sup>6</sup> and its implementation. A substantial number of Heads of State or Government and high-level leaders from business and civil society took part is confirmation of the excitement produced by this new Agenda. To accomplish the 2030 Agenda, lessening inequalities through the empowerment of women and marginalised groups were prioritised. As the poverty has been identified as having a multidimensional character, balanced and sustainable economic development have been suggested to address this issue.<sup>7</sup>

In UN Summit on Sustainable Development 2015, Interactive Dialogue sessions discussed the various perspectives of sustainable development including gender equality perspective.<sup>8</sup> It has been emphasised that the goals of sustainability can't be achieved unless it incorporates all, particularly women as half of the total populace comprise of them. Interactive dialogues mainly concentrated on ensuring inclusive economies, pursuance of full and productive employment for all men and women by reducing gender disparities and promoting equality of genders.<sup>9</sup> Some essential prerequisites,

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6 Resolution adopted by General Assembly on 25<sup>th</sup> September 2015 available at [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&referer=/english/&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&referer=/english/&Lang=E) (visited June, 8, 2018) Also see *Transforming our world: the 2030 Agenda for Sustainable Development* available at <https://sustainabledevelopment.un.org/post2015/transformingourworld> (visited June, 8, 2018)

7 Interactive Dialogue 3: Fostering sustainable economic growth, transformation and promoting sustainable consumption and production. To ensure inclusiveness of our economies, we need to pursue full and productive employment and decent work for all women and men, reduce income disparities and promote gender equality. Investing in women's health and education, eliminating gender violence and promoting women's entrepreneurship are essential to achieving the sustainable development goals. available at <https://sustainabledevelopment.un.org/content/documents/8151Interactive%20Dialogue%20%203%20-%20Growth%20Industrialization.pdf>. (visited on June, 8, 2018)

8 Interactive dialogue 2 Tackling inequalities, empowering women and girls and leaving no one behind. Detailed document available at <https://sustainabledevelopment.un.org/content/documents/8146Interactive%20Dialogue%20%20-%20Inequalities.pdf>. (visited June, 8, 2018)

9 Id, para 2.

like the promotion of women entrepreneurship, elimination of gender violence and investment for health and education of women, has been identified for the full achievement of the sustainable development.<sup>10</sup>

Summit had ended up with a final post-2015 agenda of sustainable development<sup>11</sup> and the goal of the agenda was to have an innovative, people-centred strategy with women empowerment. So also, the Third International Financing for Development Conference outcome<sup>12</sup> reaffirms that accomplishing sex balance is fundamental to accomplish sustained, comprehensive, and fair monetary development and economic improvement. The new strategy that has been presented through 2030 plan is obviously incorporated inclusive and integrated strategy for sustainability. It has been made inclusive to give active participation for all sections of society irrespective of any gender disparities. Economic security and ecological integrity have been made supportive and dependent on each other and social equity through equal participation has been made a covering plan for accomplishing sustainability. To be precise the present strategy envisages through 2030 agenda is of course a holistic approach of inclusive development where gender justice plays a key role in achieving sustainability. Hence achieving gender equality and women's empowerment has been made a stand-alone goal of the SDGs<sup>13</sup>.

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10 Interactive Dialogue 3 (cited in note 7)

11 *The 2030 Agenda for Sustainable Development* available at <https://sustainabledevelopment.un.org/post2015/transformingourworld> (visited Apr 21, 2018)

12 *Report of the third International Conference on Financing for Development*, chapter 1, at 41 para 4&6 available at <http://www.undocs.org/A/CONF.227/20> (visited Apr 21, 2018).

13 Goal 5— End all forms of discrimination against all women and girls everywhere

- 5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation
- 5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation
- 5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate
- 5.5 Ensure women's full and effective participation and equal opportunities for

It is also part of all the other goals, with many targets specifically recognizing women's equality and empowerment as both the objective and as part of the solution. Women share the primary responsibility for nutrition, child care and household management in almost all countries. They are also active in environmental management. In most developing countries, women play a major role in society. They contribute to food sustainability as farmers in many of the places. They manage all the family affairs and they earn by rearing domestic animals like cow, sheep and so on. They collect fuel and water for their house hold and to meet the needs of the family. All in all they are good leaders, entrepreneurs and managers. Yet, despite their roles, women are not adequately represented in the decision-making processes related to the issues of environment and development at local, national or international levels. Hence achieving gender equality and sustainable development by 2030 will require stepping up efforts at all fronts. This was set apart as an incredible advance forward. The SDG Goal 5 incorporates a multi-dimensional way to deal with gender equality with an extensive variety of focuses on ending discrimination and violence against women, including trafficking and sexual (and other types of) exploitation; ending child, early and forced marriage, and female genital mutilation ;perceiving unpaid care and household work; advancing ladies' cooperation and open doors for initiative; guaranteeing general access to sexual wellbeing and regenerative rights; enabling ownership of land and

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leadership at all levels of decision-making in political, economic and public life

- 5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences
- 5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
- 5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women
- 5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels.

other property, including natural resources and so on.<sup>14</sup> The 17 objectives are interconnected, that implies that gains in any one region would catalyse accomplishments.

Building a feasible, more secure and all the more ‘just world ‘is a noteworthy subject taken up by women organisations at all levels and around the globe. All of such initiatives have finally brought out an end product of a universal standard for the sustainable strategy based on inclusive development where gender justice has been made an inexorable goal to be achieved. It has been made obligatory upon the Nation States to work on each standalone goals of 2030 agenda.

### **Where India Stands?**

Gender equality was a goal contemplated by Indian Constitution from its inception onwards. Time and again we amended our Constitutional provisions, changed our strategies and institutionalised new policies with the sole aim of achieving this specific goal but the entrenched patriarchal society of India is very protracted in imbibing the idea. However it, Indian Governments of all times, have introduced lot many policy measures to imbibe the idea of gender justice which ultimately manifests the sustainability goals of 2030 agenda.

We witnessed a number of policy initiatives in India towards equality even before the above discussed international initiatives. Towards equality, the notable and path breaking first report of the Committee on the Status of Women in India was driven by the late feminist scholastics Vina Mazumdar and Lotika Sarkar. The report attracted the nation’s regard for disempowered women.<sup>15</sup> It issued an alert to the problem of the declining sex ratio that in turn led to the development of gender-sensitive policy-making and an increased focus on the education of girls. Forty years later, the second

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14 Id

15 Government of India, *Report of the Committee on the status of women in India*, (Ministry of Education and Social Welfare December 1974). Full report available at <http://pldindia.org/wp-content/uploads/2013/04/Towards-Equality-1974-Part-1.pdf> (visited Mar 19, 2018)

report was prepared by a High-Level Committee on the Status of Women (2015). This report highlighted key gender gaps, applying an intersectional lens, and covered the diversity and complexity of women's lives in the country.<sup>16</sup> There were other committee reports like Justice Verma Committee (2013), CEDAW (2014) which made an extensive and informed analysis of the pathways that can be traversed to enhance women's status. In furtherance of internationally set sustainable goals with the specific goal of gender equality, several important initiatives have been taken by the Government of India during the last few years for promoting gender equality.

A flagship initiative is *Beti Bachao Beti Padoo*<sup>17</sup> (Save the Girl Child Educate the Girl Child), under which State Governments are implementing a range of measures suited to their local contexts to elevate the status of the girl child. It aims at an equal opportunity and education for girls in India.

Additionally, a Maternity Benefit Programme<sup>18</sup> has been launched for all pregnant and lactating mothers. Through conditional cash transfer, it protects women from wage loss during the first six months after childbirth.

For raising the levels of female labour force participation, a number of initiatives are being implemented including Stand-up<sup>19</sup> India and The

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16 *Report on the Status of Women in India* (High Level Committee on the Status on Women, 2015). available at [http://www.wcd.nic.in/sites/default/files/Executive%20Summary\\_HLC\\_0.pdf](http://www.wcd.nic.in/sites/default/files/Executive%20Summary_HLC_0.pdf) (visited Mar 12, 2018)

17 In 2005 enrolment in primary and upper primary classes together had a Gender Parity Index of 0.89 in India. In classes I-V it was 0.91 and in classes VI to VIII it was 0.83, this shows a lower gender parity in higher classes. In 2014-15 it was 0.94 for all classes and 0.93 in Classes I-V and 0.95 in Classes VI-VIII which shows a definite improvement (DISE data for 2005 and 2014-15). Available at <http://www.dise.in/Downloads/Publications/Documents/U-DISE-SchoolEducationInIndia-2013-14.pdf> (visited on Apr 13, 2018)

18 It's a scheme for pregnant women and lactating mothers introduced and implemented from 01/1/2017. Details of the governmental order for implementation is available at <https://pmsma.nhp.gov.in/wp-content/uploads/2017/08/administrative-approval-maternity-benefit-programme.pdf> (visited May 18, 2018).

19 Under this scheme women have been given subsidies, concessions and incentives for entrepreneurship. Centre gives subsidy for women in coir industry and States do have enough schemes for granting subsidy for other industries too. Available at <https://www.standupmitra.in/home/subsidyschemesforwomen> (visited June 11, 2018).



Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)<sup>20</sup>. Through the act and its implementation rules, Government has ensured that women have been given more participation and the schemes introduced under the Act should promote gender equality and empowerment of women.<sup>21</sup>MGNREGA, through the formation of feasible provincial resources, water protection and forestry works have the potential to contribute to the ecological restoration and generate environmental benefits through increased livelihood security, especially for rural women, to climate change and other shocks. At present, a large number of women workers have minimal rights to the productive assets they work on even under the Scheme, and this contributes to the persistence of social exclusion. Organisational arrangements at the local level are needed to reduce the problem of implementation of gender-specific policy measures. These may include rights to maintenance, sharing, etc.<sup>22</sup>Further, Women Empowerment Centres are being established for providing comprehensive services at the village-level. Specific interventions on female employment, programmes on the empowerment of adolescent girls, the Sukanya Samridhi Yojana<sup>23</sup> on girl child prosperity and the Janani Suraksha Yojana for mothers advance India's commitment to gender equality and the targets of Goal 4.

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20 The mandate of the Act is to provide 100 days of guaranteed wage employment in a financial year (FY) to every rural household whose adult members volunteer to do unskilled manual work. Since 2008, MGNREGA has covered the entire country with the exception of districts that have a hundred per cent urban population. Government of India, *Sameeksha, An Anthology of Research Studies on the Mahatma Gandhi National Rural Employment Guarantee Act, 2005, 2006–2012* (Orient Blackswan Private Limited 2012). available at [http://nrega.nic.in/Circular\\_Archive/archive/MGNREGA\\_SAMEEKSHA.pdf](http://nrega.nic.in/Circular_Archive/archive/MGNREGA_SAMEEKSHA.pdf) (visited June 11, 2018)

21 From FY 2006–07 up to FY 2011–12, around Rs 53,000 crore have been spent on wages for women and around 47 per cent of the total person-days generated have been by women. Id, chapter 2, at 18

22 G. Kelkar, *Gender and Productive Assets: Implications for the National Rural Employment Guarantee for Women's Agency and Productivity*, (UNIFEM, 2009)

23 Sukanya Samridhi Yojna is a special deposit scheme for girl child only. *Empowering the Girl Child*, 64 *Kurukshetra, A Journal on Rural Development* 52 (Jan 2016) available at <http://yojana.gov.in/Final%202023-12-15%20Kuru%20January%202016.pdf> (visited Apr 12, 2018).

Sarva Shiksha Abhiyan<sup>24</sup> (SSA), the principal programme of universalisation of primary education, has been implemented, as a Centrally sponsored scheme in partnership with States/Union Territories (UTs) since 2000-01<sup>25</sup>. The programme had been introduced with a view to promote the education of girls. As a part of the programme and incidental to it two more special schemes had been introduced through the scheming of SSA with a view to promote girl's education. These are: (i) The National Programme for Education of Girls at Elementary Level (NPEGEL): The programme was launched in 2003 and was implemented in educationally backward blocks (EBBs), addressing the needs of girls who are 'in' and 'out' of school.<sup>26</sup> Since many girls become vulnerable to leaving school when they are not able to cope with the pace of learning in the class or feel neglected by teachers/peers in class, the NPEGEL<sup>27</sup> emphasises the responsibility of teachers to recognise such girls and pay special attention to bring them out of their state of vulnerability and prevent them from dropping out, (ii) Kasturba Gandhi Balika Vidyalaya (KGBV) Scheme:<sup>28</sup> These are residential upper primary schools for girls from Scheduled Caste (SC), Scheduled Tribe (ST), and Other Backward Classes (OBC) and Muslim Communities and are set up in educationally backward blocks where schools are at great distances and are a challenge to the security of girls and often compel them to discontinue their education. The KGBVs<sup>29</sup> reach out to adolescent girls who are unable to go to regular schools, out-of-school girls in the 10+ age

24 Available at [http://www.ssa.nic.in/about\\_ssa.html](http://www.ssa.nic.in/about_ssa.html) (visited Apr 28, 2018)

25 Its overall goals are: (i) all children in school, (ii) bridge all gender and social category gaps at primary and upper primary stages of education, (iii) universal retention, and (iv) elementary education of satisfactory quality

26 Available at <http://www.nmew.gov.in/index1.php?lang=1&sublinkid=226&lid=204&level=1&domid=9&ltypeid=1> (visited June 10, 2018).

27 By the end of 2012-13, 41.2 million girls have been covered in 3,353 EBBs in 442 districts, 41,779 Model School Clusters have been established. At the cluster level, one school is developed into a resource hub for schools within the cluster.

28 <http://www.nmew.gov.in/index1.php?lang=1&sublinkid=226&lid=204&level=1&domid=9&ltypeid=1> (cited in note 26)

29 It is implemented in 27 States/UTs . Up to the year 2012-13, 3,609 KGBVs have been sanctioned and 366,500 girls were enrolled in these KGBVs as against the targeted enrolment of 373,000 girls.

group who are unable to complete primary school, and younger girls of migratory populations in difficult areas of scattered populations who do not qualify for primary/ upper primary schools. The Rashtriya Madhyamik Shiksha Abhiyan is a flagship programme of Government of India, launched in March 2009, to enhance access to secondary education and improve its quality. The implementation of the scheme started from 2009- 10 to generate human capital and provide sufficient conditions for accelerating growth and development and equity and also quality of life for everyone in India. The Rashtriya Madhyamik Shiksha Abhiyan (RMSA), revised in 2013, has integrated among others, the Girls Hostel Scheme and National Incentive to Girls, especially to encourage girls in secondary level of education. A sum of Rs. 3, 000 is deposited in the name of eligible girls as fixed deposit. The girls are entitled to withdraw the sum along with interest thereon on reaching 18 years of age and on passing 10th class examination.

Saakshar Bharat Scheme was another programme launched in 2009 and has been extended up to 31 March 2017.<sup>30</sup> Around 29 lakh learners have been benefitted under Vocational Training programme through Jan Shikshan Sansthan between 2009 to 2014 out of which the women beneficiaries were 25.02 lakhs. Government of India, started in 2000 a scheme called “Kishori Shakti Yojna” (KSY) using the infrastructure of Integrated Child Development Services (ICDS), which, seeks to empower adolescent girls, so as to enable them to keep charge of their lives. Thereafter, Nutrition Programme for Adolescent Girls (NPAG) was initiated as a pilot project in the year 2002-03 in 51 identified districts across the country to address the problem of under-nutrition among adolescent girls. Under the programme,

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30 By end of September 2014, 388 districts in 26 States and one in UT were covered. About 3.92 crore learners appeared for biannual basic literacy assessment tests conducted so far. About 2.86 crore learners (including 2.05 crore females), comprising 0.67 crore SCs, 0.36 crore STs and 0.23 crore minorities have successfully passed the assessment tests under basic literacy conducted by National Institute of Open Schooling (NIOS), up to March 2014. In addition, about 41 lakh learners have taken up the assessment test held in August, 2014 and 1.53 lakh .Adult Education Centres are functioning as of now. 2.5 million persons have been mobilised as Voluntary Teachers; 35 million primers in 13 Indian languages and 26 local dialects have been produced and distributed.

6 kg of free food grains per beneficiary per month are given to underweight adolescent girls. The two schemes have influenced the lives of Adolescent Girls (AGs) to some extent, but have not shown the desired impact.

NITI Aayog<sup>31</sup> has been entrusted with the role to co-ordinate ‘Transforming our world: the 2030 Agenda for Sustainable Development’ (called as SDGs). A National Consultation has been organised by them on Sustainable Development Goals (SDGs) on 11th April 2017. The consultation discussed SDG5 of gender equality. Importance of education, skills, employment, data indicators, ownership of assets, and use of Information Technology has been discussed as the prime factors to facilitate empowerment of women.<sup>32</sup> As a part of its role, NITI Aayog has presented the 1st Voluntary National Review on the implementation of SDGs in the country to the 2017 High-Level Political Forum on 19th July 2017.<sup>33</sup> Report has nothing to point out anything other than a confession that plans for progress are yet to be made. Other than *Beti Bachao, Beti Padao* and Maternity Benefit programme, nothing much was there to high light in the National Review.

## Conclusion

We have already seen that programmes and policies are in abundance in India in pursuance of the sustainable development goals. Gender equality as a standalone goal of sustainable development is very difficult to achieve through governmental policies and schemes in India as ours is an extremely patriarchal society. Not only men but women in our societies are also conditioned for generations that inequality as the rule and equality as an

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31 The National Institution for Transforming India, also called NITI Aayog, was formed via a resolution of the Union Cabinet on January 1, 2015. NITI Aayog is the premier policy ‘Think Tank’ of the Government of India, providing both directional and policy inputs. While designing strategic and long term policies and programmes for the Government of India, NITI Aayog also provides relevant technical advice to the Centre and States.  
Available at <http://www.niti.gov.in/> (visited June 14, 2018).

32 Detailed report available at <http://niti.gov.in/content/overview-sustainable-development-goals#> (visited June 10, 2018).

33 Full report available at [http://niti.gov.in/writereaddata/files/Final\\_VNR\\_report.pdf](http://niti.gov.in/writereaddata/files/Final_VNR_report.pdf) (visited June 10, 2018)

exception. Women have been treated and recognised as the caregivers and it assumes special responsibility upon women. Through many policies and programmes government implement to share the responsibility of care giving and trying to reduce the burden of woman, the age-old responsibility tag upon women is still there which makes them time constraint for contributing to society.

Intra house discrimination is another hindrance to sustainable development through gender equality. The decision making power and the leadership still remains the monopoly of men in our society which makes the qualities of women which will be much helpful in managing resources will always be turned unnoticed and unrecognised. Sustainable development should be a household affair where a woman should be allowed to utilise her managerial skills through the decision making power and by giving freedom to utilise and allocate resources. The leadership qualities, dedication to the family which ultimately can be turned to be the dedication to society should always be promoted and utilised in the sustainable development initiatives of the country. Some programmes and policies of the government are helpful in empowering women and thereby increasing their control over the resources and household decision making. But this alone is not adequate to have a successful and envisioned 'transformative' social protection for addressing gender-specific vulnerabilities and problems. We are in dearth of refocused and restructured social protection scheme for confronting deep-rooted social conditioning like intra household inequalities, gender-specific malnutrition, and absence of choices in reproductive rights and unpaid caregiving and household management, inequality in remuneration for the same kind of work and so on.

United Nations, its consultative international NGOs and other international organisations and working groups have successfully laid down great ideals and standards to be achieved. Standalone as well as intersecting goals of sustainability have been laid down but the challenges for the achievement of cross-cutting goals like gender equality and women participation in sustainability, includes cultural, traditional and social barriers. These barriers can never be crossed without having a solid National Plan of Action.

Funding and corruption is also another confusing issue once talking and thinking about national action Plans in India. It has been noted that the inadequacy of funding was a major weakness in the fulfilment of MDG. The challenge of funding SDG 5 too seems therefore to be a major stumbling block. National plans in India can only be achieved through individual State Plans because we have several cultural, traditional and social barriers in between the States within the country. In some States people still do have cultural religious and customary practices of discrimination and women themselves believed that they are meant for the family and not for themselves or for the society. Childbearing and rearing is considered as the women-centric obligations where men are not supposed to do any role. Such customary practices can be overcome only through social reformation which needs to be brought out not only through legislations, policies and programmes of Government but as a social movement. These kind of movements need strong local, regional and national women leadership. Unfortunately, due to the same sort of barriers, we are lacking adequate administrative representation of women in spite of all our reservation policies. Regarding the local and regional leadership of women, their voices remain unheard because of the male-dominated administrative offices of some States in India.

Strong and powerful civil society organisation appealing to women empowerment can be seen behind the SDGs with prominence to gender equality. India too needs such involvement of civil society organisation to bring grass root level social changes. Unfortunately, we are lacking the presence of a strong regional or local organisation that can understand the local, regional traditional and social barriers and work for the local problems. We have seen enough times, the failures of local self-government in handling the issues like environmental and food sustainability even in most literate states like Kerala.

We have already failed in achieving many of the targets of MDGs like universal primary education (even after so many programmes and policies for promoting and achieving it), infant, girl child mortality, empowerment of women through equal remuneration, preventing open defecation and so

on because of the lack of resources and the poor utilisation of the existing resources. The under utilisation of existing resources is mainly due to corruption, the indifference of the administrative staff to the policies of the government, political favouritism, lack of awareness and access to the public and so on. Point to be noted and discussed are that these reasons which are unique to India need special research and solutions which are yet to be explored.

Another major stumble we face, is the assessment of the progress through the available data. Most of the time, data available fall short of the exact statistics or the data is manipulated due to many reasons like dishonesty of the general population, unavailability of the exact statistics (as in the case of interstate migrant workers and their families, kids etc.) or because of some social stigma in disclosing the real-life situations to outsiders. Assessments and reports available are far from the real most of the times. This puts us in a more or less helpless situation where at one end, we project successful achievement of sustainable Goals in international assessments when on the other hand the real-life situations are totally in contradiction with it.

# Animal Extinction and its impact on Biodiversity

Simi John\*

## Introduction

Biodiversity involves so many variations among the plants and animal species within ecosystem. Different kinds of animals and plants live at one place, each having its own mode of shape, living, food, protection, etc. According to “Darwin’s Struggle for Existence Theory”<sup>1</sup>, each form of living organism adopts its own procedure to protect its life. Even plants are no exception. This is a natural phenomenon. Due to this natural phenomenon provided by the nature, all forms of living organisms have been continuing on the earth. This is called Biodiversity. However, this natural and harmonious biodiversity has been destroyed by man. The expansion of civilization, modernization, technology, industrialization, indiscriminate use of the natural resources<sup>2</sup>, urbanization, over population, etc., has led to man’s indiscriminate use of the natural resources of earth.

## Biodiversity: Concept and Meaning

The International Convention on Biological Diversity<sup>3</sup> defines biodiversity

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1 Carpenter, William Benjamin, “*Darwin on the Origin of Species*”, 10National Review 188-214(December 1859)available at <http://darwin-online.org.uk>> (visited Feb 2, 2018)

2 Minerals, water crude oil, forests, etc

3 Article 2 of Convention on Biological Diversity, The Convention was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993 available at [https://en.wikipedia.org/wiki/Convention\\_on\\_Biological\\_Diversity](https://en.wikipedia.org/wiki/Convention_on_Biological_Diversity)> (visited Mar 2, 2018 )



as the diversity of species, including genetic variety within individual species and the diversity of ecosystems. Biodiversity underlies all ecosystem processes, and these ecological processes interact with the geosphere, atmosphere and biosphere, and determine the environment which all living organism, including which humans are dependent. This dependence of the nature is usually called ecosystem services. These services for instance clean water, food crops, biomass, clean air, and these services are vital for all organisms and for these reasons we are all dependent on biodiversity.<sup>4</sup>

## **Components of Biodiversity**

The components of biodiversity is as follows<sup>5</sup>:

### *1. Genetic diversity*

This includes the genetic variation within species, both among geographically separated populations and among individuals within single population<sup>6</sup>. This genetic diversity is the result of different modes of adaptation in different habitats, which provides organisms and ecosystems with capacity to recuperate after change has occurred. Thus genetic diversity can be viewed and compared at three levels.

- (i) Genetic variability between individuals within population.
- (ii) Genetic variability among population within species; and
- (iii) Diversity among species.<sup>7</sup>

### *2. Species diversity*

It denotes the variety of species on earth from acellular viruses to single

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4 Mike J. Jeffries, *Biodiversity and Conservation*, Psychology Press, (1997), available at <[https://books.google.co.in/books/about/Biodiversity\\_and\\_Conservation.html?id=xqj8fPAowIC&redir\\_esc=y](https://books.google.co.in/books/about/Biodiversity_and_Conservation.html?id=xqj8fPAowIC&redir_esc=y)> (visited Feb 27, 2018)

5 Available at <https://oli.cmu.edu/jcourse/workbook/activity/page?context=90d403bd80020ca6006c179593df4847> (visited Mar 1, 2018)

6 Available at <<http://www.yourarticlelibrary.com/psychology/3-major-components-of-biodiversity-biodiversity/28252>> (visited Mar 2, 2018)

7 K V Krishnamurthy, "Textbook of Biodiversity", available at [https://books.google.co.in/books?id=zXPcngEACAAJ&pg=PA10&source=gbs\\_toc\\_r&cad=3#v=onepage&q&f=false](https://books.google.co.in/books?id=zXPcngEACAAJ&pg=PA10&source=gbs_toc_r&cad=3#v=onepage&q&f=false) (visited Mar 10, 2018)

celled microorganisms like bacteria, mycoplasmas, actinomycetes etc. to multicellular plants and animals. For proper functioning of particular community or ecosystem the species diversity is very essential. In a community the survival of all species are interrelated to the existence of other living organisms<sup>8</sup>.

### 3. *Ecosystem diversity*

It refers to variations in the biological communities in which species live, the ecosystem in which communities exist and interactions among these levels. Ecosystem diversity is reflected in diverse biogeographic zones such as lakes, deserts, coasts, estuaries etc<sup>9</sup>.

## **Life Cycle and Animal Extinction**

All living things (organisms) have a life cycle. They are born, they grow up, they reproduce and they die. Different groups of organisms have different kinds of life cycles. All living organisms hold a place in the food chain, structured around the transfer of life-sustaining energy through an ecosystem.<sup>10</sup>

Ecosystems involve many complex interactions between members of different species. These interactions often create negative feedback loops, keeping the ecosystem in approximately the same state. For example, if the population of a certain type of plant starts to grow, then the population of an animal that eats this plant may also start to grow, thereby lowering the population of the plant. Ecosystems contain many interactions like this. These interactions are crucial to understanding the importance of individual species in biodiversity<sup>11</sup>.

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8 Available at <<https://www.embibe.com/learn/biology/concept-species-diversity-5649>> (visited Mar 2, 2018)

9 Available at <https://oli.cmu.edu/jcourse/workbook/activity/page?context=90d403bd80020ca6006c179593df4847> (visited Mar 1, 2018)

10 Available at <https://sciencing.com/happens-something-food-chain-goes-extinct-18214.html>> (visited Mar 14, 2018)

11 Available at <https://www.e-education.psu.edu/geog30/node/398>> (visited Mar 16, 2018)

Suppose the animal species described above goes extinct, perhaps because of human hunting. This destroys the negative feedback loop. When the plant population grows, there is nothing to stop it from continuing to grow. The plant may then deplete resources that are crucial for a different species, which then starts to die out. As that species dies out, it can affect still other species. Indeed, removing just one species can have huge consequences for all other species in the ecosystem, sending the entire ecosystem into a completely different state. In other words, removing just one species can be a disturbance so great that it exceeds the ecosystem's resilience<sup>12</sup>.

Now the animals currently on earth are in grave danger. We are entering an era where the number of extinctions is increasing rapidly. When we hear of extinction, most of us think of the plight of the rhino, tiger, panda or blue whale. But these sad sagas are only small pieces of the extinction puzzle. The overall numbers are terrifying. Of the 40,168 species that the 10,000 scientists in the World Conservation Union have assessed, one in four mammals, one in eight birds, one in three amphibians, one in three conifers and other gymnosperms are at risk of extinction. The peril faced by other classes of organisms is less thoroughly analysed, but fully 40 per cent of the examined species of planet earth are in danger, including perhaps 51 per cent of reptiles, 52 per cent of insects, and 73 per cent of flowering plants.<sup>13</sup>

Species extinctions have several causes. There is no doubt that humans are the root cause of most ecosystem stresses and biotic extinctions in the modern world. Negative human pressures on biodiversity occur via pollution, introductions of alien species, overexploitation, landscape transformations, and other factors. Like the asteroid impact 65 million years ago, human impacts extend to many kinds of terrestrial, aquatic, and marine organisms<sup>14</sup>.

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12 Id

13 Available at <https://exitstageright.wordpress.com/2007/08/23/animal-extinction-the-greatest-threat-to-mankind/>> (visited Mar 12, 2018)

14 Available at [http://www.pnas.org/content/105/Supplement\\_1/11453.full](http://www.pnas.org/content/105/Supplement_1/11453.full)> (visited Mar16, 2018)

Understanding these causes is a way to help prevent extinctions in the future. Below are some of the some causes of extinctions and animals.<sup>15</sup>

### *1. Habitat degradation*

Habitat loss and degradation affect 86% of all threatened birds, 86% of mammals and 88% of threatened amphibians. We find that there can be degradation to the habitat like poisoning which can directly mess up with the life of a species. It may not only affect the life but also its productivity, life span among others. Through this degradation, we may find that the affected species can extinct very fast.<sup>16</sup>

### *2. Climate change*

Another cause of extinction can be attributed to the climate change that is human induced. Human beings have played a very big role in ensuring that the climate of the earth is not static. The climate has been changing due to various activities that they, human beings, do think they take for the sake of their lives. The bio diverse Earth can't keep up with the rapid changes in temperature and climate. The species are not used to severe weather conditions and long seasons, or a changing chemical make-up of their surroundings. As more species die, it is only making it more difficult for the survivors to find food. The warmer climates we are used to present-day are perfect for diseases and epidemics to thrive<sup>17</sup>

There is emission of many gases into the atmosphere which do interfere with the ozone layer thus exposing the earth to the dangers of the sun's rays. Apart from the emission of the gases, human beings also do play a role in the desertification, thus interfering with the rain cycles in the world among other possible effects of desertification to the climatic change<sup>18</sup>.

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15 Available at <https://www.zmescience.com/ecology/environmental-issues/animals-gone-extinct-recently/> (visited Mar 18, 2018)

16 Available at <http://www.theworldcounts.com/stories/Causes-of-Extinction-of-Species>>(visited Mar 16, 2018)

17 Available at <https://people.uwec.edu/jolhm/eh4/extinction/causeslink.html>> (visited Mar 1, 2018)

18 Available at <https://www.paypervids.com> › World> (visited Mar 19, 2018)

### *3. Human-wildlife conflict*

As humans increase in population around the world and move into areas where wildlife live, there is an increase in human-wildlife conflict. Sadly, in many cases, wildlife are often killed when predators kill livestock or eat crops. For wildlife populations that have already been reduced due to loss of habitat and other issues, such conflicts can increase the chances that a species will become threatened or endangered<sup>19</sup>.

### *4. Over-exploitation*

It results from the total number of individuals of a species that use the same economic resources. Due to the nature of these resources, when they are exhausted, the lives of the species will be at stake. Animals of a given species will be struggling to fulfill its biological needs and yet the resources will not be there. This will lead to starvation to death among other causes<sup>20</sup>.

### *5. Lack of food*

Mass starvation is the quick, one-way, sure-fire route to extinction—especially since hunger-weakened populations are much more prone to disease and predation—and the effect on the food chain can be disastrous. For example, imagine that scientists find a way to permanently eliminate malaria by exterminating every mosquito on the face of the earth. At first glance, that may seem like good news for us humans, but just think of the domino effect as all the creatures that feed on mosquitoes (like bats and frogs) go extinct, and all the animals that feed on bats and frogs, and so on down the food chain!<sup>21</sup>

### *6. Predation and diseases*

Predation on the other hand refers to the process where a species is

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19 Available at <https://greentumble.com/10-reasons-why-species-become-endangered/> (visited Mar 20, 2018)

20 Available at <https://www.hunker.com/12407751/what-causes-the-extinction-of-plants-animals> (visited Mar 20, 2018)

21 Available online at <https://www.hunker.com/12407751/what-causes-the-extinction-of-plants-animals> (cited in note 21)

simply the food to a certain species. When the predators feed on the preys, the lives of the preys are not restored. Therefore when one is killed it means that the number is reduced. So if the population of the predators overweighs that of the prey then the prey is in danger of extinction. They are likely to be fed on and wiped out of the earth's surface. Finally diseases can cause extinction in a species. For instance, when there is an outbreak of a disease to a specific species, there is likelihood of this species losing many of its members before the way forward is found. This is why diseases are always counteracted with speed.<sup>22</sup>

### Impact on Biodiversity

When we lose the animals through extinction, we lose biodiversity. Biodiversity simply refers to the total number species as well as ecosystems in the earth's surface or of a given place. It therefore reflects that when animals become extinct, they reduce the variety of animals that were present on the earth's surface. In this world, there are different roles that are played by animals of different types. So when we lose these animals then it means that we lose its contribution also, the role it used to play will no longer be enjoyed. This is the complication that animal extinction brings to our environment.<sup>23</sup>

Animal extinction is a threat to the human life. Just imagine a world without other animals? Just try to figure how boring this life can be, everywhere you go you meet one species of the animal kingdom, will it then mean that human beings should adopt to be vegetarians forever. Animal extinction is a threat in that there are a lot of things that the animals provide to the human beings that cannot be counted. Look at food, clothing, hides and skins, look at attraction, look at the role they play in the biodiversity at large. So the extinction of animals has got more disadvantages than advantages<sup>24</sup>.

22 Raup, D. M. *Extinction: Population Growth and Ecosystem Limits; Bad Genes or Bad Luck?* (W.W. Norton and Company 1991 ).Also see Whitty, J. "Animal Extinction – the greatest threat to mankind." *The Independent*. (November 2011)

23 Available at < <https://www.paypervids.com> > World> (cited in note 19)

24 AnneElizabethMaczulak, 'Biodiversity: Conserving Endangered Species', (Infobase Publishing 2010) available online at <<https://books.google.co.in/books/about/Biodiversity.html?id=WM0flbmDrLsC>> (visited Mar 17, 2018)

## **Legislative framework for the protection of animals in India**

### ◆ *Protection of wild life under the Constitution of India*

Article 48- Organization of agriculture and Animal Husbandry<sup>25</sup>.

Article 48A- Protection and improvement of environment and safeguarding of forests and wild life.<sup>26</sup>

Article 51- A-(g) Fundamental duties- It shall be the duty of every citizen of India - to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;

### ◆ *Protection of wild life under Indian Penal Code*

In the Indian Penal Code, 1860 which defined animals<sup>27</sup>, it further declared killing or maiming of animals as a punishable offence<sup>28</sup>. However, this was not a specific provision dealing exclusively with wildlife; instead it talked generally of animals, both, those who were domesticated and those who were found in their natural habitat.

### ◆ *The Wildlife (Protection) Act, 1972 (Last amended in 2006)*

The Wildlife (Protection) Act (WLPA), 1972 is an important statute that provides a powerful legal framework for:

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25 Article 48 of the constitution of India: 'The State shall endeavour to organize agriculture and animal husbandry on modern and scientific lines and shall, in particular, take steps for preserving and improving the breeds, and prohibiting the slaughter, of cows and calves and other milch and draught cattle'.

26 Article 48A: 'The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country.'

27 Section 47 says 'the word "animal" denotes any living creature, other than a human being'

28 Section 428 of Indian Penal Code says 'Whoever commits mischief by killing, poisoning, maiming or rendering useless any animal or animals of the value of ten rupees or upwards, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine, or with both'

Section 429 of Indian Penal Code: Mischief by killing or maiming cattle, etc., of any value or any animal of the value of fifty rupees Whoever commits mischief by killing, poisoning, maiming or rendering useless, any elephant, camel, horse, mule, buffalo, bull, cow or ox, whatever may be the value thereof, of any other animal of the value of fifty rupees or upwards, shall be punished with imprisonment of either description for a term which may extend to five years, or with fine, or with both

- Prohibition of hunting
- Protection and management of wildlife habitats
- Establishment of protected areas
- Regulation and control of trade in parts and products derived from wildlife
- Management of zoos.

The WLP Act provides for several categories of Protected Areas/Reserves:

- National Parks
- Wildlife Sanctuaries
- Tiger Reserves
- Conservation Reserves
- Community Reserves<sup>29</sup>

◆ *The Indian Forest Act 1927*

The main objective of the Indian Forest Act was to secure exclusive State control over forests to meet the demand for timber. Most of these untitled lands had traditionally belonged to the forest dwelling communities. The Act defined State ownership, regulated its use, and appropriated the power to substitute or extinguish customary rights. The Act facilitates three categories of forests, namely

- Reserved forests<sup>30</sup>
- Village forests<sup>31</sup>
- Protected forests<sup>32</sup>

Reserved forests are the most protected within these categories. No rights can be acquired in reserved forests except by succession or under a grant or contract with the government.<sup>33</sup> Felling trees, grazing cattle, removing

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29 Wild Life Protection Act, 1972

30 Chapter II of the Act deals with this.

31 Chapter III

32 Chapter IV

33 See Section 5 of the Act.



forest products, quarrying, fishing, and hunting are punishable with a fine or imprisonment<sup>34</sup>.

◆ *The Forest Conservation Act, 1980*

In order to check rapid deforestation due to forestlands being released by State governments for agriculture, industry and other development projects federal government enacted the Forest Conservation Act in 1980 with an amendment in 1988. The Act made the prior approval of the federal government necessary for de-reservation of reserved forests, logging and for use of forestland for non- forest purposes.<sup>35</sup> This powerful legislation has, to a large extent, curtailed the indiscriminate logging and release of forestland for non-forestry purposes by state governments<sup>36</sup>.

◆ *The Environment (Protection) Act, 1986*

The Environment Protection Act is an important legislation that provides for coordination of activities of the various regulatory agencies, creation of authorities with adequate powers for environmental protection, regulation of the discharge of environmental pollutants, handling of hazardous substances, etc. The Act provided an opportunity to extend legal protection to non-forest habitats ('Ecologically Sensitive Areas') such as grasslands, wetlands and coastal zones<sup>37</sup>.

◆ *The Prevention of Cruelty to Animals Act, 1960*

This Act is enacted to prevent the infliction of unnecessary pain or suffering on animals. As per the provisions of the law the government of India formed the Animal Welfare Board of India.<sup>38</sup>

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34 The Indian Forest Act, 1927

35 See Section 2 of the Act

36 V.K Sridhar, *Supreme Court: Mining, Forest Encroachments and Rehabilitation from Kudremukh National Park*, XII Social Change and Development 63(2015)

37 Praveen Bhargav, *Legal Framework for wild life Conservation in India*, available at <http://www.conservationindia.org/resources/the-legal-framework-for-wildlife-conservation-in-india-2> (visited Mar 19, 2018)

38 Available online at [https://en.wikipedia.org/wiki/Prevention\\_of\\_Cruelty\\_to\\_Animals\\_Act](https://en.wikipedia.org/wiki/Prevention_of_Cruelty_to_Animals_Act) (visited Mar 22, 2018)

◆ *The Biological Diversity Act, 2002*

India is a party to the United Nations Convention on Biological Diversity. The provisions of the Biological Diversity Act are in addition to and not in derogation of the provisions in any other law relating to forests or wildlife.

In addition to these legislative frame works there are a number of action plans, policies, and programmes were adopted for the protection of animals and also to prevent its extinction.

### **Judicial Approach towards animal protection**

Judiciary plays an active role for the protection and preservation of wildlife in India. Courts are participating in wildlife protection by giving appropriate sentencing and deterrent sentencing in wild life crimes.

In the case of *State of Bihar v. Murad Ali Khan & others*<sup>39</sup>, the Hon'ble Supreme Court raised alarm of ecological imbalances and consequential environmental damage, stating the urgency of immediate, determined and effective steps to preserve wildlife. The court emphasized that: "An Empirical Study on Implementation of Wildlife Protection Laws in India for the preservation of the fauna and flora, some species of which are getting extinct at an alarming rate has been a great and urgent necessity for the survival of humanity...."

In *PradeepKrishen v. Union of India*<sup>40</sup> the order of the MP government giving permission to the villagers living near the sanctuaries and national parks to collect tendu leaves through contractors were challenged. The Supreme Court directed the Madhya Pradesh government to take urgent steps to prohibit entry of villager and tribals in national parks and sanctuaries.

In *Tarun Bharat Sangh, Alwar v. Union of India*<sup>41</sup> the petitioner Organisation challenged the grant of 215 mining licenses in the area declared as Tiger Reserve in Alwar district of Rajasthan. The Supreme Court cancelled all the licenses as they were given in the tiger reserve area.

39 (1988) 4 SCC 655

40 AIR 1996 SC 2040

41 1993 Supp. (3) SCC 115

In *R. Simon v. Union of India*<sup>42</sup> the 1991 Amendment was challenged which prohibited trade in animal articles. It was contended that the said Act is colourable legislation as it indirectly takes away fundamental right to carry on any trade or business under Art. 19(1)(g). Delhi High Court held that every animal is important in maintaining ecological balance and it is the duty of every Indian citizen to protect and improve the wildlife in the country. Further, no fundamental right is absolute and the same can be restricted in public interest. Wildlife protection is very much in public interest. Hence the 1991 Amendment is constitutional. Similar decision has been given in *Ivory Traders and Manufacturers Association v. Union of India*.<sup>43</sup>

In, *Nair N.R. and Ors. v. Union of India and Ors*<sup>44</sup> the Kerala High Court upheld a notification by the Ministry of Environment and Forests stating that bears, monkeys, tigers, panthers and lions shall not be exhibited or trained as performing animals. When the notification was challenged in the Supreme Court, the court declared that animals suffer cruelty as they are abused and caged to make them perform, and therefore, this contravenes the PCA Act, 1960. It also dismissed the argument that the petitioners' right to carry out any trade or business under article 19(g) of the Indian Constitution was violated as those activities that caused pain and suffering to the aforementioned animals would not be allowed.

In *Navin M. Raheja v. Union of India and others*<sup>45</sup>, ' the Supreme Court voiced its concern about the distressing state of affair insofar as welfare of animals, both in the reserved forests and in the zoos, is concerned. The Court took judicial note and a report about a tiger skinned alive in a zoo in Andhra Pradesh. Poor voiceless animals cannot be allowed to be treated in such a cruel manner. The Court directed that the State is obliged to take all such steps so that no such incident ever re-occurs in any of the zoos or reserved forests.

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42 AIR 1997 Del.301

43 AIR 1997 Del. 267

44 AIR 2000 Ker 340

45 (2001) 9 SCC 762

In *T.N Godavarman v. Union of India*<sup>46</sup> the Supreme Court was approached to issue directions to the Central Government and State of Chhattisgarh to prepare a rescue plan to save the Asiatic wild buffalo, an endangered species from extinction.

The Apex court in *Centre for Environmental Law, World Wide Fund-India v. Union of India*<sup>47</sup> held that sustainable development has anthropocentric bias, and is not concerned with the rights of other species which live on this earth. Honourable Court explained that laws are made by men, and as a result they are anthropocentric, and rights of wild animals become of secondary importance.

*Jallikattu Case – Animal Welfare Board of India v. A. Nagaraja*<sup>48</sup>

In this case, the Supreme Court banded the use of bulls and bullocks in “entertainment activities” such as Jallikattu and bullock cart racing, among others. In this case Apex court has discussed the Article 21 in the context of the animals. It was a case concerning the violation of PCA, Act, by the customary practice of ‘Jallikattu’. *Jallikattu* is a practice where bulls are tamed or annoyed in inhumanely manner till they get enraged, and start running haywire. Apex Court said that the rights guaranteed to the animals under PCA Act are only statutory rights, and the same have to be elevated to the status of fundamental rights. It called the rights under, Sections 3 and 11 of the PCA Act, and Articles 51-A (g) and (h) of the Constitution, as the Magna Carta of animal rights in India.

Article 21 has indirectly covered under its umbrella every species, and blessed them with right to life and security, which includes depriving its life, out of human necessity. Article 21 protects life, and the word “life” has been expanded by the highest constitutional Court, so as to include all forms of life in the environment, which contains animal life also, which are necessary for human life. Honourable Court held that “life” in context of animals does not mean, mere survival or existence or instrumental value

46 (2012) 3 SCC 277

47 (2013) 8 SCC 234

48 (2014) 7 SCC 547

for human beings, but also life with some intrinsic worth, honour and dignity.

### **Protection of Wildlife in other Countries**

Plants and animals hold medicinal, agricultural, ecological, commercial and aesthetic/recreational value. Endangered species must be protected and saved so that future generations can experience their presence and value.

#### *Position in United States of America*

In the U.S. there is a sharing of authority to protect wildlife. The federal government can use its authority under the interstate commerce clause and the property clause to enact laws protecting wildlife; any state law in conflict with such federal laws will be void. States can use their claim to ownership of wildlife and their police power to enact laws to protect wildlife to the extent their laws are not inconsistent with federal law<sup>49</sup>

There is a spectrum of federal laws that protect wildlife. Bald and Golden Eagle Protection Act<sup>50</sup> makes it illegal to import, export, or take bald or golden eagles, or to sell, purchase, or barter their parts, or products made from them, including their nests or eggs. In Migratory Bird Treaty Act<sup>51</sup> except as allowed by implementing regulations, this Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. Lacey Act<sup>52</sup> provides authority to the Secretary of the Interior to designate injurious wildlife and ensure the humane treatment of wildlife shipped to the United States. The Wild Free-Roaming Horses and Burros

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49 Available online at <<https://www.coloradocollege.edu/dotAsset/fc919f40-c24a-4287-ab6c-d649e4dca7a6.pdf>> (visited Mar 16, 2018)

50 16 U.S.C. 668-668C, available at <<http://www.endangeredspecie.com/protect.htm>> (visited March 17, 2018)

51 16 U.S.C. 703-712, Accessed on 15.3.2018, available at <<http://www.endangered-specie.com/protect.htm>> (visited Mar 17, 2018)

52 18 U.S.C. 42; 16 U.S.C. 3371-3378, available at <<http://www.endangeredspecie.com/protect.htm>> (visited Mar 17, 2018)

Act<sup>53</sup> protect these animals on federal and private lands. The two most important multiple use laws are the National Forest Management Act and the Federal Land Policy and Management Act. Federal lands managed under these acts are to be administered for five different purposes: outdoor recreation, range, timber, watershed, and wildlife and fish purposes.<sup>54</sup>

Since the Wilderness Act took effect in 1964, the United States government has protected more than 100 million acres of land for the purpose of conservation.<sup>55</sup> Fish and Wildlife Act of 1956, National Wildlife Refuge System Administration Act of 1966<sup>56</sup>, Antarctic Conservation Act<sup>57</sup>, African Elephant Conservation Act<sup>58</sup> etc. have stood for the protection of wildlife and thereby biodiversity of the nation.

In the 1970s, many of the nation's native plants and animals were in danger of becoming extinct. The United States government passed two conservation laws, the Endangered Species Act<sup>59</sup> and the Marine Mammal

53 16 U.S.C. §§ 1331-1340, available at <https://www.coloradocollege.edu/dotAsset/fc919f40-c24a-4287-ab6c-d649e4dca7a6.pdf> (visited Mar 16, 2018)

54 *T.N Godavarman v. Union of India* (cited in note 46)

55 Available at <http://time.com/3772207/wilderness-protection-endangered-species/> (visited Mar 17, 2018)

56 16 U.S.C. 668dd-668ee available at <http://www.endangeredspecie.com/protect.htm> (visited Mar 17, 2018)

57 16 U.S.C. 2401, available at <http://www.endangeredspecie.com/protect.htm> (visited Mar 17, 2018)

58 16 U.S.C. 4201-4245, available at <http://www.endangeredspecie.com/protect.htm> (visited Mar 17, 2018). The Act provides additional protection for African elephants. Additionally, it authorizes financial assistance for African elephant conservation programs; requires review of these programs; provides for the establishment of an African Elephant Conservation Fund; establishes moratoria on ivory import if specific criteria are not met; requires annual reports to Congress; creates criminal and civil penalties for illegal ivory import or export; exempts sport-hunted elephant trophies; and allows for payment of reward. available at <https://definitions.uslegal.com/a/african-elephant-conservation-act/> (visited Mar 24, 2018)

59 16 U.S.C. 1531-1543, available at <http://www.endangeredspecie.com/protect.htm> (visited Mar 17, 2018)

Protection Act<sup>60</sup>, to aid in the recovery of at-risk species.<sup>61</sup>

Protecting these natural resources is a cause that has long united Americans from all walks of life and political stripes. To hunters, anglers, hikers, birders, wildlife watchers, boaters, climbers, campers, cyclists, gardeners, farmers, forest stewards, and other outdoor enthusiasts, this conservation ethic represents a sacred duty and obligation to protect and build upon conservation heritage for the sake of wildlife, ourselves, our neighbours, and most of all for future generations<sup>62</sup>.

### *Position in UK*

England has a network of thousands of formally-protected wildlife sites that make up around 7% of its land and are crucial habitats for the country's 55,000 animal and plant species<sup>63</sup>. There are many active pieces of legislation that refer to species and habitats in the UK. The key pieces of legislation are outlined below.

The Wildlife and Countryside Act (as amended) 1981 is still the major legal instrument for wildlife protection in Britain. This legislation covers the protection of a wide range of protected species and habitats and provides the legislative framework for the designation of Sites of Special Scientific Interest. The Countryside and Rights of Way Act 2000 compels all government departments to have regard for biodiversity when carrying out their functions.

The Protection of Badgers Act 1992 consolidated existing legislation on the protection of badgers. This legislation is intended to prevent the persecution of badgers. <sup>64</sup>Countryside & Rights of Way Act 2000, the protection of SSSIs, already established in the Wildlife and Countryside

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60 16 U.S.C. 1361-1407, available at <http://www.endangeredspecies.com/protect.htm>> (visited Mar 17, 2018)

61 Available at <https://www.usa.gov/animals>> (visited Mar 21, 2018)

62 Available at <https://www.nwf.org/>> (visited Mar 20, 2018)

63 Available at <https://www.theguardian.com/environment/2010/sep/24/england-wildlife-areas-failing>> (visited Mar 6, 2018)

64 Available at [http://webcache.googleusercontent.com/search?q=cache:http://www.buildingconservation.com/articles/complying/wildlife-legislation.htm&gws\\_rd=cr&dcr=0&ei=VjyiWoKaB8r\\_vAS\\_1JK4Cw](http://webcache.googleusercontent.com/search?q=cache:http://www.buildingconservation.com/articles/complying/wildlife-legislation.htm&gws_rd=cr&dcr=0&ei=VjyiWoKaB8r_vAS_1JK4Cw)> (visited Mar 19, 2018)

Act, is strengthened in this legislation.

Wild Mammals (Protection) Act 1996 offers a form of protection to all wild species of mammals and is more of an animal welfare Act rather than conservation Act. The Natural Environment & Rural Communities Act 2006 enabled the amalgamation of English Nature with the Countryside Agency and the Department for Environment, Food & Rural Affairs' Rural Development Service to form a new agency called 'Natural England', which came into existence in October 2006.

In UK the importance of biodiversity conservation was given a legal basis, requiring government departments to have regard for biodiversity in carrying out their functions, and to take positive steps to further the conservation of listed species and habitats.<sup>65</sup>

## Conclusion

The Earth's biological diversity is distributed in specific ecological regions. There are over a thousand major 'ecoregions' in the world. With 2.4 per cent of the world's land, India contributes 8 per cent to the world diversity.<sup>66</sup> It has, therefore, been designated as one of the 12 mega diversity regions of the world. India is recognized as a country uniquely rich in biodiversity because of its tropical location, varied physical features and climate. Indian biodiversity is estimated to be over 45,000 plant species contributing 8 per cent of the world's flora and about 80,000 animal species constituting 7 per cent of the world's fauna of which 33 per cent flora and 62 per cent fauna are endemic to India.

Among the larger animals 79 mammals, 44 birds, 15 reptiles and 3 amphibians are threatened today and 1,500 plant species belong to endangered category. As far as faunal diversity is concerned, India is home for 67,000 species of insects, 1,000 of molluscs, 6,500 other invertebrates 1,700 of

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65 Available at <[https://en.wikipedia.org/wiki/Wildlife\\_law\\_in\\_England\\_and\\_Wales](https://en.wikipedia.org/wiki/Wildlife_law_in_England_and_Wales)> (visited Mar 17, 2018)

66 Dr. P.J. Sudhakar, *Conservation of Biodiversity* available at <http://www.pib.nic.in/newsite/mbErel.aspx?relid=105134> (visited Mar 14, 2018)



fishes, 1,200 of birds, 453 of reptiles, 182 of amphibians, and 350 of mammals, in which 62 per cent amphibians and 32 per cent reptiles are endemic to India. Among lizards, of the 153 species recorded 50 per cent are endemic. Indian sub-continent alone has given the world nearly 320 species of wild animals, whose centre of origin lies in India.

India is a home to very diverse and rich wildlife which includes over 172 endangered species. A great deal of effort has been made in the last sixty years to preserve the natural habitats as well as the population of the wildlife across the Indian landscape. The Bengal tiger, Asiatic water buffalo and Indian elephant are just some of the magnificent animals walking the plains and tropical rain forest across India.

It can't be denied that wildlife forms an important part in our universe; it not only helps in maintaining the ecological balance but also is beneficial from economic, recreational and aesthetic point of view. There was a time when human intrusion in wildlife habitat was almost nil; there used to be no man-animal conflict, except the hunting that the aristocrat people used to do. But, with the expansion of agriculture, settlement, industrial and other developmental activities and mainly due to greed of man, the number of wild animals gradually became lesser and lesser; several species of animals became extinct, and several others were found to be on the verge of being so. It was noticed that wildlife conservation was gradually losing the battle to save many species of plant and animal from extinction.

Despite of our country having cultural wisdom for life beyond man since ancient times, despite of our country having no. of laws, rules, regulations, &, executive orders, despite of our country having judiciary that has always been champion of the oppressed ones, including the speechless animals, we have failed. Our system has failed miserably in protecting wildlife animals. Hence, there is a need to take stronger measure for protecting animals and prevention of animal emitation.

# The Potential of Urban Forestry in Improving the Quality of Life: Benefits and Challenges

*Fathima. A & Neelima. V. Nair\**

## Introduction

*“Between every two pines is a doorway to a new world.” - John Muir<sup>1</sup>*

Forests cover a vast part of Earth, giving biological community benefits that are basic to human welfare. Yet, humans are responsible for widespread deforestation, the result of urbanisation, which is at a rapid pace, at present. Urban areas reshape and alter natural landscapes as they expand, making microclimates in which, temperatures, rainfall and winds vary from those of the encompassing countryside. Urbanisation, brings about the exhaustion and debasement of common biological communities in and around urban zones, the intense loss of vital ecosystem services and, conceivably, little flexibility to perturbations, such as, those caused by environmental change.

At this juncture, comes the importance of urban forests. Urban forests<sup>2</sup>

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1 John Muir (1838 – 1914) also known as “*John of the Mountains*” and “*Father of the National Parks*”, was an influential Scottish-American naturalist, author, environmental philosopher, glaciologist and early advocate for the preservation of wilderness in the United States. The Sierra Club, which he co-founded, is a prominent American conservation organization. Available at [https://en.wikipedia.org/wiki/John\\_Muir](https://en.wikipedia.org/wiki/John_Muir).(visited Feb 16,2018)

2 Three principle segments of the urban forest and green spaces are: Patch (Urban

can be characterised as systems or frame works comprising all forests, gathering of trees, and individual trees situated in urban and peri-urban<sup>3</sup> zones; they incorporate, in this manner, therefore, woods, street trees, trees in parks and gardens, and trees in abandoned corners. Urban forests are the foundation of the green infrastructure,<sup>4</sup> spanning rural and urban areas and enhancing a city's ecological impression.

Urban and peri-urban forestry (UPF) is the act of managing urban forests to ensure their most favourable contributions to the physiological, sociological and economic well-being of urban societies. UPF is an advanced concept which involves the assessment, planning, planting, maintenance, preservation and monitoring of urban forests and it plays an important contributory factor in the cities for environmental enhancement, control of air and noise pollution, microclimatic modification and recreational purposes of the urban population.

## **The Significance of Urban Forestry**

At this era of urbanisation, the maintainability of life in the earth has turned into a challenging phenomenon. When the combination of urban development with sustainable environment becomes necessary, urban organizers and city administrators confront day by day challenges in overseeing complex urban situations, like, keeping up adequate solid and safe sustenance, clean water, clean air, vitality, lodging and green spaces and tending to irreconcilable circumstances identified with land use. More

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domestic gardens, public and private parks and so on), Corridor (roadside avenues, walkaway and so forth) and Network structure (layout of all the patches and corridors connecting the patches).

- 3 Peri-urban: of or relating to an area immediately surrounding a city or town available at <https://www.merriamwebster.com/dictionary/peri-urban>. (visited Feb 18,2018)
- 4 All urban areas share a comparable physical surface, comprising “grey” infrastructure (e.g. residential and industrial buildings, roads, utilities and parking lots), “blue” infrastructure (e.g. rivers, lakes, ponds and water channels) and “green” infrastructure (e.g. trees, shrubs and grasses in parks, forests, gardens and streets). Upgrading the communications among these components is the way to reshaping or building urban communities fit for reacting to urban difficulties.

than ever, they should meet people's high expectations of guaranteeing that their urban areas are financially, socially and environmentally sustainable, resilient and fit for giving the biological system services, required by their nationals for a decent living. Hence, well-designed and managed urban forests are vital to addressing this challenge: urban forests can make significant contributions to the environmental sustainability, economic viability and liveability of urban settlements.

### The Benefits of Urban Forestry

Urban forests brings numerous natural and economic benefits to the cities. Urban trees can help to mitigate some of the negative impacts and social consequences of urbanization, and thus make cities more resilient to these changes.<sup>5</sup> The benefits of urban trees and green cover in the urban life are:

- ◆ Security of Sustenance: Urban forests are immediate sources of food. Indirectly, they bolster healthy eating by providing affordable wood fuel, good-quality water and enhanced soil for sustainable agricultural production.
- ◆ Economic Support: Urban forests create employment, attract investors and organizations, reduce the cost of urban infrastructure, enhance the living conditions and increase property values, pull in tourism, and ultimately boosting neighbourhood green economies.
- ◆ Recreation Facility: Urban parks are an important recreational facility in developing as well as developed countries. Amazing green spaces convey impressive advantages to the general population's physical and mental well-being.
- ◆ Enhance soil conditions and water management: By protecting soils and increasing their fertility, urban forests can help combat desertification, restore degraded soils and lands, contribute

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5 FAO, *Building greener cities: nine benefits of urban trees*, available at <http://www.fao.org/zhc/detail-events/en/c/454543/> (visited on Feb 24, 2018)

greatly to the sustainable management of water and water resources; and prevent drought and floods.

- ◆ Conserves and elevate biodiversity: Researches at the city/ province scale as well as at the landscape scale uncovers that urban zones can contain relatively high levels of biodiversity. Essential rates of species found in the encompassing common territory, including imperilled species, have been found in the urban forests.
- ◆ Climate Change Mitigation: Urban forests can be useful both in alleviating climate change and in helping urban communities adjust to higher temperatures and different effects of climate change. Urban trees reduce the amount of greenhouse gases in the air by sequestering carbon dioxide and by reducing the amount of energy needed to heat and cool buildings. Trees additionally cool the air through evapotranspiration (i.e., the evaporation of water through their leaves) and helps in regulating the urban microclimate.
- ◆ Eliminate air pollutants and lessen commotion: Urban trees offer the capacity to evacuate significant amounts of air pollutants and consequently enhance environmental quality and human wellbeing. These trees absorb high frequency noise. They reduce noise pollution through a phenomenon called sound attenuation, which is the reduction of sound intensity.<sup>6</sup>
- ◆ Provides educational and career opportunities: Urban greens with their wide gathering of trees and different plants have huge educational potential. Urban foresters can work in any industry with a concern in urban landscapes, natural resources management or the environment.

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6 *How does vegetation help reduce noise pollution in urban ecosystems?* available at <http://articles.extension.org/pages/73727/how-does-vegetation-help-reduce-noise-pollution-in-urban-ecosystems>. (visited Mar 18, 2018)

## The Challenges in the Management of Urban Forestry

A major risk to human safety in urban forestry is one of the real potential issues and can serve as a hazard to urban inhabitants either directly through the falling tree/ branch or indirectly when cause damage to the structure. Poorly planned or managed urban forests have the potential to have immediate and aberrant negative effects on human health. For instance, they can actuate hypersensitivities, and have potential vectors of pandemic or non-transferable ailments. In this way to limit or to avoid it, legitimate arranging at starting stage, before planting is required.

The importance of an integrated approach to urban forest governance is widely recognized, however building up a structure of activities and giving an empowering domain for UPF is complex.<sup>7</sup> An effective administration system requires the development of the necessary policies, incentives, laws and regulations through multi-actor and multi-sector approaches that fully take into account all relevant economic, social and environmental dimensions. Settling impediments will require composed endeavours among urban communities.

A crucial issue for the accomplishment of community involvement of UPF policies is land tenure, characterised as the complexity of norms, by-laws and standard practices that administer the ownership and possession, and access to land. Legal ownership may be insufficient for determining land tenure in urban and peri-urban settings, and this is especially valid as for open spaces. People are usually unwilling to plant and tend trees on land to which they lack tenure security; this is especially so in locales where tree-planting is seen as an image of land ownership and is therefore discouraged by legal owners.

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<sup>7</sup> See Fabio Salbitano et al, *Guidelines on urban and peri-urban forestry*, (FAO 2016) available at <http://www.fao.org/3/a-i6210e.pdf> (visited Apr 14, 2018)

## **The Global Outlook on Urban Forestry**

### ***Role of International Institutions:***

As for now, there is no legal binding global agreement managing particularly with UPF, however numerous conventions and international programmes have some bearing on it. International organizations play two main roles – assistance and guidance, in the improvement of UPF legal systems. FAO,<sup>8</sup> UN-Habitat, the United Nations Environment Programme (UNEP), the UN Educational, Scientific and Cultural Organization, the United Nations Development Programme (UNDP) and the World Health Organization (WHO) all undertake actions and programmes to support local policies and laws related to the urban environment. A number of binding<sup>9</sup> and non-binding<sup>10</sup> international conventions, protocols and agreements exist that can guide the UPF-related actions of national governments and local administrations.

International organizations have developed a range of relevant guidelines, such as those addressing tenure, landscapes, forests, urban settlements and climate change; these provide reference frameworks that can help in formulating laws pertaining to urban forests and other green infrastructure. The global cities network ICLEI<sup>11</sup>-Local Governments for Sustainability, is the world's leading network of over 1000 cities, towns and metropolises

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8 FAO has initiated a series of global and regional sector outlook studies to examine linkages between forests and societies and to indicate emerging opportunities and challenges.

9 The main binding conventions are the Convention on Biological Diversity (CBD) and related protocols (including the Ramsar Convention); the UN Convention to Combat Desertification (UNCCD); and the UN Framework Convention on Climate Change (UNFCCC).

10 Among non-binding instruments are the Sustainable Development Goals (SDGs); the WHO health standards; the UN-Habitat Resolution on Sustainable Urban Development; and Chapter 11, of Agenda 21.

11 International Council for Local Environmental Initiatives, founded in 1990, is an international association of local governments and national and regional local government organizations, that have made a commitment to sustainable development. available at <https://en.wikipedia.org/wiki/ICLEI>. (visited on Feb 16, 2018)

committed to building a sustainable future. The Forestry Outlook Study for West and Central Asia (FOWECA) is another organisation which has long term prospects for urban and peri-urban forestry in West and Central Asia, especially in the context of urbanization.

The latest initiative in international sector is International Urban Forestry Congress (IUFC) to be held in Vancouver, Canada, from Sept 30- Oct 3, 2018, which is a unique partnership between Tree Canada's Canadian Urban Forest Conference (CUFC), the Pacific Northwest Chapter of the International Society of Arboriculture's (PNW-ISA) Annual training Conference and the Urban Tree Diversity Conference (UTD).

### ***Few Remarkable Instances:***

- ◆ In Utrecht, a city in the Netherlands, 'Neighbourhood Green Planning' is a municipal-level policy programme to facilitate citizen involvement in the development of green infrastructure.
- ◆ UN reports and various international indexes show that Norway, in Europe, ranks high in terms of global implementation of the SDGs. Sustainable natural resource management and climate change mitigation and adaptation are priority areas for Norway." *Cities in nature, and not nature in the city*" is the motto of city planners in Norway.<sup>12</sup>
- ◆ In Tokyo, Japan, after the nuclear bomb attacks, in 1946, the city created a plan to secure 10 percent of urban lands for green areas and turn the barren parcels of land into urban parks. By 1980, the number of street trees exceeded 235,000. Tokyo's urban forests and trees have also helped to supply the city with clean drinking water, a system of wastewater disposal and storm water control.<sup>13</sup>

12 Marion Tanguy, *Norway has set European eco-example*, The Guardian, (2010) available at [BST https://www.theguardian.com/commentisfree/2010/aug/11/europe-must-follow-norways-eco-example](https://www.theguardian.com/commentisfree/2010/aug/11/europe-must-follow-norways-eco-example). (visited Mar 18, 2018)

13 Sarah Weber, *On International Day of Forests, a Look at How Trees Help Make Cities Healthier*, available at <http://thecityfix.com/blog/international-day-forests-look-how-trees-help-make-cities-healthier-sarah-weber/>. (visited Feb 20, 2018)



- ◆ Green Belt Movement founded by Wangari Maathai<sup>14</sup> in Kenya, for Environmental non-governmental organisation focused on planting trees, has made a program in 2015, on climate change and corporate partnerships which aimsto mobilize corporate organizations’ consciousness for therehabilitation of urban ecosystems throughtree planting as a ‘Corporate Social Responsibility’ (CSR).<sup>15</sup>
- ◆ The urban forest strategy developed with the support of FAO for the city of Bangui in the Central African Republic included the design of environmental education programmes for schools and rural communities; and an awareness-raising campaign directed at municipal authorities, technicians and farmer organizations.
- ◆ In 2010, Vancouver, Canada, promoted a city strategy associated with a comprehensive action plan called “Green Vancouver”, a policy consists of ten goals: 1) green economy; 2) climate leadership; 3) green buildings; 4) green transportation; 5) zero waste; 6) access to nature; 7) lighter footprint; 8) clean water; 9) clean air; and 10) local food. The Vancouver region is home to some of the most productive and intact natural ecosystems on the planet.
- ◆ China’s State Forestry Administration officially launched the “National Forest City” programme in 2004 with the aim of advancing urban and rural ecological development which represents a new model of urban forestry development, with both strong national policy support and successful local community involvement.

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14 Wangari Muta Maathai (1 April 1940 – 25 September 2011) was an internationally renowned Kenyan environmental political activist and Nobel laureate.

15 The Green Belt Movement, Annual Report, 2015 available at <http://www.greenbeltmovement.org/sites/greenbeltmovement.org/files/GBM%202015%20Annual%20Report.pdf>. (visited Jan 24, 2018)

- ◆ London, UK stresses on Maximisation of urban greening through planting of trees and soft landscaping where applicable, following the principle of “right place, right tree”.

## **Urban Forestry in India**

Various measures have been initiated at the national level to maintain natural heritage, check soil disintegration, and denudation, however, an imbalance is seen between the built and natural cover in cities. While the National Forest Policy weighs on the greening of parched and industrial tracts, adequate greening of private terrains has not been emphasised. Further, the rapid pace of advancement since early 1990s has broadened urbanisation beyond the carrying capacity of cities. However, many of the States and local government across India are recognizing and giving more importance to urban trees and green cover for their interconnectedness to the sustainable development goals.

### ***Present Legal Framework in India on Conservation and Management of Forests***

National-level laws may manage, for instance, forest ownership, exploitation rights and administration standards, but there are few examples where they address urban forests particularly. Most often, national laws related to forestry and the environment set general standards and help shape the legal framework for forests and other green spaces at the urban level of administration.

Legal frameworks pertaining to other sectors that may influence UPF laws at the national or subnational level include those referring to: forestry, agriculture, agroforestry; urban development; land use and land ownership; infrastructure and public works; nature and landscape protection etc. The extent to which national legal frameworks on UPF are binding at the subnational or metropolitan level varies, depends upon the context.

The Smart City initiative by the Indian Government promoting development of urban green spaces can be coupled with strategic landscaping to optimise

benefits of greening programs. <sup>16</sup>Organisation like National Afforestation and Eco-Development Board established in 1992, promotes afforestation, tree planting, ecological restoration, and eco-development activities. National Action Plan for Climate Change, 2008 was a national mission launched to enhance ecosystem services including afforestation of 10 million hectares of land. On the World Environment Day, 2016, the Central Environment Ministry initiated an ‘Urban Forestry Scheme’ to create urban forestry in as many as 200 cities and towns across the country.<sup>17</sup>

### ***Initiatives by States:***

- ◆ NCT of Delhi has been making continuous effort in the direction of urban forestry and taken many initiatives on this front which has shown positive results. To have proper legal control, in Delhi there is a special act in the form of Delhi Preservation of Tree Act, 1994 (DPTA, 1994) which is applicable in the NCT of Delhi in respect of all the tree irrespective of its ownership and the ownership of the land on which it is standing. The Tree Ambulance service by New Delhi Municipal Corporation provides emergency help to residents, to save trees. There is also an establishment of Tree Help line where information can be given about illegal felling of trees. The Delhi Preservation of Trees Act, 1994 is a legislation meant for preservation, development, and maintenance of trees.
- ◆ The Government of Andhra Pradesh have constituted an A.P. Urban Greening and Beautification Corporation Ltd. Dept. on 11.02.2015 for protection and planning of all urban vacant lands, municipal lands, parks, green zones and to manage them effectively by establishing parks, urban forestry and herbal plantations etc., in all the Urban Local Bodies (ULBs) of the state.<sup>18</sup>

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16 Aabshar U.K Imam and Uttam Kumar Banerjee, *Urbanisation and greening of Indian cities: Problems, practices, and policies*, available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4824703/> (visited Jan 14, 2018)

17 *Govt to create ‘urban forests’ in 200 cities*, The Times of India (June 6, 2016), available at <https://timesofindia.indiatimes.com/good-governance/centre/Govt-to-create-urban-forests-in-200-cities/articleshow/52615629.cms>. (visited Jan 14, 2018)

18 Available at <http://urbangreening.ap.gov.in/> (visited Jan 24, 2018)

- ◆ Gandhinagar and Chandigarh are two cities which known to have, integration of urban greenery in their City Master plans.
- ◆ Bangalore city is known as the ‘Garden City of India as the place holds 705 parks spread across the city in the form of small and medium sized parks as well as large parks.<sup>19</sup>
- ◆ In Pune, Maharashtra, an Urban Forest Garden Project was launched in 2015 to grow about 4,000 trees under the project which also envisages planting of medicinal herbs, a lake for birds and jogging tracks for citizens.<sup>20</sup>

## Suggestions

Creating an enabling environment is the initial phase in optimizing the contribution of urban forests to sustainable development. An intelligent strategy and legal system can help governments and groups effectively configure, set up, ensure and restore urban forests.

- ◆ Adoption of suitable adaptive management policies offers a deliberate framework for ensuring successful urban forests administration. Creating education policies for urban forestry management and career opportunities will attract individuals into this sector.
- ◆ Educating residents about the intangible benefits of various species of trees and financial encouragement for building residential gardens or forests.
- ◆ Involvement of national, regional, local governments and private enterprises for the management of urban forestry.
- ◆ Community awareness programmes, enlightening the importance of forests for sustainable development.
- ◆ Redesign of existing forests, to provide new services and facilities and enhance their sustainability;

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19 Available at [shodhganga.inflibnet.ac.in/jspui/bitstream/10603/176863/7/07\\_chapter1.pdf](http://shodhganga.inflibnet.ac.in/jspui/bitstream/10603/176863/7/07_chapter1.pdf)(visited Jan 24,2018)

20 *Javadekar inaugurates Urban Forest Garden project in Maharashtra*, ZEE NEWS (June 06,2015),available at [http://zeenews.india.com/news/eco-news/javadekar-inaugurates-urban-forest-garden-project-inmaharashtra\\_1608712.html](http://zeenews.india.com/news/eco-news/javadekar-inaugurates-urban-forest-garden-project-inmaharashtra_1608712.html). (visited Jan 24,2018)

- ◆ Discrete legal policies for the building, advancing, maintenance and conservation of urban forests.
- ◆ Strict enforcement of bye-laws for building green spaces in private properties.

## **Conclusion**

Urbanisation at a rapid pace is a reality at present. By 2050, 70 percent of the worldwide populace will live in urban areas and towns. In India, urbanisation with its quick speed is spreading to an immense degree making even the rural areas urban. Numerous spots in India have confronted catastrophes due to the poor urban planning. Chennai city which was hit with a disastrous flood in 2015, is a prominent instance of shoddy urban planning and lack of urban forestry. In Kerala, Cochin is developing at a fast pace and is one of the urban areas which is confronting the possibilities of natural disasters. Numerous residential developments in Kerala does not offer significance to the planting of trees. The vast majority of the open grounds are secured with tiles and concrete, plants or trees have become a rare view. The heat impact has ascended in Kerala, however, building concrete forests with air conditioners has become the choice, rather than building or conserving urban forests.

Sustainable urban development is crucial, therefore, for ensuring the quality of life of the people around the world. Public participation is essential for the accomplishment of any urban development program and is significantly missing in India. The Directive Principles of State Policy as laid down in Article 48 A of the Constitution of India, stipulates that the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country. Article 51-A lays down the fundamental duty of every citizen to protect and improve the natural environment including the forests, lakes, rivers and wildlife and to have compassion for all living creatures. The Hon'ble Supreme Court has held that any threat to ecology can lead to violation of the right to enjoyment of a healthy life guaranteed under Article 21 of the Constitution. To be effective, international conventions need to be ratified and incorporated into national laws.

Urban Forestry is an imperative contributory factor in the urban areas for environmental enhancement, control of air and noise pollution, microclimatic changes and recreational purposes of the urban populace. Before the city expands further, a proper plan for greening in the city especially with respect to land availability in the form of parks and gardens, forest patches and road side plantation ought to be set up. UPF can assume a urgent part in ensuring the congruity of environmental features through the advancement and administration of ecological passages connecting urban areas with encompassing provincial territories.

In 2015, the global community adopted a set of goals – the SDGs – designed to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda, thus reaffirming sustainable development as the means for achieving a better future. Urban forests have a vital frontline role to play in the achievement of the SDGs.<sup>21</sup> Many urban foresters who claim to have altered the climate of some cities through widespread tree planting points out that the balance between the natural and built environments is recognized as an influential factor in urban health.

Conventional models of urbanization prompt urban sprawl, which undermines the productivity of urban living and can lead to the marginalisation of poorer individuals in dense casual settlements or slums. If well arranged, urbanization can build the strength of urban communities – that is, urban communities with the ability to retain future shocks and stresses to social, ecological, economic and specialized frameworks and foundation in order to keep up similar functions, structures, frameworks and identity. Habitat fragmentation is a biggest challenge for the conservation of urban wildlife. The more heterogeneous, undisturbed and interconnected the green infrastructure, the more resilient will be the ecosystems it hosts.

A city with well-planned and well-managed green infrastructure turns out to be more resilient, sustainable and impartial in terms of food and

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21 *Urban forests to play major role in achieving world's SDG in Asia-Pacific:FAO*, available at <http://www.fareasternagriculture.com/crops/agriculture/urban-forests-to-play-major-role-in-achieving-the-world-s-sdg-in-asia-pacific-fao> (visited on Jan 24, 2018).

nourishment security, poverty alleviation, livelihood improvement, climate change mitigation and adaptation, calamity risk reduction and ecosystems conservation. All through their lifetime, trees would thus be able to provide a benefit package worth a few times more than the investment made in planting and administering them. While moving out to the country may have been the best approach to associate with nature's advantages before, it's not by any means the only arrangement now. We should start considering approaches to better consolidate these trees and forests into our daily lives and lead ourselves and our future generation to an 'earth' saved from 'annihilation'.

## **Tribals in India and their Contribution towards Nature's Sustainability**

*Nevin Jacob John\**

### **Introduction**

The World Commission on Environment and Development has observed, sustainable development aims to meet the needs and aspirations of the present without compromising the ability to meet those of future generations. India is a country having more than 500 different tribal groups who have different cultural traits and ethnic situations which are their identity. Our economic modernization strategies through the construction of new buildings, new power projects; opening of mines and construction of large dams is leading to the displacement and impoverishment of tribes. It is been seriously felt that while there has been emphasis on tribal development by both the government and voluntary sectors, yet it has rested in policy formulation and timely cost effective implementation of development projects. The sustainability aspect of these development projects has not yet received sufficient attention. So, more and more tribes are becoming alien in their own area.

### **An overview into India's Sustainable Development:**

In an article on Sustainable Development,<sup>1</sup> according to the author,

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1 Ashish Kothari, *Sustainable Development*, 27(The Hindu Survey of the Environment 2002)



India's model of development focusing on certain material goods and services is profoundly unsustainable. Natural resources are extracted at a rate far greater than their capacity to regenerate. Pollutants are pumped back into natural ecosystems at rates far higher than they can be absorbed or cleaned up. There are glaring inequities: a small minority receives a significantly high proportion of benefits while many millions actually lose out natural and cultural resources on which they depend. The development mindset still centers on monetary or materialistic indicators like per capita income, per capita energy consumption and industrial production. This is the reason behind continuing malaise. Natural and cultural resources are still alien to the planning and budgeting process.

Author notes that there is a quiet revolution. Regreening of lands by rural communities, and panchayats, water harvesting practice and bio-agriculture are encouraging signs. With a view of blocking destructive projects, the popular attempts of those like Narmada Bachao Andholan have brought sustainable and equitable development into the national agenda.

## **Tribals in India**

Tribals are "a social group living in a definite area with a dialect cultural homogeneity and unifying social organization."<sup>2</sup> A tribal man lives not only for himself alone but he is an integral part of community to which he belongs.<sup>3</sup> They make thick and inaccessible forest as their dwelling areas. In India, tribals generally inhabit in hilly and inaccessible areas.

The tribal groups consider the environment and forest as their habitat, food and shelter. It is the property of their community that provides continuous physical survival. There are no restrictions on any of the members of the community to take out his subsistence. However, they take from environment strictly as according to their immediate needs. This type of utilization may be called 'Sustainable Subsistence'.

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2 R. Gunashekar and G. Ramaswamy, *Social Change Among Tribals a study*, Kurukshetra, 23(January 1988)

3 S. Mahalingam, *Role of Cooperative Organisations in Developing Tribal Economy*, 23 (Mittal Publications 1990)

India is the country which is having the second largest concentration of tribal population, after that of African continent. After independence, Government of India has scheduled the tribal groups in the Constitution and provided special provisions for their welfare and developments in the case of Scheduled Tribe communities across the States in India and 75 of the Scheduled Tribes are most backward and are termed as Primitive Tribal Groups. The total tribal populations of India, is 8.6 per cent<sup>4</sup>. As many as 550 tribal communities are residing in India.

Liquor and money lending are the main two ways in which tribals are being exploited. Illiteracy amongst the tribals is the reason for their exploitation. Improvement of literacy is the only solution and both Centre and State governments are trying their best to give education to these people in order to bring them to the mainstream of the society.

Tribals are the people who live in the forest and that is the basic reason why they have such an affinity to the forest. Forests are the only means of their survival and the only source of energy to their survival. They not only consider the forest as one of the most important part of their life but the whole environment per se.<sup>5</sup> Tribals are backward in nature and live on the basic elements provided by the nature. Even today they have sunlight as the basic source of light and energy and that the other lights they know is that generated from fire. The word 'electricity' is not known to many of tribes. This is the reason they consider every part of environment, from trees to rivers as very important part of their life as they are the only means of human survival as per their understanding.<sup>6</sup> The quantum of importance given to the environment is not limited here. They have given the environment the status of divinity and they worship trees, sun, rivers, air and land, protecting the environment considering it their responsibility towards the lord of human race.<sup>7</sup>

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4 Census of India, 2011

5 Mahendra Mohan Verma, *Tribal Development in India: Programmes and Perspectives*, (Mittal publications, 1st edition 1996)

6 A.K Pandey, *Tribal Society in India*, (Mannak publication 1997)

7 Baidyanath Saraswati, *Tribal Thought and Culture*, (Concept publishing company, 1<sup>st</sup> edition 1991)

**Percentage of Scheduled Tribes in State's total population, India (1981-2011)<sup>8</sup>**

NORTH EASTERN REGION	1981	1991	2001	2011
Assam		12.82	12.4	12.4
Manipur	27.30	34.41	34.2	35.1
Meghalaya	80.58	85.53	85.9	86.1
Nagaland	83.99	87.70	89.1	86.5
Tripura	28.44	30.95	31.1	31.8
Arunachal Pradesh	69.82	63.66	64.2	68.8
Sikkim	23.27	22.36	20.6	33.8
Mizoram	93.55	94.75	94.5	94.4
NORTHERN				
Himachal Pradesh	4.61	4.22	4	5.7
Uttar Pradesh	0.21	0.21	0.1	0.6
CENTRAL				
Madhya Pradesh	22.97	23.27	20.3	21.1
WESTERN				
Gujarat	14.22	14.92	14.8	14.8
Maharashtra	9.19	9.27	8.9	9.4
Rajasthan	12.21	12.44	12.6	13.5
Dadra and Nagar Haveli	78.82	78.99	62.2	52
Goa	0.99	0.03	0	10.8

8 Prof. A. Jayakumar, and P. Palaniyammal, *Socio-Economic Status Of Scheduled Tribes in Kalrayan Hills*, 4(3)International Journal of Research – Granthaalayah 22-30 (2016)

Daman and Diu		11.54	6.3	6.3
SOUTHERN				
Andhra Pradesh	5.93	6.31	8.8	6.3
Kerala	1.03	1.10	1.1	1.5
Karnataka	4.91	4.26	6.6	7
Tamil Nadu	1.07	1.03	1	1.1
ISLAND				
Andaman and Nicobar	11.85	9.54	8.3	7.5
Lakshadweep	93.82	93.15	94.5	94.8

### The Law and Rights of the Tribals

As we look back into history, we can trace out that during the time of British advent or rule in India, a series of struggles were waged by the tribals against the British as well as other exploiters (money lenders, middlemen, contractors, liquor vendors, zamindars, government administrators) for their survival and they followed their traditional laws, legal systems and customs. Before the British rule in India, the regulation of people's use of forest was mainly done through local customs and rules.

The various issues concerning tribals can be classified as relating to the development of tribal culture, planning and the self-government of tribal areas. The problem with the development plans is that they rarely take into account the existing culture and economy of tribals. The logic for imposing these programs is created by the belief that the tribals are backward and helpless and they need outsiders to act as their guardians which is certainly false. The disadvantage here is that the masqueraded guardians abuse their privileges thereby depriving tribals of their 'right to livelihood'.<sup>9</sup>

After the Independence, India was transformed into a 'Welfare State' from that of 'laissez-faire' followed by the British. When the Constitution

9. Sharit Kumar Bhomik, *Development Perspective for Tribals*, 23Economic and Political weekly(May 14, 1988)

of India was formulated special provisions were included to safeguard the social, economic, educational and political interests of weaker sections of society including tribals. Post Independence, the forest department took over the monopoly of developing forests and tribals become foreigners in their own forests and hills especially after the promulgation of Forest Conservation Act, 1980.

The Forest Act, being the product of the British colonial days, reflects the exploitative intentions of the colonial and feudal society of the time, rather than the environmental and ecological policy. Based on revenue oriented policy, its main object was to regulate dealings in forest produce and augment the public exchequer by levy of duties on timber.<sup>10</sup>

The Act also provides for reservation and incidence of reservation. No right could be acquired in or over reserved forests except by (a) succession or (b) under a grant or contract entered into with the government or (c) by any other persons having pre-existing rights. The rights were though lost as soon as draft notification as issued. Any person indulging in prohibited acts such as setting fire to the forests, hunting, trespassing, quarrying, fishing and setting traps were liable to be prosecuted. The State government on the other hand can assign any of its rights in a reserved forest to a village community and make laws in furtherance of that.<sup>11</sup>

The Forest law of 2007<sup>12</sup> aims to do away with the injustice i.e., the non-recognition of tribes over the forest land and habitat. It give due recognition to the tribal people and other forest dwellers i.e., member or community who has for at least three generations prior to 13<sup>th</sup> December 2005, primarily resided in and depend on forest or forest land for bona fide livelihood needs.<sup>13</sup> These people are provided certain rights i.e., right to hold and live in the forests, to have title over lands, community rights,

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10 P. Leelakrishnan, *Environmental Law in India*, (Lexis Nexis Butterworths, 3<sup>rd</sup> edition 2012)

11 G.S Narwani, *Tribal Law in India*,(Rawat publications, 1<sup>st</sup> edition 2004)

12 The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forests Right) Act, 2007

13 Section 2(o) of 2007 Act

entitlement to water bodies, grazing land and traditional resource access, biodiversity access, and community right to intellectual property and traditional knowledge relating to forest diversity and cultural diversity. The 2007 Act makes an attempt to create a balance and relation between the tribes and the forest. However a major challenge in the implementation of the legislation is to strike a balance in the continuous process of privatization in the area of mining, construction etc. which hamper the sustainable development and the restoration of the tribes into their forest habitat.

Another threat to the tribes was the introduction of Wildlife Protection Act, 1972 which made implications of the possible impact or activities that the tribal people will have on the existence of the species. So, the freedom of movement of tribes has been greatly reduced and restricted. This Act actually helped intruders to mask themselves and treat the forest communities as scapegoats. To counter this the National Tiger Conservation Authority started to recruit the local tribal community tribal members as field staffs in the tiger reserve areas.

For the protection of tribal community and their natural rights, there is a need to recognize and acknowledge the difference between those who are in the forests for survival and livelihood and those who are there for commercial purpose and to make profit.

### **Contribution of Tribes and Indigenous Community in Environment Conservation:**

These can be named as ‘Community based Conservation and it has 3 aspects:

- 1) Initiatives by indigenous people and other traditional local communities to conserve wildlife and biodiversity;
- 2) Involvement of indigenous peoples and communities in formal, government-managed protected areas and;
- 3) Indigenous people and community involvement in NGO led initiatives. India’s first wildlife and environmental protected areas and forest reserves were not set up by the government, or by the kings or sultans. They were actually created by the ordinary people i.e.,

adivasis (tribal groups) who set aside parts of landscape for cultural, ethnic or economic reasons.

Tribes usually create a 'community conserved areas', which they treat as 'sacred areas' and it includes patches of forests, water bodies or grassland that were considered to be inhabited by Gods, ancestors and therefore strictly protected from the resource extraction. This involves the forest groves, village tanks and Himalayan grasslands. Most of these have preserved remnant populations of rare and endemic species.

In Orissa, Andhra Pradesh and other States, 10,000 of hectares have been regenerated and/or protected by village communities on their own initiatives. The biodiversity value of these forests is considerable, providing habitat to number of threatened mammals and birds. In Orissa alone, there are more than 10,000 village-forests protection committees, and in some parts of State, elephants are reported to be frequenting the community conserved forests, having moved from previously occupied ranges that have been disrupted by highways, railway line and industry.<sup>14</sup>

In Nagaland, several dozen of tribal villages have over last decade or two, conserved the natural ecosystems as forest or wildlife reserve.<sup>15</sup> One biggest example is 'Khonoma Tragapon' spread over 20 km<sup>2</sup>, where hunting and resource extraction is completely prohibited. In another 50 km<sup>2</sup>, very minimal resource use, for domestic purposes is only allowed.

With the help of NGO 'Tarun Bagath Sangh' (TBS), tribal villages in Alwar district in Rajasthan have restored the water regime, regenerated forests and helped the revival populations of wild herbivores, birds and other wildlife.

In 1800 hectors of deciduous forest, Gand adivasis of Mendha (Lekha), Maharashtra warded off the threat of construction of paper mill which

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14 Kristen Walker Palnemilla, Anthony B. Rylands, Allsa Woofter and Cassle Hughes, *Indigenous peoples and Conservation From Rights to Resource Management*, 183(Conservation International 2010)available at [https://www.conservation.org/publications/Documents/CI\\_ITPP\\_Indigenous\\_Peoples\\_and\\_Conservation\\_Rights\\_Resource\\_Management.pdf](https://www.conservation.org/publications/Documents/CI_ITPP_Indigenous_Peoples_and_Conservation_Rights_Resource_Management.pdf) (visited Dec3,2017)

15 Id

would have destroyed the bamboo stocks, and also stopped the practice of lightning forest fires and have made progress towards the sustainable extinction of non-timber forest produce.

There are many instances wherein efforts have been taken by the tribals and local communities to protect the natural ecosystem and wildlife. For e.g., several dams which would have submerged huge areas of forests and ecosystems have been stopped by people's movement. This includes the proposed dams such as Bhopalpatanam-Ichhampalli in Maharashtra and Chattisgarh which would have submerged a major part of Indravati Tiger Reserve.

### **Judicial Decisions**

Today, the tribals are becoming alien in their own land. The Forest Acts prevents them from earning from minor forests products. In many parts of our country, the tribals who were actually the 'cultivators' of land has been changed into agricultural labourers. The police, politicians and government officials who are supposed to help or have the duty to help the people are actually unleashing a terror in common people. Actually it is a situation e can compare like 'fence eating away the field'.

India, as a developing country, its project of development actually resulted in the transfer of resources from the weaker sections of the society to more privileged one. The dams, power projects, coal and oil mining, construction of townships, railways, roads, airports, factories and industries etc create victims i.e., the tribals and indigenous people who never get a share in the gain of development in any manner. If there is a development project, there is a great centralized or corporate control over it. Even the weak people are facing the threat to life and women who are being sexually exploited for standing against these projects.

Judiciary has played an important role in protecting the rights of weaker section of society i.e., the tribals. A superficial glance at some prominent court judgments suggest that adivasis forest and land rights have been taken seriously by the court on occasions.



- ◆ In *Fatesang Gimba Vasava v. State of Gujarat*<sup>16</sup>, the Gujarat High Court ruled that forest department's action to prevent the transport of bamboo by the tribals at concessional rates was unwarranted.
- ◆ Reiterating *Fatesang* case, the Supreme Court held in *Suresh Lohiya v. State of Maharashtra*<sup>17</sup>, that confiscation, by forest officials, of bamboo mats made from tribal labor was not valid.
- ◆ In *Animal and Environment Legal Defense Fund v. Union of India*<sup>18</sup>, the Supreme Court had to resolve a dispute between two neighboring states on the rights of the tribals. The government of Madhya Pradesh allowed fishing permits to the displaced tribal people in Taltadoh reservoir within Pench National Park. The government of Maharashtra objected on environmental grounds such as potential danger of felling trees, harm to crocodiles and turtles in the reservoir, disturbance to water birds and migratory birds and possibility of lighting fires and throwing garbage and polythene bags around and into the reservoir. The court stated that steps must be taken to protect the fragile ecology but every effort should be made to ensure that the tribals are in position to earn their livelihood.
- ◆ In *Machegoda v. State of Karnataka*<sup>19</sup>, the Supreme Court nullified the statute which allowed the purchase of adivasi land by private persons.
- ◆ In *Lingappa Pochana v. State of Maharashtra*<sup>20</sup>, the Supreme Court allowed the Maharashtra State government to enact a State legislation aimed at restoration of land to adivasis.
- ◆ In *Samata's case*<sup>21</sup>, Samata, a NGO working in the Scheduled Tribe area of Andhra Pradesh, filed a special leave petition in Supreme Court against the state government of Andhra Pradesh for leasing

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16 AIR 1987 Guj. 9

17 (1996) 10 SCC 397

18 AIR 1997 SC 1071

19 AIR 1984 SC 1151

20 AIR 1985 SC 389

21 AIR 1997 SC 3297

out tribal lands to private mining companies in scheduled area. The Supreme Court held that government is also a 'person' and that all lands leased to private companies in scheduled areas are null and void.

Salient features of *Samata* judgment:

- a) By the Constitution, 73<sup>rd</sup> Amendment Act, 1992, every Gram Sabha shall be competent to safeguard and preserve "community resources" and given the power to prevent alienation of land in scheduled areas and to take appropriate action to restore any unlawful alienation of land of Scheduled Tribe.
- b) Minerals to be exploited by tribals themselves either individually or through cooperative societies with the financial assistance of the State.
- c) In the absence of total prohibition, the court laid down certain duties and obligations to the lessee, as a part of project expenditure: at least 20% of net profits as permanent fund for development needs apart from reforestation and maintenance of ecology.
- d) Transfer of land in scheduled areas by way of lease to non tribals, cooperation aggregate etc stands prohibited to prevent their exploitation in any form.
- e) Transfer of mining lease to non tribals, company, cooperation aggregate or partnership firm etc is unconstitutional, void and inoperative. State instrumentalities like APMDC stand excluded from prohibition.
- f) Renewal of lease is fresh grant of lease and therefore, any such renewal stands prohibited.
- g) In States where there are no Acts which provide for total prohibition of mining leases of land in scheduled areas, committees of secretaries and state cabinet sub committees should be constituted and decision taken thereafter.
- h) Conference of all Chief Ministers, Ministers holding the ministry concerned, and Prime Minister and Central Ministers concerned should take a policy decision for a consistent scheme throughout the country in respect of tribal lands.

Vested interests of powerful corporate houses and political class joined hands to negate the Supreme Court decision, as this judgment became hurdle in their 'development' plans. In March 2000, The Supreme Court dismissed the petitions of State and Central government for modification of *Samata* Order. In current scenario of liberalisation, privatisation and globalization, market forces have become the central player, not community or government. As the Indian government appears determined to follow the narrow western concept of 'development' as "maximization of wealth", through market forces and commodization of natural resources, ordinary people of the country have come forward to fight for social justice, equity and sustainable livelihood of most marginalized tribal community of Indian society.

- ◆ *P. Rami Reddy v. State of Andhra Pradesh*<sup>22</sup>, In Andhra area, before the commencement of the Constitution certain laws including 'Agency Tracts Interest and Land Transfer Act, 1917' inter alia prohibited the transfer of land in Agency Tract areas except in favour of members of hill tribes conferring upon the persons belonging to Scheduled Tribes certain benefits. After Constitution came into force, Article 244 and 5<sup>th</sup> schedule empowered the President to notify the scheduled area in consultation with Governor of the State. The Andhra state as a result got, Andhra Scheduled Area Order, 1950. The Supreme Court ruled that section 3(1) of this regulation which prohibited the transfer of immovable property situated in scheduled areas of Scheduled Tribes to non-tribals without previous sanction of government as constitutional.
- ◆ *Banwasi Sewa Ashram v. State of Uttar Pradesh*<sup>23</sup>, a writ petition under Article 32 as filed by Banwasi Sewa Ashram to consider land and related rights of adivasis living in Mirzapur. The State government declared a part of jungle land in the two tehasils as reserved forests under section 20 of Forest Act, 1927. The adivasis of these two villages were using the forests for generations for their livelihood.

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22 AIR 1998 SC 1626

23 1987 AIR 374, 1987 SCR (1) 336

Criminal cases for encroachment were registered and steps were taken to throw them away under U.P Public Premises (Eviction of Unauthorised Occupants) Act, 1972. The Supreme Court ordered to put back adivasis in possession of their land and no further encroachments shall be made in the forest and court asked the adivasis not to cut trees and State authority was empowered to take action if they violate this but not to take them away from possession of their land.

- ◆ In *Pradip Prabhu v. State of Maharashtra*<sup>24</sup>, the Supreme Court held that adivasis were in possession of land since prior to 1978 and ordered the regularization of adivasis-cultivated land in forest area.
- ◆ Though these decisions are taken by the Supreme Court in favour of tribal people, sometimes, the adivasis or tribal rights are juxtaposed with the development plans. At such circumstances, tribal rights are often limited or redefined.
- ◆ In *Dahanu Taluka Environmental Protection Group v. Bombay Suruban Electric Supply Ltd.*<sup>25</sup>, the Environmental Appraisal Committee brought to the notice that power project was located in ecologically fragile area, but Supreme Court ignored the report arguing that the centre had made use of state expert committee report that has okayed the project.

## Conclusion

Forest is a valuable component of human environment. For healthy subsistence of human beings on earth it is essential that 1/3<sup>rd</sup> area of land on the earth must be under forest cover and this principle is being followed by many developed nations. Undoubtedly, it is the duty of the State to protect forests on environmental and economic considerations and also in the interest of tribals living there. When these forests are being consumed for huge hydroelectric, thermal power projects and other industries, it is the tribals

24 Decided on 7<sup>th</sup> March 1995

25 AIR 1991 SC 472

who suffer the most. By recognition of rights of tribals and appreciating their dependence on the forest would only motivate them to protect the forest. Further by allowing them to collect the minor forest products and to sell it, will help to increase their income so as they can be protected from the exploitation of money lenders and businessman and also this income would help them to improve their health and education.

Due to their backwardness, tribals are unaware of the rights vested in them. The main reason is in spite of so many legislations, it is made in a language which is not familiar to them and there is no permanent system to convey to them such information and details. As tribals consider the forest as their God which serves all needs of their livelihood, it is the duty of a social welfare State to protect these people and their rights. They would be the apt guardians of the forest cover and must be supported in their endeavour.

Motto: *'ECONOMIC DEVELOPMENT AND PROGRESS MUST BE COUPLED WITH PRESERVATION OF ENVIRONMENT AND TRIBAL CULTURE.'*

## **The Importance of Environmental Protection and Sustainable Development in the Ancient Indian Literature**

*Dr Sheeba Pillai\**

The importance of environment and its protection has taken centre stage in the last few decades. Man and his environment share a deep bonding. His welfare, well being and his future depends on how he nurtures and protects his environment. Man is the superior being and his activities in the environment will decide to what extent it is sustained in a proper manner. Understanding the importance of environment, the ancient Vedic literature contains enriching information on the need to protect it and repercussions that would befall man if he doesn't. For instance the Manusmriti has references to direct and indirect instructions about the conservation of plants and animals. It gives specific punishments for harming trees or animals.<sup>1</sup>

Sustainable development is a term which has been a subject of a lot of discussions and debates. India is a signatory to a number of International documents that laid foundation to the concept of sustainable development. The 42nd Amendment and the insertion of Article 48A and 51A (g) paved

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1 Kumar B.M, *Forestry In Ancient India: Some Literary Evidence*, 12 (4) Asian Agri History 299-306 (2008).

the way for the evolution of environmental jurisprudence in India. Much credit must be contributed to the Indian Judiciary which was responsible in moulding the various dimensions of right to environment and for also creating a platform for protecting the environment. For this they took extensive help from the international instruments and made use of various principles like polluter pays principle, precautionary principle which were off shoots of the concept of sustainable development. Environment sustainability entails the respect for some restrictions to keep the balance on the use of both the renewable and non-renewable resources, and the control of pollution and waste.<sup>2</sup>

Even though the concept of sustainable development was put forward for the first time in the Stockholm Declaration it was consolidated in the Harlam Brundland report in 1987, with countries across the world actively engaging in debates and discussion concerning the nuances of this concept. This constitutes the guide for the international agenda and the international community's insight for economic, social and environmental development.<sup>3</sup> The Report introduces some important concerns like the respect for fundamental human rights, the conservation and sustainable use of natural resources, the fulfillment of environmental standards and monitoring processes, the accomplishment of a prior environmental assessment, prior notification, access and due process, plus sustainable development and assistance. These subjects are identified as the legal set of principles for environmental protection and sustainable development.<sup>4</sup>The Johannesburg Declaration on Sustainable Development sought to cover not only the concerns of development and environment, but also poverty reduction through social and economic development.. However it was not so successful

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2 Christopher S. Sneddon, '*Sustainability in ecological economics, ecology and livelihoods: A Review*,24 Progress in Human Geography 521, 526(2000)

3 *Brundtland Report, Summary of Proposed Legal Principles for Environmental Protection and Sustainable Development, Annex I*.available at [https://en.wikisource.org/wiki/Brundtland\\_Report/Annexe\\_1.\\_Summary\\_of\\_Proposed\\_Legal\\_Principles\\_for\\_Environmental\\_Protection\\_and\\_Sustainable\\_Development](https://en.wikisource.org/wiki/Brundtland_Report/Annexe_1._Summary_of_Proposed_Legal_Principles_for_Environmental_Protection_and_Sustainable_Development) (visited Mar 13,2018)

4 *Id*

in attracting attention of the world nations. The UN Conference on Sustainable Development held at Rio De Janeiro, Brazil <sup>5</sup>was named Rio +20 Summit. It was an attempt to review the progress made since 1992. It concentrated on strategies to build a green economy, eradicate poverty and expand international coordination for sustainable development.<sup>6</sup> It resulted in a focused political outcome document which contains clear and practical measures for implementing sustainable development.<sup>7</sup> Finally this resulted in over 700 voluntary commitments and witnessed the formation of new partnerships to advance sustainable development.<sup>8</sup>

### **Attributing divinity to nature- A tool for protection of Environment**

It is quite enlightening to learn that our ancient Indian literature had already laid foundation to the concepts of sustainable development our ancient Indian literature had already laid foundation to this. The Vedic Hymn to the Earth, the *Prithvi Sukta* in Atharva Veda, is unquestionably the oldest and the most evocative environmental invocation. In it, the Vedic seer solemnly declares the enduring filial allegiance of humankind to Mother Earth: *Mata Bhumi Putroham Prithivyah*: Earth is my mother, I am her son.' Mother Earth is celebrated for all her natural bounties and particularly for her gifts of herbs and vegetation. Her blessings are sought for prosperity in all endeavours and fulfillment of all righteous aspirations.<sup>9</sup> In fact our literature is enriched in discussions concerning the importance of environment, the necessity of maintaining the balance and also the consequences if our environment is not protected adequately.

The Chandogyopnishad says: 'The earth is the essence of all beings. Water is the essence of the earth. Herbs are the essence of the water and

5 20<sup>th</sup> June 2012-20 June 2012.

6 Helen Clark, *What does Rio+20 mean for sustainable development?* Lecture at Lincoln University, (New Zealand 2012 available at [www.undp.org/.../speeches/2012/.../20/helen-clark-what-does-rio-20-mean-for-sustain](http://www.undp.org/.../speeches/2012/.../20/helen-clark-what-does-rio-20-mean-for-sustain) (visited Mar 18, 2018)

7 Available at <https://www.sustainabledevelopment.un.org/rio20> (visited Mar 18, 2018)

8 Id

9 *Environment Wisdom in India*, available at <http://www.ecomall.com/greenshopping/eastgreen.htm> (Visited Feb 20, 2018)



man is the essence of the herbs.’ So, it become evident that there is a constant relation between the macro-cosmic and micro-cosmic world. This is known as *Loka-Purusha-Saamyain Ayurveda*.<sup>10</sup>

The Atharva Veda says’

*Let there be balance in the space! Let there be balance in the sky! Let there be peace in the earth! Let there be growth in the plants! Let there be growth in the trees! Let there be grace in all Gods! Let there be bliss in the Brahman! Let there be balance in everything. Let there be peace and peace. Let such peace be with everyone of us!*<sup>11</sup>

Let us start from a verse from the Rig Veda that portrays the importance given to the environment in the ancient Vedic culture

*“madhu vatah ritayate madhu ksaranti  
sindhavah madvih nah santusadhi  
madhu naktamutusasu madhumatparthiva  
rajah madhu ksorastu suryah  
madhigabo bhavanthu nah”*<sup>12</sup>

It translates like this “Environment provides bliss to people leading their life perfectly. Rivers bless us with sacred water and provide us health, night, morning, vegetation. Sun bless us with peaceful life, our cows provide us with milk”

The Vedas, Ramayana, Mahabharata, Bhagavad Gita and Artha Shastra laid a great foundation of environmental ethics. According to ancient Indian thought, man feels divinity in all beings. This includes both motile and non motile sort of life forms described. There can be this ecological balance

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10 Indr. J.S.R.A. Prasad, *Concepts Of Environment And Nature In Ancient India*,2(5) Bi-Monthly Newsletter Of The Eu-India Project E-Qual (September 2015) available at file:///C:/Users/Teacher/Downloads/concepts\_of\_environment.pdf (visited Mar 24,2018)

11 A.V XIX 9.14 cited in Subodh Kapoor(Ed), *Encyclopaedia of Vedic Philosophy-The Age, Religion, Literature,Pantheon, Philosophy,traditions and the Teachers of the Vedas*,(Cosmo Publication 2002) available at <https://books.google.co.in/books?id> (visited Jan 23,2018)

12 (Rig Veda,1/90/6,7,8)

when humans maintain a sync between ‘*dehadasha*’ (body) and ‘*bhumidesha*’ (habitat).<sup>13</sup>

Thus realizing the importance of environment, man was given directions not to cause destruction to the environment. Some of the instructions given to mankind was almost like a caution, for example- ‘Do not cut trees said the Rig Veda, because they remove pollution.<sup>14</sup> Similarly the Yajurveda says ‘do not disturb the sky and do not pollute the atmosphere ‘<sup>15</sup>

The Atharvaveda (1500-1000 B.C.) also warns about the forthcoming disasters in the name of environmental and natural pollutions. ‘Foods like raw/cooked rice, fruits, water, milk and clothes, vessels, living space are liable to be contaminated due to their contact with three types of poisons.<sup>16</sup> Sushruta in his Sushruta Samhita, <sup>17</sup>refers to

- herbo-mineral origin – related to plants and minerals
- animal origin – related to insects, flies, mosquitoes, rats etc., and
- artificial – that is man made

Varahamihira (5th C.) in his Brihatsamhita, offered cues to the onset of disastrous Tsunami. This was explained in a chapter called *udakargaladhyaya*. He eloquently explains that forty days before the tsunami effect, the related geographical area emits smoke kind of vapors in pockets. This in turn effected the habitat by bringing about a complete change in the ecological conditions prevailing in the habitat. He observed that the colour of the leaves of plants change and they wither away. Such indications in the nature warn the people of the forthcoming disaster and make them more vigilant. What is quite interesting is that people at that time observed the environment and were able to forecast disasters.

13 Indr. J.S.R.A. Prasad, *Concepts Of Environment And Nature In Ancient India*, (cited in note10)

14 Rig Veda,6:48:17 cited in *Ecological awareness in Hinduism* available at <http://hindufocus.wordpress.com/2009/04/23> (visited on Jan 20,2018)

15 Yajurveda, 5:43,Id

16 *Atharvaveda* 8.2.19,Id

17 *Sushruta Samhita* 5.2.24,Id

Even before India became signatories to fundamental documents enshrining the protection of environment and its sustainable management, we find that the very concept was deeply ingrained in the Vedic literature in ancient India. The conservation and protection of environment is reflected in our culture, folklore, myth, religion etc. Sanctity was given to this idea by superimposing a religious texture to the whole debate. One of best examples of traditional practices in India based on religious faith which has made a profound contribution to nature conservation is the maintenance of sacred groves. These groves were dedicated to a deity or village God etc. In fact, in Kerala, there are many such small forests dedicated to snakes known as *sarpakavu*.<sup>18</sup> Thus we can also say that Indian attitude towards nature was conglomeration of spiritual and philosophical thinking as well as social awareness and environmental ethics.<sup>19</sup>

According to Upanishads, the universe consists of five basic elements -earth/land, water, light or lustre, air and ether.<sup>20</sup> There is a status of balance amongst the elements and any disturbance can cause catastrophe.<sup>21</sup>

From the ancient text it is very clear that man was called upon to treat nature with a lot of reverence, failing which, it can result in a lot of calamities. Those who interfered with the balance of nature was ordained to undergo severe punishment. The concept of sustainability is reflected in Isha Upanishad'. The whole universe together with its creations belong to nature. Let no, one species, encroach over the rights and privileges of other species. One can enjoy the bounties of nature by giving up greed.<sup>22</sup>

All the four Vedas namely the Rig Veda, Samaveda, Yajurveda and Atharvaveda recognise the importance of preserving the environment and

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18 S.M Nair, *Cultural Traditions Of Nature Conservation In India*, available at [cctindia.gov.in](http://cctindia.gov.in) (visited Mar 24,2018)

19 Das Shukla,2003,*Concern for environment :An early Indian Perspective*, XX Journal of Ancient Indian History135(2003)

20 Aitareya Upanishad 3.3

21 Shashi Tiwari, *Origin of environmental sciences from Vedas* available at <http://www.sanskrit.nic.in> (visited Mar 24,2018)

22 Anirban Sengupta, *Consciousness about environment in ancient India* available at [www.ayk.gov](http://www.ayk.gov)(visited Mar 24,2018)

the climate change that can occur due to inappropriate human actions.<sup>23</sup>

The Vedic literature like the Vedas, Brahmanas, Aranyakas (forest book), Upanishads, Samhitas are replete with references to different aspects of Environment.<sup>24</sup>

Thus by giving divinity to nature the Vedic texts and culture protected the environment and also prescribed heavy penalties for its violation.

In Maitrayani Samhita, the earth has been described as ‘*devajayani*’ also adored by deities and in all kinds of medicinal plants and hence Manu suggested punishment for him who cuts valuable trees.<sup>25</sup>

In fact the Rig Veda states that the sky is the father, earth akin to mother and the space as their son. Any disturbance to this relation will throw the universe out of balance.<sup>26</sup> This is so true of what is happening today with increasing amount of pollution and indiscriminate plundering of resources has put our entire ecosystem into a total disarray. A verse in Rig Veda says that for ‘thousands and hundreds of years if you want to enjoy the fruits and happiness of life, then to take up systematic planting of trees.’<sup>27</sup>

**The protection of resources** of the earth was given a lot of importance and their contribution in sustaining life was much appreciated and this was evident from the various texts. The primary concern has been to save and use resources in a manner that would not harm the future generations.

## Water

Water is given the highest pedestal among the panchabhuta namely- ether, space or firmament (akash), air (vayu), energy or fire (tej or agni),

23 Rabin Sarmath, *Environment awareness in the Vedic literature :An assessment*, 1 (4) International Journal of Sanskrit Research(2015) available at [www.anantanjournal.com](http://www.anantanjournal.com) (visited Apr 14,2018)

24 Dr Benudhar Patra, *Environment in Early India: A historical perspective*,1(1) Environment, Traditional and Scientific Research(Jan-June 2016) available at [www.gcll.ac.in](http://www.gcll.ac.in) (visited Apr 14,2018)

25 Rabin Sarmath, (cited in note 23)

26 David D S, *Tamil Temple Myths*, (Princeton University Press 1980)

27 Dwivedi O.P., Tiwari BH, *Environmental Crisis and Hindu Religion*, (Gitanjali Public House 1987)

water (aapals) and earth (prithvi). The description that is given to water is quite enticing. The Rigveda says

*‘water which comes from heaven or those that wander dug from the earth, or flowing free by nature, bright purifying, speeding to the ocean, here let those waters Goddesses protect me.’<sup>28</sup>*

*Blest be the streams from hills of snow, sweet be spring Waters unto thee; Sweet be swift running waters, sweet to thee be water of the rains, sweet unto thee be Waters of the waste and Waters of the pool ;Sweet be waters dug from earth, to thee, and Waters brought in jars.’<sup>29</sup>*

In fact it states that there is no better element other than water which is the most beneficial to the living beings. The rivers were so important and sacred to the Aryans that Punjab during the Rig Vedic period was known as the land of seven rivers or Sapt Sindhavah.<sup>30</sup> Saptapata Brahmana says waters are indeed sacred<sup>31</sup> and “water is in fact nectar”.<sup>32</sup>

It is very interesting to note that Varahamihira as early as 550A.D presented a simple method for obtaining potable water from a contaminated source of water.<sup>33</sup> The vedic texts describe the consequences of anyone who contaminates this source. A person who is engaged in killing creatures, polluting wells and ponds and tanks and destroying garden goes to hell.<sup>34</sup> Charaka wrote about pollution and said that the cause of diseases was air and water pollution.<sup>35</sup> Caraka Samhita (900-600 BCE) alerts one on the

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28 The Rig veda 07.49.2 cited in Shamik Baranwal, *Concern for Environment in Ancient India* available at <http://rexjournal.org.managewebsiteportal.com/files/documents/Concern-for-Environment-in-Ancient-India--Shamik-Baranwal.pdf> (visited May 2,2018)

29 Atharvaveda 19.2.1-2cited in Shamik Baranwal, *Concern for Environment in Ancient India*, Id

30 Dr Benudhar Patra(cited in note 24)

31 Medhyava Apah S.B 1-1-1-1 cited at [http:// www.hinduwisdom.info/Nature\\_worship.htm](http://www.hinduwisdom.info/Nature_worship.htm),page 1(visited May 24,2018)

32 Amrtahyapah SB 3-9-4-16),Id

33 Available at [http:// www.nihrookee.gov.in](http://www.nihrookee.gov.in) (visited May 2,2018).

34 (Padmapurana, Bhoomikananda 96:7-8 (cited in note 31)

35 Dwivedi, O.P., *Human Responsibility and the Environment :A Hindu Perspective*, 6 Journal of Hindu-Christian Studies,(1993)available at [http:// digitalcommons.butler.edu/jhcs/vol6/iss1/8](http://digitalcommons.butler.edu/jhcs/vol6/iss1/8) (visited Mar 18,2018)

possible water contamination issues. Following are the symptoms of contaminated water:

- it is excessively abnormal in smell, colour, taste and touch, is considered to be polluted .<sup>36</sup>
- it has excessive stickiness
- it is observed with manifestation of unpleasantness

If water containing such adverse qualities is left untreated, it leads to epidemic diseases that would destroy the local inhabitants.

Kautilya<sup>37</sup> wrote, "The punishment of one-eight of a *pana* should be awarded to those who throw dirt on the road. For muddy water, one fourth *pana*. The punishment would be double if they did both of these condemned acts. If a person relieves himself near the temple, well or pond, sacred place or government building, the punishment would increase one *pana* in each case.<sup>38</sup> The Manusmriti states many instances to keep water clean.<sup>39</sup>

## Forests

The Mauryan period was the most glorious chapter of the Indian History from environmental protection point of view. It was in this period detailed and perspective legal provisions were found in Kautilya's Arthashastra. His thesis gave an elaborate eminence to forest and emphasised on the necessity of forest administration .The State assumed functions of maintenance of forest regulation of forest produce and protection of wild life during the Mauryan reign.<sup>40</sup>

36 JSR Prasad, *Environment in Early India: A historical perspective*, (cited in note 24)

37 Kautilya also known as Chanakya, was the minister of Chandragupta maurya, (321-297 BC), India's first Emperor. The book Arthashastra written by him is a treatise on Government and Economics in ancient India.

38 Kautilya 's Arthashastra, Book II, ch 36, verse 145, cited by O.P Dwivedi, *Classical India*, in Jemieson, D (Ed), *A Comparison to Environmental Philosophy* (Blackwell Publishers Ltd 2001)

39 Manusmriti 4.56 available at [http:// www.hinduwisdom.info/Nature\\_worship.htm](http://www.hinduwisdom.info/Nature_worship.htm), page 1 (visited Mar 18,2018)

40 Sara Parveen, *History of Environment Protection in India*, available at <https://www.scribd.com/document/237912264/History-of-Environmental-Protection-in->

The importance of forests and their relevance to the lives of the mankind has also been elaborated in various texts. According to Kautilya, a village must be surrounded by river, hill and forest wherever possible.<sup>41</sup>

The Vrksayurveda<sup>42</sup> says that planting a tree is equally beneficial as having ten sons.

*“dasakupa sama vapi dasa vapi sama hradah  
dasahrada samah putro dasaputra sama drumah*

In fact a tree is said to render to a sonless person the virtue of having a son.<sup>43</sup> The Skanda Purana talked of auspiciousness of plantation of trees.<sup>44</sup>

The Vedic traditions affirm that every village will be complete only when certain categories of forest vegetation or trees are preserved in and around its territory, reflecting the concept of sustainability.<sup>45</sup> Of these, Mahavan, or ‘the great natural forest’ is perhaps equivalent to the protected areas of today. It adjoins the village and provides a place where all species can coexist.<sup>46</sup> During the Vedic age, each village was also responsible through its panchayat for maintaining the forest of its own territory.<sup>47</sup>

Another idea of sustainability is reflected where the vedas necessitated the creation of other forests when original forests are cleared.<sup>48</sup> During Emperor Ashoka’s days planting of medicinal herbs and trees besides shade

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India (visited Mar 18, 2018)

41 Kautilya ‘s *Arthashastra*, Book II, ch 36, verse 145, cited by O.P.Dwivedi, *Classical India* (cited in note 38)

42 Vrksayurveda -5cited in Rajib Sarmah, *Environmental awareness in the Vedic literature: An assessment*, 1 (4) International Journal of Sanskrit Research 5-8 (2015) available at [www.anantanjournal.com](http://www.anantanjournal.com) (visited May 24, 2018)

43 Bhavisya Purana, Madhyama Khanda, 1.10.37; in Benudhar Patra. (cited in note 24)

44 Skanda Purana :12.27,21-22, Id

45 Prime R, *Vedic Ecology: Practical wisdom for surviving the 21st century*, 157. (Mandala Publishing Group, 2002)

46 B.M Kumar, *Forestry in Ancient India: Some Literary Evidences on Productive and Protective aspects*, 12 Asian Agri-History 299-306, (2008) available at [www.indiaenvironmentalportal.org.in](http://www.indiaenvironmentalportal.org.in) (visited Mar 14, 2018)

47 Id

48 Id

tree along the roads and fruit plants on the waste plants were mandatory.<sup>49</sup>In Mahabharata too there are various verses advising the protection of trees and forests.<sup>50</sup>

According to Kautilya it was the duty of the King to conserve environment, ecology and natural resources. He opined that the King should maintain and preserve water reservoirs as water was very precious to mankind. Residential buildings, roads, commercials, cremation grounds etc ought to be constructed in a way that it does not harm the environment. He also said that Mauryan law had provision in each house for proper sewage and removal of garbage and wastes.<sup>51</sup>

## Conclusion

Thus through the discussions above, it is quite clear that Vedic, Jain, Buddhist and Kautilya's Arthashastra established the principles of sustainability centuries ago.<sup>52</sup>The first principle of the Rio Earth Summit implies that human beings should be centre of sustainable development, but it should always be in concurrence with nature.<sup>53</sup>This very idea has been reflected in the Prithvisuktha which advocates man's close association with ecology and nature. The fourth principle of Rio Earth Summit asserts that environmental protection should be an essential part of development.<sup>54</sup>India has the roots for sustainable development deeply embedded in the ancient texts. The jurisprudence in this area was developed beautifully by our ancient Vedic traditions. When principles of sustainability is ingrained into our way of life it needs no strictures and no penalty to ensure enforceability.

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49 <https://www.cs.colostate.edu/malaiya/ashoka.html> (visited mar 14,2018)

50 Mahabharata, Shanti Parva,s.89,p.194,Id

51 Rajeev Sharma,Naveen Aggarwal and Sandeep Kumar, *Ecological sustainability in India through the ages*, 3International Research Journal of Environment Sciences70-73(January 2014)available at <http://www.isca.in> (visited May 24, 2018)

52 [http://www.iop.or.jp/1020/yamamoto\\_kuwahara.pdf](http://www.iop.or.jp/1020/yamamoto_kuwahara.pdf) (visited May 24, 2018)

53 Rajeev Sharma, Naveen Aggarwal and Sandeep Kumar, *Ecological Sustainability in India through the ages*, International (cited in note 51)

54 Available at [http://en.wikipedia.org/wiki/Earth\\_summit](http://en.wikipedia.org/wiki/Earth_summit) (visited May 24, 2018)



We need not even look beyond our borders nor depend on the international documents for assuring compliance. However it is unfortunate that development activities are being carried out without any concern for the environment. There is need to look back to the past and take some lessons from our forefathers.

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