ആമുഖം

K.N. Harilal

ഭൂമുഖത്തെ ഏറ്റവും പരിസ്ഥിതി പ്രധാനമായ പ്രദേശങ്ങളിൽ ഒന്നാണ് കേരളം. കേരളത്തിന്റെ പരിസ്ഥിതി പ്രാധാന്യം കുടികൊള്ളുന്നത് ഒരേസമയം അത് ഏറെ പരിസ്ഥിതി-സമ്പന്നവും അത്രത്തോളം തന്നെ പരിസ്ഥിതി-ദുർബ്ബലവും ആണെന്നതിലാണ്. വരുംകാല തലമുറകൾക്ക് സമൃദ്ധമായി പുലരാനുള്ളതൊക്കെ പ്രകൃതി നമുക്ക് ഒരു ലോഭവുമില്ലാതെ നൽകിയിട്ടു□്. എന്നാൽ അസൂയാവഹമായ ഈ സമൃദ്ധിയും, വൈവിധ്യവും അലംഭാവത്തിനും, ആർത്തിയ്ക്കും എളളിടപോലും അനുവദിച്ചു നൽകുന്നില്ല എന്ന വിരോധാഭാസവുമു□്: സംസ്ഥാനത്തിന്റെ പരിസ്ഥിതി അത്രമാത്രം സങ്കീർണവും ലോലവും ദുർബ്ബലവുമാണ്. എല്ലാമു□് എന്നാൽ അത്യാർത്തിയെടുത്താൽ ഒന്നും അവശേഷിക്കില്ല എന്നതാണ് അക്ഷരാർത്ഥത്തിൽ കേരളത്തിന്റെ ഭൂപ്രകൃതിയുടെയും, പരിസ്ഥിതിയുടെയും അടിസ്ഥാന സവിശേഷത. തീർച്ചയായും ഇത് ദൈവത്തിന്റെ നാടുതന്നെയാണ്, എന്നാൽ തദനുസരണം ദിവ്യമായി പരിപാലിക്കാനുള്ള ഉയർച്ച ഉ□ായില്ലെങ്കിൽ ചെകുത്താന്റെ നാടായി മാറാൻ ഒട്ടും കാലവിളംബം ഉ□ാവില്ല എന്നതും നിശ്ചയം.

ഭൂപ്രകൃതിയുടെ ഈ സവിശേഷതകൾക്ക് തികച്ചും ഇണങ്ങുന്ന ഒരു ജീവിതവും സംസ്കാരവുമാണ് ഇവിടെ നൂറ്റാ□ുകളായി നിലനിന്നുവന്നത്. പക്ഷെ, സമീപകാലത്തായി പ്രകൃതിയും മനുഷ്യനും തമ്മിലുള്ള ഈ ഇണക്കം സംഭ്രമജനകമാംവിധം വേഗത്തിൽ നമുക്ക് നഷ്ടപ്പെട്ടുകൊ□ിരിക്കുകയാണ്. കഴിഞ്ഞ ഒന്നൊന്നര ദശാബ്ദകാലത്തിനിടയ്ക്ക് കേരളത്തിൽ ഉ□ായ പരിസ്ഥിതിനാശം ഇനി നൂറ്റാ□ുകൾ പിന്നിട്ടാൽപോലും നികത്താൻ കഴിയാത്തത്ര വലുതാണ്. പ്രകൃതിക്കെതിരെ സർവ്വ നശീകരണ ആയുധങ്ങളും ഉപയോഗിച്ചുകൊ□ുള്ള ഒരു യുദ്ധത്തിൽ മനുഷ്യർ ഏർപ്പെട്ടിരിക്കുന്നു എന്ന പ്രതീതിയാണ് കേരളത്തിൽ ഉടനീളം കാണാൻ കഴിയുന്നത്. ജെ.സി.ബികളും, ട്രാക്ടറുകളും, ടിപ്പറുകളും, ട്രക്കുകളും ഇതര ആയുധങ്ങളുമായി വനവും, മരങ്ങളും, വന്യമൃഗങ്ങളും, കുന്നുകളും, പാറക്കൂട്ടങ്ങളും അതിവേഗം ആക്രമിച്ചു തകർപ്പെടുകയും തണ്ണീർത്തടങ്ങളും, വയലുകളും, കൈത്തോടുകളും നികത്തപ്പെടുകയും ചെയ്യുന്നു. പൊതു വിഭവങ്ങളും, സർക്കാർ ഭൂമിയും സ്വകാര്യ വ്യക്തികൾ കൈയ്യേറുന്നു. ഭരണകൂടവും നീതിന്യായ സ്ഥാപനങ്ങളും മരവിച്ചു നിൽക്കുന്നു. പരിസ്ഥിതിനാശത്തിന്റെ തിരിച്ചടികൾക്ക് ഇരയാകുന്നതാകട്ടെ സാധാരണ ജനങ്ങളാണ്. സ്ത്രീകളും, കുട്ടികളും, തൊഴിലാളികളും, കർഷകരും, ദളിതരും, സമൂഹത്തിൽ പിന്നാക്കം നിൽക്കുന്ന ഇതര വിഭാഗങ്ങളുമാണ് പരിസ്ഥിതിനാശത്തിന്റെ ഭാരം ഏറെയും അനുഭവിക്കേ□ിവരുന്നത്. അങ്ങനെ കേരളത്തിൽ, മറ്റു ഏത് പ്രദേശങ്ങളിലും എന്നപോലെ, പരിസ്ഥിതി നാശം സാമൂഹ്യനീതിയുടെ നാശം കൂടിയായി മാറുകയാണ് ചെയ്യുന്നത്.

പരിസ്ഥിതിക്കെതിരായ അതിക്രമത്തിന് ഒരു വികസന പ്രത്യയശാസ്ത്രത്തിന്റെ ഒത്താശ ലഭിക്കുന്നു എന്നതാണ് ഇന്നത്തെ കാലത്തിന്റെ പ്രത്യേകത. കേരളമടക്കം എല്ലാ ഭൂ പ്രദേശങ്ങളും മൂലധനത്തെ പരമാവധി ആകർഷിക്കാൻ മൽസരിക്കേ□തു□ന്നും, ''മൂലധന നിക്ഷേപത്തെ ആകർഷിക്കുക അല്ലെങ്കിൽ നശിക്കുക'' എന്നതാണ് ഈ കാലഘട്ടത്തിന്റെ മുദ്രാവാക്യമെന്നും ഈ പ്രത്യയശാസ്ത്രം പ്രചരിപ്പിക്കുന്നു. മൂലധന താൽപര്യത്തെ വിശുദ്ധ താൽപര്യമായി ഉയർത്തുകയും, മറ്റ് എല്ലാ താൽപര്യങ്ങൾക്കും, മൂല്യങ്ങൾക്കും അതീതമായി പ്രതിഷ്ഠിക്കുകയും ചെയ്യുന്ന നവ-ഉദാരവത്കരണ വികസന പ്രത്യയശാസ്ത്രത്തോടു കേരള പരിസ്ഥിതി സമ്മേളനത്തിന് സന്ധിയില്ല. മൂലധനതാല്പര്യത്തിന് അപ്രമാദിത്വം കല്പിക്കുന്ന വികസനചിന്തയെ ഈ സമ്മേളനം തള്ളിക്കളയുന്നു. മൂലധനവും, നിക്ഷേപവും, നിക്ഷേപകരും നമുക്ക് ആവശ്യമാണ്. പക്ഷെ, പരിസ്ഥിതിനീതിയും, സാമൂഹ്യനീതിയും, അടിസ്ഥാന മൂല്യങ്ങളും സംരക്ഷിക്കാൻ കഴിയാത്ത മൂലധനവും വികസനവും ഈ നാടിന് സ്വീകാര്യമല്ല.

മുൻപ് ജിമ്മിലും, ഇപ്പോൾ എമർജിംഗ് കേരളയിലും നിർദ്ദേശിക്കപ്പെടുന്ന നിക്ഷേപ സംരംഭങ്ങളിൽ ഏറിയ കൂറും കേരളത്തിന്റെ പ്രകൃതിയുടെയും പരിസ്ഥിതിയുടെയും സമ്പന്നതയിൽ ആകൃഷ്ടമായി എത്തുന്നതാണ്. നിയന്ത്രണമില്ലാത്ത ചൂഷണത്തിനു കേരളത്തിന്റെ വാതിലുകൾ തുറന്നിട്ടാൽ ഏത്രവേണമെങ്കിലും മൂലധനം നമുക്കും ആകർഷിക്കാൻ കഴിഞ്ഞേക്കും. പക്ഷെ അങ്ങനെയു□ാകുന്ന വികസനം ഏത്രകാലത്തേക്കു; ആർക്കുവേ□ി എന്ന ചോദ്യം ഉയർത്താതിരിക്കാനാവില്ല. മൂലധനപക്ഷപത്തിന്റെ അവകാശവാദങ്ങളെ വിമർശനബുദ്ധ്യാ തലനാരിഴകീറി പരിശോധിക്കാതിരിക്കാൻ കഴിയില്ല. അതാണ് ലോകത്തിന്റെ സമീപകാല വികസനചരിത്രം- പ്രളയങ്ങളുടെയും, വരൾച്ചകളുടെയും, മരുവൽക്കരണത്തിന്റെയും, കാലാവസ്ഥ വ്യതിയാനത്തിന്റെയും, സസ്യജന്തുജാതികളുടെ വംശനാശത്തിന്റെയും, ഭക്ഷ്യക്ഷാമത്തിന്റെയും, ദാരിദ്ര്യത്തിന്റെയും, മനുഷ്യരുടെ കൂട്ടപ്പാലയനങ്ങളുടെയും അനുഭവങ്ങളിലൂടെ -നമ്മെ പഠിപ്പിച്ചുകൊ□ിരിക്കുന്നത്.

INTRODUCTION

V.S. Vijayan

India has certainly made tremendous growth, economic growth, since independence. If GDP is any indicator, it is enviable; from 3% GDP of 1950 to 9% in 2009. The declared ambition is to make it 10.5% by the end of 12th Plan.

Its manifestations are numerous; number of wealthy people in India has gone up; 1, 53,000 millionaires (those holding one million US dollars; by Indian currency Rs. 5, 55, 00,000/) in 2011 and 48 billionaires (those holding Rs.55000, 00,000/) in 2012. India had only 1 lakh cars in 1950, while it went up to 400 lakhs in 2010. Similarly the number of registered vehicles went up from 3, 06,000 to 11,49,51,000 between the same period. And, it keeps increasing. Most of them give lower mileage per litre.

Awfully palatial residential buildings, even 27 floors for a single family, sky rise residential flats, shopping malls and the like are all yet other manifestations of the same economic growth.

The other side of this glossy India has the largest majority; where 35% of Indians are below poverty line; 49% do not have toilet (they defecate in the open); 21 lakhs children below five years die every year out of *diarrhoea, typhoid, malaria, measles and pneumonia; 1000 children die every year out of diarrhoea alone; 4.26 crores people live in slums; 276 lakhs do not have a house to dwell; farmers commit suicide out of debt – trap, as many as 2,16,500 committed suicide from 1997 to 2009.*

The type of economic policy and the development path that have been followed, disregarding the environmental, ecological and social cost have left indubitable impacts on our natural resources, environment, and human health as indicated below.

Loss and degradation of forests: On the Western Ghats, one of the biodiversity hot-spots in the world, the forests were felled for timber, plantations, agriculture, human settlements, resulting in the fragmentation of the remaining; plantations of various hues replaced natural forests and vegetation; hills razed, buildings rose up, quarries flourished violating all rules and regulations. These and many other resource exploitive anthropogenic activities led to a heavy toll on forest, approximately to the tone of 30 lakh ha resulting in the alarming disruption of the ecology of mountains, loss of biodiversity, substantial soil erosion, heavy sedimentation of reservoirs, quantum fall in water availability in the rivers and other wetland systems and, above all menacing landslides.

Loss of mangrove ecosystems: In spite of being one of the most productive ecosystems of the world, mangrove in Kerala is confined mainly to a few areas in the northern districts. The remaining patches are also facing increasing threats, especially from new industrial and infrastructure development projects including tourism and housing. The impact of this on the

fishing sector is recognized, but inadequately addressed and is a classic example of the need for integrating the sectoral planning process.

Threat to coastal ecosystems: Coastal erosion, pressure from various stakes, especially tourism, pollution from urban areas and high density of population in the coastal area, coupled with lack of basic infrastructure for fishermen families, such as toilets and sewage systems, have made our coastal ecosystem perilously endangered. A serious intervention to remediate, without affecting the habitats and livelihoods of fisher folk, needs to be developed. Also, vital is to improve the marine aquatic wealth with a focus on conservation needs.

Increased sand and clay mining: Mining from the rivers, river banks and paddy lands causes not only unaccountable ecological disaster, but poses a serious challenge to our very food and water security. Attempts to regulate it through the district administration and police have not been able to curb this menace. And, it could never be, unless there is a realization that sand mining is directly related to the much pampered and fostered construction lobby. Along with this, the State is losing precipitously its hills and rocks threatening an ecocatastrophe. Kerala's construction boom may have its economic spin-offs, certainly increases the GDP to many folds, but could destroy its water and food resources irreversibly.

Freshwater and marine fauna: These valuable resources of the highly productive ecosystems of the State face fast depletion on account of habitat loss as well as over-exploitation. The growing pampered export industry, focusing on foreign exchange, often disregards the norms of sustainable harvesting of resources. Compounded by the over-exploitation, is the unabated pollution from agricultural and industrial sources. Reclamation of wetlands is an epidemic, an inviting calamity. The resources of freshwater, coastal and marine fauna are of significance to the livelihood of millions and to boost export; a sustainable and promotional management strategy is required with active participation of the fisher folks.

Conversion of paddy lands: Conversion of paddy fields for cash crops, construction and other so called development activities has made serious erosion in food production in the State. As much as 5.66 lakh ha have been reclaimed since 1975. This, indeed, is alarming, especially when the State requires 40 lakhs tones of rice annually as against the present production of hardly six lakh tones. Worse still is that it affects water availability, as paddy fields essentially serve as water-conserving tanks, replenishing the ground water. Highest priority must, therefore, be given to the protection of paddy fields and revival of paddy cultivation.

Deterioration of the rivers: The Rivers and the river ecosystems in Kerala are deteriorated, on account of sand mining, encroachment, contamination from chemical pesticides and fertilizers from plantations and agricultural lands in the catchments and, effluent and sewage/solid waste from industries, Municipalities and Corporations. A revival and remediation programme for the rivers on a river basin basis involving the local self-governments, self-help groups, schools and colleges has to be taken on a high priority. Appropriate acts and laws may also be needed to protect the river systems and maintain its good health.

Increasing scarcity of water: Water has become one of the most abused resources in Kerala, and there certainly is a growing demand adding further to the inter-State and intra-State conflicts in sharing water. The irony is that the State blessed with 3000 mm of annual

precipitation, 41 rivers running across the full breadth, and numerous wetlands, still faces water scarcity! And, forced to submit to pipe-and-tap supply for drinking water, that too using loan from international sources. We must look into the ground reason for the same which could be the increasing level of contamination, the destruction of wetland ecosystems, and over-exploitation of the remaining water for domestic and industrial uses. The Union Government's proposed policy to consider water as an economic commodity, fixing price and selling through private/private public partnership will only aggravate the situation. Of course, there will be an increase in GDP!

Loss of farmland productivity: This is attributed mainly to intensive modern agriculture practices using chemical fertilizers and pesticides leading to loss of soil health, lack of adequate water when needed, non-availability of good quality seeds and also organic inputs. The high external input demanding practice at the cost of traditional self-supporting system is the root cause.

Alarming rate of air, water and soil contamination: It is a matter of serious concern that tones of chemical fertilizers are being pumped into the agricultural land in the name of increasing productivity and, chemical pesticides, even those banned, are sprayed indiscriminately, again, in the name of protecting the crops from pests. As a result, today, the air that we breathe is contaminated, soil is dead, farmland biodiversity debilitated and disappeared, our food and water contaminated at various levels. Even the soft drinks and bottled water, costing dearly but resorted to for purity, still have the load of contaminants!

Menace of solid waste: Solid waste continues to be a serious issue all across the State, in spite of the various initiatives taken to contain them. Most of the Panchayaths, Municipalities and Corporations face the issue of not being able to manage the solid waste that is being dumped out of homes and establishments. Medical wastes are still worse a problem. Neighbourhoods of the hitherto dumping yards rightly refused to live any further inhaling fowl air with a filthy backyard for supporting the extravagant life style of the effluent city dwellers. The government's attraction for modern centralised, expensive waste management systems offered by corporate bodies as against the totally decentralised, inexpensive systems appears to be the reason. Quite truly, the government's preference would increase the GDP. As a result, many parts of our towns and cities are filthy and fowl smelling and act as breeding ground for epidemics.

Increasing threats from Industrial Pollution: Industrial pollution**,** especially in the industrial estates in Ernakulam (Eloor-Edayar) and Palakkad (Plachimada, Kanjikode), has made life miserable for the local residents, apart from polluting the river Periyar and strangulating its biodiversity. Some of the pollutants found in the environment – soil, river and air - have entered the food chain and some of the worst toxins have been found in food and human blood. Increasing incidence of cancer and several diseases caused by such contamination have been reported from Eloor-Edayar Industrial belt. While remediation is needed in such areas, the State must also formulate policies for the remediation of the distressed people.. Even with the intervention of the Supreme Court, Kerala has not yet been able to stop hazardous wastes and solve the problems caused by them.

Menace from electronic waste: Electronic-waste, produced from IT and electronic industries is becoming a serious issue to be reckoned with. While there is an over-enthusiasm for attracting electronic industries, no serious attempts are being made to deal with wastes emanating from them.

Growth of urbanization: The fast growing urbanization tremendously impacts the urban landscapes and living environment, making it more and more un-inhabitable, especially when urban waste disposal remains as a daunting job as yet. This is now spreading into rural landscapes as well. Apart from numerous ecological problems in the urban area, rapid urbanization indirectly debilitates ecology and life support systems of the rural areas. Essential infrastructural development requires basic building material such as sand and rock, devastating the rivers and wetlands and destroying the already mauled hills and rocks which are all sources of water.

The net result of all the development that have been taken place, focussing mainly on economics, supposed to be reflecting positively on GDP, has its perilous impacts on the very social, secular and democratic society that has been ensured by the Constitution. And, disturbingly noticeable is the peril in human health; recurring contagious diseases, alarmingly increase in life-style diseases, diseases affecting growing child, especially related to mental growth and learning disabilities, rate of occurrence of cancers of almost all types, and the ever increasing number of hospitals and super speciality hospitals, are manifestations of the sublimely poor environment to which our development process has drowned the majority.

The question is should we continue to have the same development pattern resulting mothers to feed their poisnous (contaminated) breast milk to the hand baby? Or, still worse, should we allow a situation where the mother feeds the unborn baby in the womb with poison through her blood?

We certainly opt for a different development paradigm; a paradigm that ensures economic growth revolved on social, environmental, ecological, secular and democratic system. The primary focus of that should be to focus on ensuring all citizens clean air, clean water, clean soil, clean food, a roof to dwell, hygienic living surroundings, basic free medical facilities and education facilities. It is to meet these basic requirements, a **Green Agenda for Kerala** is proposed in the following pages.

What we are presenting is a draft, but this contains enough solutions for the burning environmental issues. A final document after a series of discussions with various stakeholders and experts will be presented shortly.

We hope the political parties both in the government and in opposition would try to integrate these basic requirements in their agenda for the benefit of our own survival and the generations to come.

Emerging Kerala:
Issues for Consideration in Building a Sustainable Society

Background

The sheen of the much publicised "Kerala Development Model" has faded considerably (although we can still claim that the situation is in many ways better than several other states in India) largely on account of successive governments' failure to steer the economy and society in the right direction. Irrespective of whether it is the United (or divided) and Left (or right) Democratic Front Governments, Kerala's economic, social and environmental situation has deteriorated and most of the time people's attention gets misdirected, often intentionally, into non-issues. Whether in power or in opposition, each group indulges in "one-upmanship" and to score points over the other on one or the other issues.

Taking advantage of this messy situation, a powerful informal/ illegal sector has emerged, with strong supporters within the two ruling fronts, systematically exploiting people and resources and amassing wealth with no consideration for rest of the society. Sectors like real estate, sand mining, quarrying, alcohol, etc. are all dominated by such informal/ illegal sectors (or mafias). With pervasive corruption, the entire thrust is to ruthlessly exploit natural resources and labour. Even formal sector initiatives have resorted to this and many increase profitability through informal methods, violating existing labour and environmental regulations.

Instead of emerging as a strong secular democracy, the hold of religion and caste on people's life and governments (which are supposed to be the guardian of secular democracy) has increased and society is much more fragmented than it was one or two decades back. This is particularly so as increasingly political leadership is emerging from small factions whose main interest is to build up their political/ money power base, emphasizing on irrelevant differences. There has been a rapid growth of the informal/ illegal economy affecting all aspects of life. Diversity, which has been and should have been the strength of Kerala polity, is being systematically used to undermine the development of a more progressive sustainable society.

On the economic front the real problems are to some extent concealed/ covered up by the superficial semblance of prosperity stemming from the huge inflow of remittances which account for almost a quarter of the state domestic product. Productivity of most key sectors is extremely low and Kerala has become highly dependent on almost all products. In spite of adequate water supply and fertile land, almost all basic needs goods – rice, vegetables, meat, eggs, etc. – are all imported. Kerala has also become a major market for all consumer

durables, including cars, two wheelers, television sets and air conditioners, almost all of which are produced outside the state. The full productivity potential of Kerala – especially its land and people - is not at all used; but for the flow of remittances, the state would have faced an economic collapse and all the associated societal problems.

On the social front, the gap between the rich and the poor has increased enormously. There are still large segments of population – especially scheduled castes and scheduled tribes - that remained excluded from the development process. Although several programmes and projects aimed to improve their lot have been taken up, the extent of benefits that actually accrue to them is negligible. In most cases what is appropriate to them is decided by outsiders. Leaders from among the marginalised sections use them as their power base and seldom pay much attention to their real needs. In many cases tribal lands have been appropriated and governments have taken a lenient view on such appropriations.

On the environment Kerala's performance is deplorable. Most cities and towns have failed to develop an effective waste management system. There have been significant failures in protecting critical elements of the life support systems, especially soil, water, forests and biodiversity. Despite all the regulations, Kerala is going through a major human driven topographical change with hillocks being levelled and paddy and wetlands being filled with impunity. Public property is ruthlessly appropriated taking advantage of political connections. Almost all rivers and other water bodies are highly polluted. Although there are multitude of rules and regulations to protect environment, their implementation is far from satisfactory. In most cases government departments are the greatest violators of environmental regulations and key departments have not mainstreamed environmental protection into their decisions. Commitment to address human misery caused by pesticides like Endosulfan is very weak and notwithstanding the awareness about the long term problems, there are no systematic efforts to make agriculture pesticide-free.

Emerging Kerala: what it should be and what it should not be?

There is a need to have clarity on what "Emerging Kerala" should be and what it should not be. As regards the latter question, it needs to be made clear that we should not pursue a "hotchpotch" of projects proposed by different investors with very divergent motives/ interests. We have to provide a robust overall framework and all projects should fit into this framework. The main path of development that Kerala has followed hitherto has led to:

a) A very rapid depletion of the natural asset base, including land, water, forests, biodiversity;

b) Failure to use critical assets to the fullest extent and building the economy on very weak foundations of extremely vulnerable remittances and low-income services sector.

c) An unproductive and increasingly corrupt bureaucracy that has failed to deliver the services required by society;

d) A rentier economy under which everyone is keen on exploiting others rather than earning income based on their actual contribution/ productivity.

It is imperative that the "Emerging Kerala" initiative helps us to shift from the above and the main thrust of these should be:

Thrust on improving the livelihood of the poorest

The development framework and the projects proposed should help to significantly enhance the income of those who are marginalised and those who have not benefitted from the development during the last few decades.

Improvement in basic amenities

There should be a qualitative improvement, especially as regards basic amenities with particular focus on provision of clean water, clean environment, improved waste management and environmentally better mobility.

No more depletion of natural capital

There should not be any further depletion of the present stock of natural capital (land, air, water, forests, wetlands, biodiversity, etc.) and there should be systematic efforts to rebuild them. In fact the comparative/ competitive advantage of Kerala is its natural capital and under no circumstances this should be depleted.

Thrust on improving human capital

The greatest, but the most mis-used/mis-directed resource is human capital. Substantial investments should be made to improve the quality of human capital by improving education, skill acquisition, health improvement, and most important public domain R&D. Unfortunately education and health have moved out of public domain and two sub-sectors have emerged in both, one being under-funded, inefficient and inadequate catering to those with limited income and the other over-equipped and costly system that caters to the very high income groups. Within the latter it is possible to see a highly exploitative educational and healthcare system which provides very low quality services at exorbitant costs. Largely this is nothing other than exploitation of the aspirations of people.

Systematic and transparent cost benefit analysis covering economic, social and environmental dimensions

All projects should be subjected to in-depth economic, social and environmental analysis in an open and transparent manner and they are to be approved only if they fully satisfy critical economic, social and environmental considerations. Under no circumstances social and environmental considerations should be diluted to make the proposals appear viable.

No "race to the bottom"

Increasingly there is a competition between states to attract investments and invariably this is done by extending all concessions/ subsidies and relaxing various rules and regulations. Kerala should avoid such a "race to the bottom", especially by diluting the social and environmental rules and regulations. In fact we should focus on investments that could take advantage of the unique social and ecological conditions in Kerala and develop unique niche market products and services.

Reinventing public institutions a must

It is well-known that the greatest stumbling block in Kerala's development is the existing government bureaucracy, which has become a part of the rentier economy and highly inefficient. Kerala's future will largely depend on how effectively this is reinvented to make it more knowledge based, transparent and accountable to the public at large. Some of its earlier strengths of objectivity and impartiality have eroded considerably, an outcome of the overall system deterioration witnessed during the last few decades. Drastic reinvention should cover all institutions including government departments, local administration, education and R&D systems. Every country that has made substantial progress has built highly efficient public institutions and there are no short cuts to this. In the absence of willingness and ability to overhaul the public administration, considerable emphasis is given to dish out undue concessions to investors through the back-door to compensate the inefficiency and rent-seeking behaviour of the public administration. However, this only helps to develop a plutocracy, under which a few are able to get all kinds of concessions, circumventing all the rules and regulations while the majority continues to suffer under the weight of inefficient governance. Almost all departments have become highly top-heavy, absorbing a major chunk of the budget, leaving negligible resources at the field/ operational levels.

Agriculture, Biodiversity and Food security

Food is the basic right of people and ensuring food security is perhaps the greatest challenge facing the world community today. Food Security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life (FAO, 1999). It implies that food security is not just making available some amount of food grains, pulses or vegetables to the people, but it is reaching a complete package of sufficient quantity of food (including food grains, pulses, vegetables, fruits, milk, eggs, meat and other essential food items) to the people to sustain their physical, mental and intellectual health. Food security can be achieved only when people's awareness about food intake, health and wellbeing is thorough. Food security is closely linked with food production and availability; availability is again linked to the purchasing power of people. So any policy to address food security should address both the issues of production and availability.

Food production in Kerala

1. Rice is the staple food for the people of Kerala and food security ffof the State has become synonymous to rice security. As Kerala's population continues to grow steadily, demand for rice also keep growing. Kerala has been characterized as a 'food deficit' State since availability of food in Kerala is below national average. Our State is perhaps, most vulnerable to any short-term or long-term food grain deficit at the national level. The extent of this deficit has increased over time, increasing the State's vulnerability to food insecurity in the event of a shortage or crisis at the national level.

2. T*he Expert Committee on Paddy Cultivation in Kerala*, headed by Dr. Syamasundaran Nair (Govt of Kerala, 1999) had suggested in their report that "Food self-sufficiency for Kerala, in the sense of the state's ability to produce all the food items to meet its requirements, is not an economically feasible one. (This is especially true for its requirement of rice). Therefore the policy of the state should be redefined in terms of *achieving food security rather than food self-sufficiency*. The Committee recommended that the aim should be to *reduce the gap between demand and supply from the existing 75% to 50 per cent within a period of ten years.*

3. To achieve the above, the Committee recommended the following: "The broad strategy to achieve this objective should be to increase (i) the total productivity, and (ii) the cropping intensity on paddy lands. Productivity per hectare of land should be increased from the present state average of 2,000 to 3,500 kg rice. Cropping intensity, defined as the ratio of gross cropped area to net area, should be increased from the current level of 1.5 to 2.0. If a net area of 3.00 lakh hectares (which is less than the original wetland area of 5.74 lakh hectares as per the Basic Tax Register and 3.33 lakh

ha utilised for paddy cultivation during 1992-93) can be retained for rice cultivation with a cropping intensity of 2.0, it will have the potential for a gross cropped area of 6 lakh hectares. With a yield rate of around 3,500 kg of rice (5,250 kg of paddy) per hectare, this will ensure a total production of 21 lakh tonnes of rice, i.e. *50 per cent of the projected requirement in 2010*."

4. Even after a decade the of this report, Kerala presents a grim picture, with the gap between production and requirement of food grain widening every year. The population of Kerala on July 20th 2012 is approximately 33,497,436. (extrapolated from a population of 31,948,619 in 2001 and a population of 33,387,677 on October 1st 2011). To feed a population of 3.35 crores, Kerala has to produce approximately 40 lakh tons of rice every year at the minimum per capita rice availability of 320 g , while the actual production is only around 5.22 lakh tones; less than 1/6th of the requirement. In other words, 85% of the rice required for Kerala comes from neighboring states. The steeping increase in food prices indicates the State's large dependence on other states. Therefore, there is an urgent need to put in place an efficient mechanism to face the imminent food crisis.

5. The inevitable question whether it is possible for the people to survive on food brought in from outside? May be possible for a short period, but not permanently. Our option should be to produce the maximum in our own State which will be possible only when the role of agriculture in development is realized by all; a realisation of paradigm shift in the role of agriculture in development, self-reliance and food security, poverty and inequality. Rice related policies need to take into account the possible impacts - positive and negative – especially on those who depend on rice as a source of food as well as income. While keeping the prices low for rice remains in the best interests of poverty reduction, it hurts poor rice growers in rural areas where the size of land holdings is small and rice farming is the main source of livelihood to the family. Hence, increasing rice production while keeping the production costs low should be the first step in ensuring food security

Extension of the area of rice cultivation

6. Among the strategies for increasing rice production in the State, expansion of the very land for cultivation is the most essential vital step. Kerala could ill afford to any more conversion of paddy lands, ecologically or economically. *The demand for land for various purposes has to be assessed giving top priority for food production as well as protection of water sources, and a firm policy decision has to be taken accordingly. All uses of land other than food and water are certainly secondary.* The ecosystem services provided by the rice systems also needs to be recognized and intensive efforts taken to bring back all the fallow land under cultivation. As per the land use pattern in Kerala during 2010-11(Table.1), the State has a total of 1,27,971 ha of fallow lands (Current fallow+ Fallow other than Current fallow) and another 91,665 ha as cultivable waste.

Table. 1. Land Use Pattern in Kerala during 2010-11

Sl. No	Classification of Land	Area in ha
1	Total Geographical Area	38,86,287
2	Land put to non-agricultural uses	3,84,174
3	Barren and uncultivated land	19,573
4	Cultivable waste	91,665
5	Fallow other than current fallow	51,943
6	Current fallow	76,028
7	Net area sown	20,71,507
8	Area sown more than once	5,75,954
9	Total Cropped area	26,47,461
10	Cropping intensity	128

Source: Economic Review 2011

7. It will be in the interest of the State that the Government put all efforts to bring maximum possible fallow lands and cultivable waste back to cultivation by providing institutional support for developing the required infrastructural facilities and by promoting lease land cultivation (through collective farming),wherever owners of paddy lands are unable to continue rice farming. There is a need to continue the support for a minimum period of three years to stabilize production from such reclaimed areas.

Upland rice

8. Upland rice cultivation called ‘karanellu krishi’ during Kharif is another option for horizontal expansion of area under rice. The experience during 2010-11 on upland cultivation was not much rewarding, but with careful selection of area, appropriate varieties and technologies this can be improved many times. Possibility of expansion of area through increasing crop intensity in areas where irrigation facilities are available may also be exploited.

9. Karanellu krishi can also contribute to the fodder needs of farmers. When the State plans to develop the animal husbandry and milk production in the underutilized uplands, kanellu can be a good source of fodder and make cattle rearing more economical and sustainable. Wherever possible inter cropping of karanellu or maize should be encouraged even in the coconut gardens.

Productivity enhancement

10. Apart from expansion of cultivable area, much of the additional food demand in the future will have to be met through productivity enhancement. Variation in the productivity status of the rice growing areas in the State is very high. The average productivity of irrigated rice in Eastern Palakkad, Kuttanad and Kole is above 4.50 t/ ha, while that of the rain-fed shallow lowlands of locations in Onattukara and Kozhikkode is less than 2.0 ton/ha. Based on productivity levels, the rice growing regions of the State can be classified into different categories or groups as shown below .

    a. High productivity - Yield more than 4,500 Kg/ha
    b. Medium productivity - Yield in between 3,500-4,500 Kg/hare
    c. Medium-Low productivity - Yield in between 2,500-3,500 Kg/ha
    d. Low productivity - Yield in between 2,000-2,500 Kg/ha
    e. Very Low productivity - Yield less than 2,000 Kg/ha

11. It is necessary to carry out a rice productivity analysis of the State at the districts level/ ecosystem level to identify the production constraints in different areas and regions in order to formulate separate packages for increasing productivity in each of the region. System productivity need to be encouraged to attain maximum production per unit area. and, Integrated Farming Systems, involving fish/ duck/poultry/cattle / horticultural crops along with rice farming needs to be encouraged .Another approach to improve productivity is by improving the infrastructural facilities of the different regions and by ensuring timely availability of inputs. Maximum productivity can be achieved by developing appropriate irrigation facilities for double cropping in lowland areas. This is especially relevant in the districts of Palakkad, Malappuram and Wayanad , where high productivity of Rabi/ Summer rice can be achieved by creating or rejuvenating water sources and providing irrigation facilities. Timely availability of inputs, namely quality seeds, organic sources of nutrients of assured quality, implements and machines necessary for rice cultivation starting from sowing to post harvest management may be ensured for increasing the production of rice in the State. Water conservation measures and drought proofing; cultivation of green manure crops and pulses also can improve the productivity. During the summer months it is good to encourage cultivation of pulses or millets or oil seeds to improve the farm productivity.

12. Rice production in Kerala is threatened by several factors, both external and internal. There is a steady decline in our natural resources namely land, water and biodiversity

which are essential for sustained production. Resource flow to agriculture sector is declining leading to increased indebtedness of small and marginal farm families; increasing input costs such as declining factor productivity and finally technology fatigue and weakened extension services, have further aggravated the problem. *The major challenge facing the State is to satisfy people's rights to food security and, at the same time, ensure that the natural resource base remains productive sustainably.* There is need for greater investment in research and extension and participatory extension systems involving farmer organizations to improve productivity.

Strategies

a) **Protect existing paddy lands:** Arrest further conversion of paddy lands: Implement the Kerala Conservation of Paddy Land and Wetland Act, 2008, in its true spirit. The value of paddy wetlands should be brought back to the State through appropriate public campaigns and education institutions.

b) **Expand the available area for cultivation through fallow land cultivation and reclamation of cultivable waste:**

c) **Provide institutional support for fallow land cultivation** and continue the support for a minimum of three years for stabilizing production in the reclaimed lands.

d) **Promote Collective farming (not Contract farming):** Ensure women participation in rice cultivation through involvement of farming collectives like Kudumbasree.

e) **Promote upland cultivation in feasible areas:** Invest on research on upland rice for selection of suitable areas, appropriate varieties and technologies and link it with animal Husbandry

f) **Increase crop intensity** in areas where irrigation facilities are available. The current cropping intensity of 1.28 may be enhanced to 2.0.

g) **Assure labour supply** through labour banks and food security armies

h) **Mechanisation of rice farming operations** ensuring supply of necessary machines and trained personnel and guaranteed service systems.

i) **Conduct productivity analysis of the State** and formulate location specific technology packages.

j) **Improve the infrastructural facilities** of the different regions and ensure timely availability of inputs such as quality seeds ,,, quality manures, implements and machines

k) **Promote system productivity:** Encourage Integrated Farming Systems iwith fish/ duck / poultry / cattle / horticultural crops along with rice farming.

l) **Assure paddy procurement** in all Districts and settle the cash to farmers immediately. Wherever possible build storage and processing facilities to produce value added and nutritious products with producer companies, SHGs and other similar groups

m) **Enhanced Production bonus linked to actual production:** An amount of Rs. 2,000/-(minimum) may be fixed for every 1 ton grain produced
n) **Convergence of subsidies and revision of subsidy norms:** All subsidies to be converged to an amount of Rs. 15,000/- per ha and **s**ubsidy norms may be revised taking into account the regional specificities
o) **Crop Insurance for unprecedented crop loss:** Crop insurance may be decided based on the stage of crop and expected returns from the crop
p) **Greater investment in research and extension** is needed to fight the *technology fatigue* now experienced in the field of agriculture and to make it ecologically and economically sustainable.
q) Paddy farmers should be supported for the ecosystems services which is provided by the cultivation of paddy and other annual crops and, for not converting paddy lands

. **Kudumbasree and food security - the potential**

Collective farming by Kudumbasree is a shining example of how food security can be ensured through participation of women in agriculture, and in particular, to ensure that women, as producers, have control over the production, distribution and consumption of food. During the financial year 2010-11, a total area of 39,033.64 ha was cultivated by Kudumbasree women by forming farming collectives. Various crops including paddy (13017.94 ha), and vegetables such as -bittergourd, snake gourd, cowpea, bottle gourd, ridge gourd, little gourd, bhindi, amaranthus, brinjal, chilli, cucumber, water melon etc. (4501.55 ha.) and other crops- banana, tapioca, pineapple, ginger, medicinal plants, and betel vine (21,514.16 ha) were cultivated by the SHGs. As the Kudumbashree experience highlights, food security, in particular socially inclusive food security, cannot happen without real empowerment of food producers and food-producing communities and more such farming collectives can be invited to participate in the efforts of the government in achieving food security for the State.

It is now realized that women SHGs all over India has a great potential in achieving food security of the families, communities and even the State given the necessary policy and financial support. There is also a great opportunity lying ahead in terms of accessing financial support from the Central Government through National Rural Livelihood Mission to develop sustainable agriculture and thus increase the production of safe and nutritious food in the state. In the 12^{th} plan, central government has earmarked 80,000 crores for sustainable agriculture.

However, one major problem facing the effort of Kudumbashree is the uncertainty in terms of getting the land on a long term basis . Majority of them are cultivating on leased land. So there should be a guarantee that they will get the land for a long term lease so that they can plan for developing sustainable agriculture thereby ensuring both food security and livelihood security.

VFPCK and vegetable production

Most of the commercial production of vegetables are undertaken by farmers registered with VFPCK now . This group is the main producers of vegetables and banana in the state. A large percentage of this community is again cultivating on leased land and for them land is an issue. They mainly depend on paddy lands because of availability of water, fertile soil and high productivity of paddy wetlands. It also shows how important paddy lands are for the state in terms of assuring food security and livelihood security sustainably.

Focus on crops other than paddy to ensure food security

Over the past several years, the Net Cultivated Area in Kerala remains almost the same or perhaps show a marginal decline from 21.91 lakh ha to 20.78 lakh ha. The drastic shift towards the cultivation of nonfood crops has seriously impacted the food production scenario. *The food crops (food grain, pulses, tapioca, vegetables) which occupied nearly slightly less than 50% of Gross Cultivated Area, presently constitute only15%.*

The food grains other than paddy (ragi,chama-little millet)which were once cultivated in rice fallows or upland have mostly disappeared from the agricultural land use of present days. The area under pulses such as green gram, black gram, horse gram, grain cowpea (more than 10,000 ha) has come down drastically in the last 10-15 years. Currently it is cultivated only in 3,823 ha. Sesame once, a major crop in rice fallows (11953 ha in 1961-‘62) is cultivated in just 600 ha presently. The large diversity in vegetables (tubers/leafy vegetables) has narrowed down to a few, due to changes in the cropping pattern as well as other land use changes. The market dependence of food also resulted in a drastic change in the food culture and a great loss related to its knowledge. The vegetable production, despite all efforts through promotion of commercial cultivation, could meet only 13 % of our requirement.

The livestock sector

As a reflection of the complementarity of food grain production and livestock rearing, the data on livestock population in Kerala also shows a declining trend. From 1987 to 2010, the cattle population has nearly halved and buffaloes almost disappeared. According to 1966 census, cattle population in Kerala was 28.57 lakhs, and their number reached a peak with 34.24 lakhs in 1987. This number was almost maintained in 1996 too (33.96 lakhs). However, from then onwards there is a steep fall in the number of cattle, and in 2007, it was 17.4 lakhs. Another point of concern is buffalo population, which was 4.71 lakhs in 1966, which declined to 0.58 lakhs in 2007.The goat population is 17.29 lakhs.

The demand for milk has also gone up in the last two decades. Total milk production in the State which was 24.20 lakh tonnes in 2003 declined to 21.11 lakh tonnes in 2004 and then began to increase in the subsequent years. It went up to 25.37 lakh tonnes in 2009-10 and to 26.43 lakh tonnes in 2010-11. Even then the gap between requirement and production continues to remain unfavourable.

Similar is the case of eggs. The gap between the production and requirement of egg is also increasing at an alarming rate. Concerted efforts of the State to increase the egg production have begun to show signs of improvement. Egg production which was 1379 Million Nos in 2007-08 increased to 1633 M. Nos in 2009-10 and to 1685.6 M.Nos in 2010-11; an increase of

3.22 percent over the previous year. Though meat production is increasing over the years, it cannot cater to the demand fully. Poultry meat production increased from 15,482 tonnes in 2009-10 to 16,153 tonnes in 2010-11 and meat other than poultry meat from 1,02,026 tonnes in 2009-10 to 1,08,398 tonnes in 2010-11 registering an increase of 4.33 percent and 6.24 percent respectively over the previous year.

Poultry farming for egg production relaying on purchased feed are uneconomic in Kerala. Learning from our experience it can be seen that the backyard poultry farming as a suitable model for average Kerala house hold, to ensure household food security.

The demand for fish and fishery products is increasing both in domestic and export market. Kerala with its long coastal line and inland water bodies were known for its fisheris wealth. Fish constituted the major source of protein for the people and fisheries a major source of employment for the coastal population. Fisheries sector contribute for 3% of the GSDP.

Marine fish production during 2010-11 was 5.6 lakh tones , showing a decline of 0.10 lakh tones over the previous year. Among 300 different varieties of fish in our coast, nearly 40 only are commercially important. Oil sardine, the most widely consumed variety, especially by the poor, shows a continuous decline. Though the marine fish production show a decline, the catch from inland fisheries exhibits an increase, over the years. It is reported as 1.21 lakh tons (70 edible species).Thus the total fish production being 6.81 lakh tones(2010-2011). But a good portion of marine fish is exported, thus keeping the gap between domestic requirement and production still wide. The changes in the agriculture practices with use of more chemicals , monoculture of selected crops, filling of wetlands and paddy lands, sand mining and the prevention of free flow of water carrying nutrient rich silt from the Ghats to the sea due to construction of dams, have all contributed to the decline in fish diversity .

Thus, over the years, the gap between requirement and production has been widening in the case of all most all food products in Kerala.

Biodiversity and food basket

The homesteads of Kerala were often explained as centers of tropical biodiversity similar to tropical forest ecosystem and one of the most productive unit of land. The social, demographic and economic forces lead to the subdivision and fragmentation of these systems and the loss of biodiversity. The dependence on homesteads for food almost ceased to exist and the development pressures resulted in the conversion of these productive systems to the status of mere settlement systems. The perennial fruit trees, (jack, mango, papaya, rose apple) and large number of horticultural species were the source of food for people. The breakup of home garden structure and the sharp fall in biodiversity has severely impacted the food security, which perhaps may not get reflected through the market based indicators.

One of the classical examples is the conversion of homesteads to rubber monocultures. There is no clear data about the loss of edible biodiversity from such fields , but discussion with old women highlights that their food basket has shrunken and it has impacted their food security as well as nutritional security. Studies done in Wayanad district have shown that even now the indigenous communities in Wayanad consume more than 100 species of uncultivated plants

and majority of them are grown in the paddy lands and coffee plantations. And these are seasonal foods also.

A major threat to this edible biodiversity in the last 10 years has been the discriminate use of weedicides. In the last 3-4 years MNREGS also contributes to the destruction of this biodiversity in some parts of the State.

Kerala has a substantial potential to revive this food basket without much financial burden. With some changes in the policies towards supporting mixed cropping systems, home stead biodiversity, protecting paddy lands and hillocks, and through banning the use of weedicides this can be achieved.

Food safety

The qualitative aspects of food and water are being debated in the public, much more seriously than ever before. The chemical and biological contaminants in food and drinking water hase emerged as a serious concern. The agricultural production practices , handling and processing technologies currently being followed and, the large scale dependence on market for food and water are the major contributing factors. T Residue analysis in samples of food articles drawn from the markets is most worrisome. There are media reports and independent studies show that vegetables including curry leaves are soaked in highly toxic pesticide cocktails after harvest in Tamilandu before it is transported to Kerala.

Kerala must launch a massive project to launch local production, storage, processing , marketing and consumption of fruits and vegetables before it becomes too late. The fallow lands, cultivated paddy lands, underutilized coconut gardens, and homesteads can be put for production of tubers, vegetables, pulses and different kinds of fruits . Unless land is utilized for cultivation, it it becomes a commodity in the hands of land sharks, a situation s already critical in Kerala. This is also important in the context of climate change and the price rise , globally and locally. Reducing the food miles is gaining popularity even in the developed world and Kerala can show a model in this regard.

Kerala should have the wisdom to decide whether the limited land available in the State should be used maximally for food production or other urban related unsustainable development which, of late, invariably involves real estate development.

Cultural Habits

Food is part of the culture of any population. The dependence on own /local sources and traditional cooking habits decide the cultural aspects of food. The changing pattern of food habits as reflected in the NSSO data, highlights the higher investments in processed foods and nutritional foods. However, the fast foods on which the younger generation are more dependent, are considered to be less nutritive and, often not good for health, and hence not advised by experts.

Strategies

Policy Support

Ensuring income from farming (model for pilot testing): The agricultural income in Kerala state is reported as Rs. 16,110.59 crores (2010-11 quick estimate) which is less by 0.78% than the previous year. Over the past ten years, the income remains almost stagnant around Rs.16 666 (is it in crores (in real terms) with a variability of 4%.

The sustained interest and involvement in farming can be made only through an assured and decent returns from the activity. The absolute and relative profitability of food production decide the level of acceptability and practice by the society. Policy support to sustain a decent income for the farm households which accommodates production risks and price risks can be a better method to achieve this goal. The farmer households should be given a protective mechanism to ensure the average farm income based on the area under farming, cropping pattern and productivity in the farm/region. Better yield realization, thus would lead .to better farm income. The price may be adjusted to ensure an income to be corrected in accordance with the CPI, so that the purchasing power is sustained. The programme warrants realistic data base on farmers, cropping pattern, farming practices, market behavior etc. The present exercise on registration of farmers can form the basis of this.

Increasing public capital Investment in agriculture

In natural resource conservation (soil and water conservation), mechanization and and post-harvest handling (transportation, cold storages, scientific storag, processing)

The present system of post-harvest management is monopolized by the middlemen who take away major share of the consumer rupee without corresponding value addition to the produce. Inadequate storage, transportation and handling and processing facilities add to the misery of the producers and agencies who procure the produce. It is suggested to build up decentralized small capacity scientific storage (including cold storage) structures for storing the produce within the locality and process it and, as far as market it within the shortest distance reducing the food miles. The role of SHGs a/cooperatives and native entrepreneurs is to be ensured in this sector.

Policy support for buildup of social institutions (labour banks, food security Army) to address the issue of labour scarcity

Legal interventions and good governance for its implementation (eg. Kerala Paddy and Wetlands Conservation Act)

Consumer Awareness

Kerala state is considered as a consumer state with highest MPCE. The civic responsibilities of the people are to be improved through constant awareness creation for promoting the use of indigenously produced food materials. The recent issues on food safety perhaps create a favourable setting for this. Thus there can be rural linkages in production and consumption (farmers--SHGs--hospitals/school noon meal programme/government official programme) etc.

Changes needed in the approach to monoculture

Kerala, since its formation have seen an unscientific and drastic expansion of monoculture plantations such as rubber, pepper, cocoa, arecanut , cardamom and , spices. Agriculture development in the state has always been and continue to depend on the global market and its shares. It has had both positive and negative impacts on the economy, but the impact on the environment has always been negative, especially in terms of soil erosion, loss of soil fertility, loss of biodiversity, loss of food security, and water flow. In the recent years the economical impact has been so severe, that it also led to farmer suicides in the State. While this is the reality, the intervention in this sector was poor and hence farming practices and land use have become more destructive. Un controlled expansion of rubber plantations, intensive chemical applications in the cultivation of crops such as banana, pine apple, and cardamom are quite disturbing. Since most of these crops come under different commodity boards, State do not have a direct control over them. Hence, adequate policy support as well as financial support from the central government is necessary to make this agriculture safe and sustainable.

Strategies needed in the overall agriculture development in the state

1. ***Agriculture development programmes shall be implemented without damaging the landscape ecology and environment***

1.1 Agriculture planning and development shall be based on watershed.

1.2 A time bound implementation of the Organic Farming Policy, five years for food crops and 10 years for cash crops, shall be implemented.

1.3 Farmers should be paid "conversion costs" for switching over to organic and thus protecting the soil and environment.

1.4 Locally specific technologies and practices shall be adopted for soil and water conservation.

1.5 Soil conservation measures should form an essential part of the annual LSG level planning and, it should focus on prevention of soil erosion and enrichment of soil.

1.6 Discourage water guzzling crops and varieties of crops in the plantations and commercial farms

Increase productivity of land under plantations

1.7 More than the quantity of produce, Kerala should focus on quality and markets related to safe organic products.

1.8 Plantations seeking alternate crop other than the permitted one shall be allowed, provided such land use would be ecologically more sustainable and that it does not violate the provisions of the Land Reforms Act, 1963 and the provisions of the present land use policy

1.9 If any change is permitted amending the provisions of the Land Reforms Act, 1963 by the Government, for trying alternate crops, such plantations should run exclusively by a

single unit as a registered company in which the workers and the Government should have a decisive say.

1.10 Plantations allegedly running at a loss shall be assessed and the reason for the same determined by a Committee of Experts constituted by the Government.

1.11 In the case of plantations in leased areas, if the lessee is unwilling to take up remedial measures as suggested by the Committee of Experts, the Government may cancel the lease and make alternative arrangements to run the plantations.

1.12 The Committee of Experts shall also examine the efforts taken on soil conservation and ecological sustainability; ecological fragility and proximity of the plantation to the forests; all records related to the area given under lease, whether any area from the leased land is sold or pledged, whether any adjoining land is annexed, or any portion of the land leased out is encroached by any, and violation of any of the lease conditions.

1.13 The Committee of Experts shall then clearly recommend whether the lease shall be extended or terminated with proper legal, technical and social justifications. In case of extensions, fresh terms and conditions and, in case of termination, management strategies for the same shall also be suggested.

1.14 In no case shall the lease be extended, if terms and conditions of the lease are violated by the lessee; the Government may cancel the lease and take over such plantations and run on alternative arrangements.

1.15 Land holding without legally valid ownership by private parties, namely plantations, institutions and, individuals should be confiscated and vested with the Land Bank to be set up by the Revenue department.

1.16 Government owned plantations such as Plantation Corporation of Kerala, Kerala State Farming Corporation and Kerala Forest Development Corporation shall provide models in terms of soil conservation work, as well as improving diversity of trees and crops. A definite percentage of their land shall be kept apart for food production and medicinal plants, both to be done organically.

1.17 The land owned by the Government Institutions, Corporations, Universities, including Agriculture University and the land under its Extension Training Centres, which are not being used or underutilised for farming or without discernable vegetation, shall be utilised for food crops with the involvement of SHGs and landless farmers. Arrangement shall be made wherever needed to give the land to a group/ collective of landless farmers/SHGs on a long-term basis for 5–10years.

Diversify food crops to meet the food requirements.

1.18 Encourage mixed cropping, integrated farming and crop rotation.

1.19 The present approach of crop based agriculture shall be changed to farm based, to accommodate more diversity and to increase overall productivity**.**

Promote homestead farming as part of land use strategy

1.20 Every single homestead should be encouraged to grow pulses, tubers, leafy vegetables, edible fruit bearing trees and, medicinal plants, including cultivation of paddy/ millets like ragi, suitable to the land.

1.21 Krishi Bhavans shall develop model homesteads (individual or cluster as the case may be) in each ward of the Panchayat and use the same for training and also planning similar schemes for the Panchayath.

1.22 LSGs shall accord high priority to organize neighbourhood associations of homestead farmers which would enable them to consult each other and undertake work related to biodiversity enrichment, soil conservation, and construction activities without affecting natural water flows and soil regimes of the adjoining area, and also for construction of retention walls, bunds and water holes which are of common benefit.

Ensure that farming is a respectable and profitable enterprise so that the farm land will not be altered.

1.23 Provide farmers with adequate compensation and remuneration for not converting the land into any other purpose and committing themselves to farming in spite of all the nature-born uncertainties involved in it.

1.24 Suitable schemes shall be introduced to ensure availability of labour, implements required for farming in the absence of labour, appropriate seeds, and manure in time and, put in place a system of marketing assuring maximum profit to the farmers.

Launch a massive campaign called "Land for food" to create awareness on land use and food security

1.25 Publish campaign material focusing on food production of various crops in Kerala, the present population and food shortage, the predicted population and the future need and, the need for sustainable land use to increase food production. Such material shall be made available to all officers of the Government departments, people's representatives, LSGs, schools and colleges.

1.26 Notify and widely publish through visual and print media the Government's initiatives for food security.

1.27 Summary of the programmes shall be posted on the web site of line departments; link shall be given to the web site of LSGs for detailed information and progress of the projects.

1.28 The existing schemes such as MNREGS may be dovetailed to "land for food" campaign and programmes.

1.29 Launch a State-wide programme, including farming in the school campuses by the Education Department to instill love for farming among the children.

1.30 Where land is not available in a given school, attempts shall be made to use the nearest unused land with the consent of the owner.

1.31 The Government shall encourage NGOs, community based organizations and education institutions of the State to take up "land for food" campaigns

Conservation of wetlands and paddy lands

Wetlands, although one of the most productive ecosystems in the world, as they contribute 45% (US$ 15 trillion) of the US $ 33 trillion global average ecosystem services (Costanza, 1997), are often referred to as 'waste lands", "waterlogged area" or "unclassified area". This miss concept often has led to the conversion of wetlands for various purposes. The values of wetlands can be broadly classified into four.

Provisioning services are tangible or direct benefits which *inter alia* include production of food such as fish, paddy, fruits, rhizomes; water supply - storage of water for domestic, industrial and agriculture purposes; providing fibre, fuel wood, and fodder; supply of plants with various medicinal properties; genetic material for a variety of uses.

Regulatory services are Intangible or indirect benefits such as climate regulation, especially local climate and serve as sink for greenhouse gases; water regulation, determining ground water level: their discharge and recharge; minimizing the impact of natural hazards such as flood and storm; erosion control, soil formation, and, water purification and waste treatment.

Habitat services such as providing habitats for flora and fauna, nutrient cycling, seed dispersal, primary production

Cultural values include spiritual needs of some people and, recreational, aesthetic and educational facilities.

Annual Monitory values of these services offered by the Inland Wetlands are Rs. 22,24,350/ha; and by the coastal wetlands Rs. 1,07,67,450/ha (TEEB, TEEB, The Economics of Ecosystems and Biodiversity - a study hosted by the United Nations Environment Programme as part of the UN Millennium Wetland Ecosystem Assessment)

Accordingly, the ecosystem services that the State is getting annually from the wetlands are worth Rs. 1, 22,868 crores. In other words, if we just maintain the wetlands and paddy fields that we have currently in the State (1, 60,590 ha and 2, 34,000 ha respectively) we get the services worth Rs. 1, 22,868 crores. And, remember, that we get this every year. It may be noted, these values are average of the wetland values from different countries. Since our wetlands are much more complex, the value will be at least 2 – 3 times more, i.e. Rs.2, 45,736 – 3, 68,604 crores!

It may be noted that the Annual Receipt of 2012 – 2013 as projected in the State Budget is Rs 68,923. 92 crore (including Revenue and Capital Receipt) which is almost half the receipt from the wetland ecosystems; Rs. 1, 22,808 crore every year.

The pertinent point that should be considered is that our budget requirement would have gone up many times, had there been no wetlands and paddy fields in the State. Because no farming

is possible without water and, there cannot be water without wetlands. No industries can match the services being rendered by the wetlands and other ecosystems.

No development can sustain without resources, prominent among them in most cases is water and, the very source of water is nothing but wetlands which include all water bodies on the land, such as rivers, streams, rivulets, lakes, tanks, ponds. They collect, retain and supply water for our needs

Quite blissful of all these benefits that the wetlands offer, they have become the first casualty for every so called 'development" project; from bus stands, marketing malls, IT industries, commercial flats , villas, convention halls, and even for liquor shops.

Wetland loss

We have been losing such a precious resource at a rapid pace. In 2004, the State had around 3, 28,402 ha; currently it has gone down to 1, 60,590 ha. The loss is 49%; 1, 67,812 ha; that too within 7 years. According to another estimate the loss is 31%; i.e. 71,681 ha within the same period. The Sálim Ali Foundation is currently re-examining the figures to find out the actual loss. It could be reasonably between 30 to 50%. In any case it is alarming. Further erosion should not be allowed at any rate.

Loss of paddy fields, although fully aware of its impacts on food security, is dangerously alarming; from 8 lakh ha in 1975 to 2.34 lakh ha in 2012. A loss of 29 %, i.e.; 5, 66,000 ha within 33 years!

It is paradoxical that instead of restoring these wetlands and paddy lands, the government is proposing to regularise all the illegal reclamation and occupation. The priority for any Government should be to restore and expand the paddy lands as the State's annual production of rice is hardly 6 lakhs tonnes only, when its requirement is 40 lakhs.

Actions to be taken

Paddy lands

1. Restore paddy areas converted to other agricultural practices.

1.1 Assess the total paddy land in the State, cultivated, temporarily converted, and uncultivated for the last ten years and, since the Kerala Conservation of Wetlands and Paddy Lands Act, 2008 came into effect, using remote sensing data and field verification by a joint team of Revenue and Agricultural Departments with representatives of civil societies.

1.2 Reconvert paddy lands already converted into rubber, banana, tapioca (total area works out to be around 22,029 ha). Conversion charges for the same are to be fixed considering the income from the converted crop. Those who are not converting will be ineligible for

government supports such as subsidies and crop insurance and further, they would be liable for progressive increase in land taxes.

1.3 There shall be a total ban on growing intercrops such as banana and tapioca in the paddy land.

1.4 Paddy lands reclaimed for mixed crop (around 21,790 ha) shall be assessed separately and reconverted into paddy paying appropriate conversion charges.

1.5 Paddy lands reclaimed for coconut (36,611ha) and areca (13,185 ha) may be assessed and based on their yield, decision taken to retain them as such or convert them into paddy lands.

1.6 Paddy lands uncultivated for the last two years may be taken over by the Local Self Government and directly cultivated or given on lease to landless neighbouring farmers, Kudumbashrees, Padasekhara Samithies or educational institutions following the norms prescribed in the Kerala Conservation of Paddy land and Wetlands Act, 2008.

1.7 The Paddy Mission should be empowered to take up necessary work for ensuring paddy cultivation and for acquiring uncultivated paddy land into a Land Bank operated at the LSG level. Such land may also be given to landless farmers, Kudumbashrees, Padasekhara Samithies or educational institutions for farming with clear target.

1.8 An Emergency Action Force for paddy protection shall be constituted at the State-level, and if necessary at district levels, (Revenue, Agriculture and Police Department along with members of environmental groups working on such issues) to respond to complaints of paddy land reclamation and conversion and, any violation of the Kerala Conservation of Paddy land and Wetland Act, 2008. The Action Force shall respond to such complaints within 24 hours and shall be empowered to stop and take action against such reclamation, including restoration. Such actions should be taken within a reasonable time frame.

1.9 Wastelands and fallow lands under the ownership of private, Government, public establishments or under any other agencies shall be taken over by the LSG and directly cultivated or given on lease to landless neighbouring farmers, Kudumbashrees, and Padasekhara Samithies following the norms prescribed in the Kerala Conservation of Paddy land and Wetlands Act, 2008.

1.10 In the case of fallow land for which owners could not be traced out for issuing notices, "affixing procedure" being followed by Department of Revenue shall be adopted.

2. Conserve the present paddy lands and those to be restored

2.1 No conversion or reclamation of paddy lands for any other land use shall be permitted.

2.2 In the case of owners of paddy land who do not possess own house for his/her own dwelling, they shall be provided 5 cents of alternate garden lands for construction of houses.

2.3 District level Authorised Committee under the Kerala Conservation of Paddy land and Wetlands Act, 2008 shall prepare a list of farmers who possess only paddy lands but do not possess any house. Such list shall be prepared with the help of Local level Monitoring Committee within six months and, those paddy farmers who do not possess any house for own dwelling shall be allotted five cents of garden lands for building the same.

2.4 The provision for 5/10 cents of paddy lands for houses given in the Kerala Conservation of Paddy land and Wetlands Act, 2008 shall be repealed accordingly.

The provision given for reclamation for "Public Purpose" in the Act may also be repealed, as the definition given in the Act covers almost everything as "public purpose" (the current definition in the Act is: *"public purpose" means purposes for the schemes undertaken or financed by the Centre- State Governments, Government-Quasi-Government Institutions, Local Self Government Institutions, Statutory Bodies and other schemes as may be specified by the Government from time to time").*

2.5 All Paddy lands should be declared as a Paddy Reserve of the State, protecting all entitlement rights of the land owner.

2.6 Clay and sand mining from paddy fields shall be totally banned.

2.7 Provide incentives that shall be fixed by the State Level Committee under the Act, for preserving paddy lands and wetlands owned by private holders, as the benefits of the same are enjoyed by the society. Required rules shall be framed under the Kerala Conservation of Paddy land and Wetland Act, 2008

3. ***Conservation and sustainable use of wetlands (Wetlands include ponds, tanks, lakes, kole lands, reservoirs, rivers and rivulets, and mangrove ecosystems)***

3.1 A comprehensive Kerala State Wetland Conservation and Sustainable Use Policy shall be brought out.

3.2 A Kerala State Wetland Register may be prepared for each Panchayath with the participation of schools and colleges under the leadership of the Biodiversity Management Committee and Panchayath. Each wetland should be numbered, measured and other details recorded. The Register should be in the custody of the local Panchayath, and, when the Secretary of the Panchayath gets transferred/retired, a stock verification of the wetlands

should be done and, he/she shall be made responsible for the missing wetlands and fine levied as per the value mentioned earlier. In case there is an increase in the wetland area during the tenure of a particular officer, he/she should be given a kind of reward, to be worked out on the basis of the ecosystem service value of the wetlands.

3.3 A massive Kerala State Wetland Restoration Programme may be launched, which include cleaning up of rivers, ponds and lakes with full participation of people. MGNREGS or any other schemes of the LSGs may be used for the same.

3.4 Aquaculture in village ponds and canals may be initiated under each Panchayat as activities of Kudumbashrees and similar organizations.

3.5 Sustainable use of wetlands on the internationally accepted wetland management principles that wetlands should be managed for the economic benefits of the local community without damaging the biodiversity may be encouraged. Model schemes may be introduced in each district

3.6 Wetlands in the State may be prioritized on the basis of their biodiversity, economic and cultural values for long-term conservation.

3.7 No wetlands shall be reclaimed as enunciated under section 11 of the Kerala Conservation of Paddy land and Wetland Act, 2008.

3.8 In case of unavoidable necessities for roads across the wetlands, the purpose may be achieved by bridges without affecting the flow of water and the basic functioning of the wetlands. All present road constructions and widening projects shall also make necessary modifications in the design.

3.9 Management programmes for wetlands shall cover conservation of catchments and should be based on a watershed approach.

3.10 Under no circumstances shall any construction be allowed within 100 meters from the border of any wetland, including rivers and streams.

3.11 Schemes to revive and clean up the major rivers of the State have to be launched with full participation of the local people at the expense of the polluters.

3.12 Those who preserve the wetlands; individuals, communities, institutions; shall be encouraged by awarding “Conservation Service Charges”.

3.13 A Kerala State Wetland Authority may be constituted with adequate powers and autonomy to liaise and coordinate the various programmes for conservation and sustainable use of wetlands. The Authority should be entrusted to deal with all matters related to Wetlands.

3.14 The Kerala State Water Policy, 2007 may be revised considering a comprehensive approach for the entire water resources of the State, which cannot be separated from environment flows (wetland conservation and sustainable use).

3.15 Ensure that no water-intensive industries are established in and around the water source/s used by the community or used for supplying drinking water

3.16 Discourage/ban use of pesticides and chemical fertilizers on the catchments of water sources.

3.17 Restoration and conservation of wetlands in the hilly areas shall be given priority

3.18 The existing Kerala Protection of River Banks and Regulation of Removal of Sand Act, 2001and Rules, 2002 shall be expanded to have comprehensive rules for regulating sand mining not only from river banks, but also from land, reservoirs, and offshore and be implemented more effectively.

3.19 Provide basic units of water quality testing facility/laboratory to LSGs for regularly monitoring water quality and reporting to the public.

3.20 LSGs should take a proactive role in protecting and restoring the water resources in their area, educating the people and getting their support to do the same.

3.21 Encourage educational institutions and social and cultural organizations to adopt at least one wetland/water resource for its protection and management. Financial and other required support may be provided for the same.

3.22 Those who dump waste/garbage into the water sources, however small quantity it may be, shall be punished.

4. Launch a Massive Campaign named 'Water and Wetlands for Life' towards conservation of the existing wetlands including rivers, ponds, lakes, springs and wells for water security.

4.1 Publish campaign material focusing on the status of water resources of the State, the threats to water security and the alarming water scarcity and, its linkages with the destruction of wetlands, global warming, climate change, sea level rise and, the need for sustainable land use to improve water retention and recharge. Such material shall be made available to all officers of the Government departments, people's representatives, LSGs, schools, colleges and NGOs.

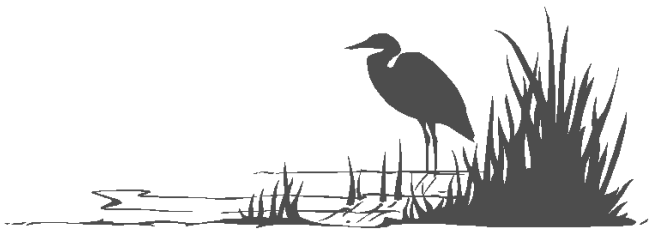
4.2 ***'Water and Wetlands for Life'*** training programmes aiming at water security through conservation of wetlands have to be conducted for all departments, since water is a resource that touches all the line departments in the State.

4.3 Engage the print and visual media on a regular basis to give a wider coverage on the need for wetland conservation for water security especially drinking water.

4.4 Encourage adoption of a wetland, paddy land or river stretch close to schools / colleges to carry out pro-active roles in protection and awareness campaigns for the same.

4.5 Wherever possible, schools shall take up water conservation, recharge and harvesting as mandatory with involvement of the public and parents.

4.6 The awareness campaign shall also be taken up by NGOs, community based organizations and education institutions of the State.



Rivers of Kerala – Time for Revival

Introduction

Forty four rivers that Kerala is blessed with along with 66 lakh open wells are the main source of freshwater for the 3.5 crores of people in the State. Although it is not realised our daily lifestyle is inextricably linked to the well-being of rivers. We depend upon flowing rivers for its values and services a few of which are discussed below.

Ecological value: River is the only ecosystem that connects diverse ecosystems such as forests, mountains, riparian forests, flood plains, mangroves, backwaters, deltas to the ocean. Through its flow it transports and deposits sediment, silt, sand and organic matter all along its way providing food and nutrients to the fish and other aquatic species. Thousands of inland fishing communities apart from tribal communities depend upon inland fish catch for their livelihoods which is sustained by the rich nutrients brought by the river. The river can continue to maintain its ecological services only if it is allowed to flow unhindered to the ocean.

Cultural value: A flowing river holds different meanings and values for people from different walks of life. Rivers have been used for religious purposes as social gathering places, for recreation since decades. The confluence of rivers is considered an auspicious place in Indian scriptures.

Basic services: All the river-side Panchayaths in Kerala depend on rivers for freshwater for drinking and farming. Most of the lift irrigation schemes and drinking water projects implemented by the Panchayaths under the decentralised development planning depend upon rivers. Chalakudy River alone has around 600 LI schemes (small and large) owned and operated by the Panchayaths and river-side population. People have been using rivers for other basic needs such as bathing, washing clothes and cattle.

Power generation: Kerala depends heavily on hydro power from rivers for its electricity needs. Out of the total 4500 + MW of electricity from different sources, around 2000 MW is contributed from the 24 hydel stations through the different rivers. As per the National Register of Large Dams (http://www.cwc.nic.in/main/downloads /National%20Register%20of%20Large%20Dams%202012.pdf) Kerala has 30 dams for power generation. Periyar River remains the largest contributor with seven major projects having a total installed generating capacity of 1240 MW. The other rivers having major HEPs are the Pamba River, the Chalakudy River and Kuttiyadi River. Under the Emerging Kerala Plan, 57 small hydro power projects (less than 25 MW) with a total installed capacity of 165.49 and 443.5 Million Units of annual power generation are being planned in various river basins.

Irrigation: 15 major irrigation projects have been built across the various rivers in Kerala (commissioned) for providing irrigation with the objective of increasing the area, production and productivity of rice for the third crop of rice and other crops. At least 16 irrigation projects are in different stages of construction. The potential net ayacut area comes to around 4.4 lakh ha

(file:///E:/my%20documents/Dams/IRRIGATION/irrigationprojctsKeralaIDRB.htm)

All these projects depend on the flow of rivers for the distribution of water to the entire ayacut. Some of them such as Thumboormuzhy, Bhoothathankettu, and Pamba Valley Irrigation Project depend upon the operation of the upstream hydro power projects for their efficient operation. In summer, many of the commissioned projects become the main source of drinking water (Pazhassi IP for Kannur and Tellicherry municipalities, Peechi IP for Thrissur Corporation, Malampuzha IP for Palakkad municipality). Over the years, rice fields in the ayacuts have been mostly replaced by commercial crops such as coconut, banana, sugarcane, and nutmeg .

Sand Mining: Mining of river sand is a major source of income and livelihood for thousands in the State. A flowing river alone is capable of depositing sand all along its course up to the delta. Sand also purifies the river as it flows. A study on the sand mining problems of certain rivers of Kerala showed that the quantity of sand that could be extracted safely without causing environmental damage to Periyar was 19,178 tones. The actual extraction was found to be more than thirty times of this quantity (Pratapan, S. 1999. Periyar- Under Severe Strain. The Hindu Survey of Environment).

Industries: Most industries need water at some stage of their process. Almost 250 huge and small industries extract 1,89,343 cum of water daily from the Periyar River, discharging 75 per cent of used water back into the river with full of effluents and toxic pollutants. Chalakudy, Chaliyar and Valapattanam also have industries extracting water. Nitta Gelatin India Limited pumps in around 80 lakh litres of water from the Chalakudy River for various needs. However, most of the industries treat rivers as discharge dumps of their effluents and waste. In fact Greenpeace had declared Eloor area in Periyar river basin as a 'global toxic hotspot' way back in 1999.

Kerala Western Ghats Rivers at a glance

- 44 river basins – 41 west flowing and 3 east flowing
- No major rivers – four medium (Periyar, Bharathapuzha, Pamba and Chaliyar) and rest are streams as per scientific terminology.
- East flowing Kabini, Pambar and Bhavani – tributaries of Kavery
- Total catchment just 43,000 sq km - less than half of Kavery
- Mainstay of more than 30 million people living in 38,000 + sq km of land between the mountains and the sea
- Only 11 rivers are more than 100 km in length
- 10 rivers are interstate
- Total annual yield is 78,041 Million Cubic Metre (MCM), out of which 70323 MCM is in Kerala

Major issues faced by the Kerala rivers

If our rivers have to continue providing the valuable services as outlined above, they must be allowed to flow. Unfortunately, the over exploitation in the name of the very same services outlined above have led to their present deplorable condition caused by a combination of multitude of issues. The downstream flows are so lean during summer that many of them do not reach the sea and are unable to complete their hydrological cycle and ecological functions of purifying water, depositing sand, sediments and nutrients or providing freshwater to the coastal Panchayaths. Salinity intrusion is increasing every year, a clear indication that the flows are receding. The most important six reasons are discussed here.

1. Catchment deforestation and habitat fragmentation

The entire 38,000^{+} sq km area of Kerala is the watershed of the 44 rivers. The entire River flow and health of the riverine system depends on the health of the catchments. More than 200 years history of deforestation for various purposes including timber, agricultural and forest plantations, dams, roads and encroachments has completely fragmented the forests into islands with no continuity in between. Consequently, the water holding capacity of the forested catchments has eroded over the years, leading to drying up of forest streams ,even immediately after the monsoons, and reduced flows in the river. These forest streams are the mainstay of the people living in the hilly areas of the Western Ghats, especially Idukki, Wayanad and Pathanamthitta. Further, it has affected irrigation of the agricultural crops in these areas. Deforestation has also affected the local and regional climate making the days hotter and drier with increasing diurnal variation in temperature which also is damaging the plantation crops.

2. Dams and diversions

Prime forests have been submerged for dams. River flows of Periyar, Chalakudy, Bharathapuzha, Siruvani and Neyyar have been diverted for inter-state and inter-basin diversions. The impacts of dams and diversions can be summarized as follows:

- In those rivers which have hydro power projects operating upstream, the release of water into the river after power generation is controlled by the KSEB. The time, duration, frequency of flow into the rivers is decided by the peaking operation of the power stations. This in turn affects the downstream uses such as drinking, irrigation and fishing during summer. In the Chalakudy River, the availability of water for irrigation and drinking water to 20 Panchayaths during summer from the Thumboormoozhi IP has been severely curtailed by the shift from base load to peak load operation of the Poringalkuthu HEP upstream in Chalakudy River.
- No flow below the dams during summer. Dams convert the river into chains of reservoirs with no flow in between – Parambikulam , Tamil Nadu Sholayar, Mullaperiyar and Idukki dams where the river does not flow for long before joined by the next tributary or recharge from the catchment.

- Rivers are disconnected from flood plains affecting lateral and longitudinal connectivity of the river – All tributaries of Bharathapuzha except Kunti are dammed which has led to the river flow getting disconnected from the flood plains during summer as the river reaches the plains.
- Dams have submerged vast stretches of riparian forests, which regulate flood flows during monsoon, trap sediments and nutrients for the fishes and other aquatic species and reduce evaporation from the river during summer thus contributing to healthy river flows.

3. Sand mining

All river-side local self governments have been earning revenue through sand mining. In spite of the Sand Mining Act 2000, mining has been going on indiscriminately to the extent that in some stretches the river has reached rock bottom with the river bed reaching much below the mean sea level. In some stretches clay and mud is mined in place of sand.. The water table and water quality have been severely affected in heavily mined rivers such as Bharathapuzha, Periyar, Chalakudy, and Pamba.

4. Incorrect land use in catchments

The Panchayaths and various departments using the river tend to look at the river only as a water flowing channel. The different types of land use changes within the river basin lead to degradation of the river catchments. In hilly catchments, monoculture, intensive farming along steep slopes, construction of roads and infrastructure without considering the contour and gradient have led to soil erosion and landslides. Such land use practices have reduced the capacity of the land to store and recharge water which in turn has affected stream flows from these micro catchments leading to their drying up after the rains recede. When thousands of such streams which feed the river dry up, the summer flow also recedes. The increasing water scarcity in Idukki can be directly correlated to the cumulative impact of destructive land use.

5. Pollution

Pollution from different sources – pesticide application in agricultural plantations and farm fields, waste and sewage disposal from towns and Panchayaths, effluent disposal from industries, has been increasing over the years. Many of our rivers have turned into sewers. In summer with the reduction in flows as explained above, the pollution load and intensity increases leading to fish kills and deterioration of water quality. The rate of *E. coli* and fecal contamination is also on the increase. There are reports *of E. coli* entering lakes and other water bodies through the river. Pamba is a classic case of *E coli* and faecal contamination from Sabarimala affecting even downstream populations.

6. Encroachments into the river

Rivers need space to flow. Encroachments into the river for construction of houses, farmlands, rive-side tourism, townships, bus stands, hospitals are on the rise. While the resurvey of our rivers is pending, most of these encroachments are illegal against which cases are pending in various courts., When monsoonal floods , badly damage the river banks, the river is blamed; and not such illegal encroachments!

Time to plan for living rivers

"The main assumption behind water resources development in the entire country appears to be that "water is flowing waste into the sea and hence, every drop has to be utilized for the benefit of mankind. Under this unfortunate view, there is no limit to abstraction of water within a river or a river basin. The problems we face due to this techno economic view are briefly outlined below:

1. Sectoral approach (KSEB, Irrigation Department, Water Authority etc. use the rivers to meet their own targeted needs) to development – nobody looks at the larger impact on the river basin.
2. Each river- side Panchayath use rivers for different needs including sand mining ignoring impact on upstream or downstream river sharing Panchayaths.
3. Lack of co- ordination between departments, Panchayaths and other concerned agencies using the same river waters leading to upstream – downstream conflicts.
4. Lack of realisation on the part of planners that upstream interventions like dams and deforestation will impact downstream needs.
5. Imbalance between water use (withdrawal and diversion) and, recharge – flows get reduced and water table has declined over the years.
6. Even the minimum flow to maintain the functions of the river is ignored in the present model of development.

The major lacunae with respect to management of rivers are as follows

1. The instinctive feeling that the river has to be maintained, if our basic needs have to be met, has disappeared from our society
2. Lack of reliable hydrological and ecological data based on which limits to development of the river basin, its micro watershed, abstraction of flows can be estimated
3. Post facto impact studies of dams based on which the water needed by the river to perform its various functions can be assessed
4. Suitable law which empowers and enables protection of rivers, ensures minimum flows below dams and environmental flows throughout the river till it reach the sea.

It is high time for Kerala to step into river basin level planning and decentralised management of water resources with conservation inbuilt into it.

Policy – legal changes and strategy shifts recommended

1. No more inter-state or inter-basin transfer of river water should be allowed. The State should put pressure on the centre to remove the clause regarding the same from the Draft National Water Policy document. Kerala should not agree for any trade off on the proposed Pamba - Achankoil Vaippar Link under the ILR Project, on ecological, environmental considerations and, internal water demand

2. Section 2.7 of the Kerala State Water Policy, 2007 stipulates that operation of reservoirs shall be scheduled in consultation with stakeholders. Reservoir Operations Management with schemes to improve downstream flows and meet the water shortages downstream especially in the heavily dammed and diverted rivers, and also to regulate floods during monsoon has to be formulated..

3. Kerala government has been mooting the idea of legally constituting River Basin Authorities / organizations for better management. This must be a totally decentralised bottom – up planning and implementation process. In heavily degraded rivers, river revival should take priority over further development. Under the Act, it should be ensured that all the different agencies such as Panchayaths, departments, indigenous river dependent communities, farmers and river conservation groups become part of the planning and decision making process for both conservation and management at appropriate levels.

   The compartmentalized approach to river basin planning should be replaced with an integrated approach that views the entire river basin as a single geographical, ecological unit for planning. Through principle of subsidiarity, planning for the entire river basin should start from the lowest Panchayath and upscale to basin level with departments and district authorities taking the role of technical and administrative support. Basin level plans should be prepared through participatory process and, implementation should also be in a phased, participatory manner.

4. Under the Emerging Kerala plan, 57 small hydro power projects are proposed. These projects should also be subject to Environmental Impact Assessment in place of single window clearance approach. This should also include comprehensive catchment restoration plan along watershed principles to be carried out in a phased manner before the project is commissioned. Moreover, the power generated from such projects should fulfill the needs of the concerned LSG on priority. The SHP or mini – micro hydel project should be jointly owned, operated and maintained by the LSG within which the project operates so as to ensure its longer life and cost – effective production.

5. All the rivers should be subject to objective status assessment. River health indicators should be developed for the same. Accordingly, restoration measures should be worked out jointly with the relevant departments, Panchayaths and river communities

6. Local self-government level decentralized water management plans to be developed at least for the next 20 years: Water resources management plans with suitable watershed measures, afforestation, eco – restoration of catchments, rainwater recharging and harvesting, storm water drainage, water auditing, recycling and reuse etc. should be built into it. These water management plans should integrate into basin level management plans. The objective is to reduce the dependence on rivers and external sources and to improve recharge.

7. Protect high altitude valley swamps that are the origins of rivers from further reclamation for tourism, real estate or agricultural development and declare them as

'hotspots for water conservation'. The recommendations in the Western Ghats Panel report hold relevance in this context.

8. The river rejuvenates and purifies itself during monsoon. Sand deposits help the river in the cleansing process. Hence River Sand mining should be totally banned during monsoon. Participatory sand auditing based strict regulations including 'sand holidays' should be put in place for heavily mined rivers. Sand Auditing has already been commissioned in many of the rivers by the Revenue Department using RMF funds. Based on the results, declare "sand holidays" for heavily mined river stretches for at least three years. The extent of mining to be allowed can be decided based upon the level of utilization and degradation of the river.

9. The River Management Fund accrued through sand mining revenue has to be used for restoration of the river and river banks.

10. Hill quarries and laterite mining have extensively destroyed and degraded water resources such as streams, surangams, ponds, and wells. This has severely altered drainage pattern of surface and ground water.

11. Water tables have lowered in severely mined areas. Hence, new mining areas shall be allowed based only on the assessment of water resources in the Panchayath and the carrying capacity of the area.

12. Rehabilitation of mined areas to be taken up by the parties responsible for mining with special focus on reviving the water resources that have been destroyed by the mines.

13. Many of the hill streams that feed our rivers are presently within plantation estates owned by private parties. Planters, LSGs and Forest Departments in high altitude areas should come together for eco – restoration of the forest fragments between the estates and hill streams.

14. Take up catchment area treatment plans of hydro and major irrigation projects to improve their life span. KSEB, Irrigation Department, Forest Department and the relevant LSGs should share the resposibility.. MNREGS has evolved guidelines for following watershed principles which can be used for this purpose.

15. Riparian management should be taken up with participation and involvement of the river side communities, river side LSGs, VSS, Forest Department, local NGOs wherever appropriate to improve river flows and water quality.

16. Ban extraction of bottling plants drawing waters of hill streams. Involve the Panchayaths and townships who get water from reservoirs towards upkeep of the hill streams and catchment which is the source of their drinking water.

17. The ayacut of most of the major irrigation projects is presently dominated by commercial crops A system of area / crop based additional cess on irrigation water used by commercial crops should be implemented. The additional cess thus accrued should be used for paying incentives to rice farmers maintaining rice and for canal maintenance in the ayacut.

18. River basin level education programmes among schools, colleges, youth, farmers, SHGs, VSS, EDC, and LSGs should become mandatory.

19. There is an urgent need for a shift in thinking and vision of the technocrats, bureaucrats, legislators and politicians on the concept of river basin management with restoration inbuilt into it. Refreshment courses for all sections could be thought of.

Studies and Assessments

1. Commission Environment flow assessments involving, research institutions, departments, NGOs along with local communities to make environmental flows assessments and to implement the same.

2. Assess the downstream impacts of dams mainly on river ecology, flood plains, fishing habitats, and livelihoods of river dependent communities.

3. Mapping salinity intrusion so as to suggest improved flows in future

4. Arrive at optimum reservoir operations management in dammed rivers to improve downstream water needs of the people. Put proper monitoring of reservoir operations in place involving downstream local self-governments and departments.

5. Generate, update and upgrade hydrological data base in rivers

6. Generate and consolidate the ecological data base and information at river basin level

Coastal and marine ecosystems of Kerala

1. Introduction

Coastal and marine ecosystems are among the most productive, yet threatened, ecosystems in Kerala; they include backwaters, lagoons, estuaries, mangroves, mudflats, sand dunes, seaweed ecosystems and the extensive coastal waters which cover terrestrial ecosystems, areas where freshwater and saltwater mix (estuaries and brackishwater lakes, Kayals), near shore coastal areas (backwaters in Kerala, including Kuttanad Wetland), and open ocean marine areas. The Coastal Zone in Kerala is the low land fringing the sea extending over 590 km (about 10 per cent of the coastline of India), with a height of less than 8 m from the Mean Sea Level (MSL), covering about 15 % of the State's total area of 38,863 sq km.

The coastal zone of Kerala is not only an important physiographic unit of the State, but also important in terms of economic activity and demographic distribution. Kerala is home to 2.76% of India's population (total population as per 2011 census is 33.3 million), with high population density (859 persons per sq km.); the population density in the coastal zone is almost three times that in midland and highland areas and about 30% of the population in Kerala inhabits coastal region. Coastal zone of Kerala harbours most of the industries in the State, ports, air ports, water ways, thermal power plants and is the hub for the present and appears to be the future development of tourism. Thanks to upwelling and formation of mud banks (*Chakara*), the coastal waters of Kerala are one of the leading States in marine capture fisheries and also rich in coastal/marine biodiversity. Commercially valuable mineral base is also found along the coastline, including thorium and titanium.

Healthy marine and coastal ecosystems provide many valuable services - from food security, resources for economic growth and recreation alongside tourism and coastline protection. They are also recognized as crucial reservoirs of biodiversity at a time when the loss of species on both land and in the sea is an increasing cause for concern. Moreover, in the maritime State like Kerala, the health of the coastal and marine ecosystems are intricately related to the health of other ecosystems such as forests, rivers, backwaters, estuaries and mangroves. However, the conservation of coastal and marine ecosystems did not receive proper attention compared to the terrestrial ecosystems.

2. Drivers of Change and Impacts

Most services derived from marine and coastal ecosystems are used unsustainably and therefore getting deteriorated faster than other ecosystems. Unsustainable use of services can result in threatening food security of coastal communities, besides debilitating their means of survival. Important drivers of marine and coastal ecosystems include: population growth, land use change and habitat loss, overexploitation (overfishing) and increased demand for marine food, climate change, eutrophication, pollution, globalization, and invasive species.

2.1. Population Growth

Under the physiographic conditions of Kerala, the population density has tended to increase towards the coastal region. Considering the large number of people (about 30% of population), the high concentration of industries, the existence of small and large ports, and the enormous fishing potential, the question of limiting development or putting in place a regime of regulatory measures for human activities on the coast is much more challenging than any other geographical area in the State.

2.2. Coastal development, land use change, and habitat loss

Coastal zone in Kerala is one of the major centres of economic development in the State, with establishment of industries, hotels and residential establishments, stadiums, IT firms, theme parks, and the like. The records of Kerala State Pollution Control Board indicate that most of the industrial and commercial establishments in Kerala are concentrated in the coastal zone. Eloor- Edayar- Ambalamugal area is the major industrial area located in the coastal zone in the city of Kochi in Ernakulam District along the banks of the Cochin backwaters.

Coastal wetlands, mangroves, mud flats, sand dunes, backwaters, beaches and estuaries and coastal habitats along Kerala coast are in various stages of degradation. Undoubtedly, one the ecosystems that witnessed greatest impact of anthropogenic intervention in the State is the mangrove forests. In Kerala, a few decades ago there were about 70,000 ha of mangroves; however, in recent years it has been reduced to less than 4,200 ha (Mohanan, 1997) though field observations reveal that the condition of mangrove ecosystems in Kerala is still pathetic, with a few healthy patches restricted to the northern districts. The destruction of mangroves for the development activities and construction of aquaculture ponds has not only started affecting the productivity and biodiversity of coastal waters, but also in destabilisation of shorelines.

Unstinted reclamation activities have drastically reduced the extent and functioning of brackishwater lakes in the State. According to Kurian *et al.* (1995), the brackish water coverage of the State has come down from 2.51akh ha in the 1950s to 61,200 ha in 1990. The biggest backwater system of the State and the second biggest in the country, Vembanad lake, which occupied an area of about 36,500 ha in 1983 (Gopalan *et al*.,1983) has shrunken to 13,000 ha currently. Coastal wetlands, mangroves and backwaters have been destroyed considerably for the development and expansion of the urban settlements, transportation, industries, and other projects. The unscientific coastal development activities have complicated the issue of siltation of water bodies.

Dredging for the maintenance of harbours and the disposal of dredged materials offshore have changed the shoreline morphology, especially along the Kochi Port. The uninhibited sand mining in most of the backwaters of Kerala not only affected the ecology of the system but also started affecting the fishery resources. Similarly sand mining from beaches poses grave environmental as well as livelihood problems. Mining of beach sand, especially from the foreshore, would lead to coastal erosion. This has already surfaced along the Neendakara-Alappad coast.

The construction of Thottapalry spillway has turned out to be an ecological disaster in Kuttanad and its adjoining area, resulting in checking natural downstream migration of the

giant freshwater prawn and fishes and upstream migration of marine or estuarine shrimps and fishes for feeding and breeding, besides altering the hydrological regime and ecological profile of Vembanad lake. Limitations in natural flushing resulted in accumulation of pollutants and intensifying disease outbreaks in aquatic organisms. The breakwaters constructed across the shoreline interfered with the littoral transport processes and caused coastal erosion on the down drift side and some accretion on the up drift side of these breakwaters.

A series of coastal regulation zone violations have been reported from the State due to the unplanned development plans, unauthorised constructions and encroachments.

2.3. Overexploitation of resources

Kerala is one of the leading marine fish producing States of India, contributing up to 25% of the marine fish landings of the country. Marine fisheries and fisheries from the backwaters of Kerala ensure food and nutritional security, livelihood options and generate foreign exchange through export. Such a highly productive inshore area is being exploited intensively by more than 4,000 mechanized boats and nearly 26,000 traditional crafts (17,362 motorized). Excessive number of trawlers in Kerala also increases the landing of bycatch including eggs and juveniles of commercial species which would in the long run affect the delicate ecological fabric of the ecosystem. Continued use of illegal nets and unscientific fishing practices also put great pressure on resources. The fisheries of brackishwater systems are also seriously affected as a result of ecosystem changes due to habitat loss/modification, pollution, invasive species, and pollution. The black clam (*Villorita cyprinoides*) fishery of Vembanad is currently unsustainable as a result of exploitation of juvenile clams (below Minimum Legal Size) using nets of very small mesh size. The economic loss due to exploitation of the juvenile clams during 15 yeasr has been estimated at Rs. 51.3 crores by CMFRI. Similarly unsustainable exploitation of sub-fossil deposits of clam shells in brackishwater lakes such as Vembanad and Ashtamudi also create rampant ecological changes.

The excessive fishing pressure and open access nature of the ocean continue to exert pressure on inshore waters, often leading to heavy competition leading to inter- and intra-sectoral conflicts. Further, increasing capital investments in the sector coupled with pressure from market as a result of globalisation further aggravate the problem; the plight of the traditional fishermen in the State continues to be miserable than any other section of the society.

2.4. Tourism: The main focal areas of tourism development in Kerala are coasts and backwaters, and therefore the support systems including hotels, beach resorts, backwater resorts and other tourist accommodation facilities are mainly situated in the coastal belt. There are about 200 motorised house boats plying in the Vembanad lake exclusively for tourism purpose. As the State is one of the hot destinations of both domestic and foreign tourists, this sector is recording fastest growth rate compared to other industries, the pressure on coastal ecosystems would continue to increase. The deterioration of environmental quality, including erosion of coasts and beach would further hamper the sustainable development of the tourism industry.

2.5. Coastal Erosion: Reports of the National Centre for Sustainable Coastal Management (NCSCM) indicate that 63% of Kerala coast is subjected to erosion, out of which around 53%

can be classified as "Artificial Coast", managed by artificial structures such as sea walls and/or riprap revetments / groynes. Out of the remaining 37%, only 8% is stable. This situation also warrants careful interventions in the coastal front, and rethinking on construction of artificial walls along the vulnerable coastal stretches of Kerala.

The few ideal beaches for the nesting of endangered marine turtles left in Kozhikkode (Payyoli) and Kasargod (Neeleswaram) are also severely impacted by the issue of coastal erosion and sand mining. The impacts of coastal erosion on human settlements and traditional livelihood activities are also rampant. The expenses incurred by the Government towards protection of coast from erosion are also huge, costing about rupees 4 crores per kilometer of the coast. The State's economy is getting strained in this process.

2.6. Climate Change: The potential impacts of climate change are reflected on shorelines, estuaries, coastal wetlands and ecosystems bordering ocean, and the impacts in Kerala coast may be due to several key drivers including sea level change, alterations in precipitation patterns and subsequent delivery of freshwater, nutrients, and sediment, increased sea surface temperature, alterations in circulation patterns and increased levels of atmospheric CO_2. Estuarine productivity could change in response to alteration in the timing and amount of freshwater, nutrients, and sediment delivery. Although these potential impacts of climate change and variability will vary from region to region, in-depth studies are needed to surmise the potential impacts on coastal and marine ecosystems of Kerala. The available modelling studies project shift in marine fish populations and coastal impacts due to sea level rise in cities such as Cochin. The monsoon vagaries, presently more frequent could also be correlated with climate change and El Nino.

3. Action Plans Suggested

3.1. Protection of coastal zone

3.1.1. Although existing Coastal Regulation Zone Act is effective in controlling many of the impacts in the coastal zone, increasing number of violations have been reported from the State. The State Coastal Zone Management Authority should take stringent actions against the violators and has to take effective mechanisms to monitor and check violations. Use of modern technologies including historical coastal zone maps (including those available in open access platforms such as Google earth maps) should be used to book cases of violations.

3.1.2. A Costal Zone Monitoring Network should be established involving all coastal local bodies, with the participation of Civil Society Groups and environmentalists to monitor violation of CRZ act and to ensure the progress of implementation of the act.

3.1.3. The functioning of the State Coastal Zone Management Authority has to be decentralized by establishing District level Authorities with adequate legislative and financial powers to monitor and to implement the act.

3.1.4. Ecosystem services of the critical coastal and marine habitats have to be analysed specifically through integrated inclusive research so as to prepare Integrated Coastal Zone Management Plans and for identifying hotspots for conservation and sustainable management.

3.1.5. The reclamation of lakes and coastal wetlands should be banned totally and the existing boundaries are to be identified and fixed using advanced technologies including satellite mapping to prevent further encroachment.

3.1.6. Strict guidelines shall be formulated to control mining of strategically important heavy minerals, namely black sand (such as ilmanite, monazite and rutile) and industrially important minerals, namely glass sand (white sand – silicates) and, the same may be enforced strictly. Mining heavy mineral deposits should be done only after determining the sustainable limits of resources through sediment budgeting and mining should be limited to public sector agencies, with proper monitoring done by a body involving civil society representatives.

3.1.7. In order to prevent human settlement in CRZ, separate fishing townships with all facilities required for the fishing communities should be developed outside the No Development Zone of the Coastal Regulation Zone (CRZ).

3.1.8. Since the Coastal Regulation Zone (CRZ) notification of February 1991 and Coastal Management Zone (CMZ) notification of 2011 are in vogue, 200 meter width of coastal areas are to be statutorily earmarked as undeveloped zones, except for utilizing it for fishery related activities of the coastal fisherfolk.

3.1.9. Mudflats, coastal wetlands, reefs, mangroves, sand dunes and shoals should be categorised as ecologically sensitive CRZ I areas. All heritage sites and reserved forests should be categorised as CRZ I.

3.1.10. No reclamation or constructions after 1991 should be regularised. This has particular relevance where industrial clearances are sought from the MoEF.

3.1.11. Though periodic dredging is a necessity in ports and harbours, it has to be ensured that the dredged materials should not get back to the harbours and used for reclamation in or near the entrance of harbours leading to choking of inlet mouths. Further, dumping sites have to be fixed only after EIA studies, including modelling.

3.1.12. No sand excavation, mining or shell/shale/stone extraction be allowed from CRZ areas. Effective enforcement mechanisms have to be set up for implementing the ban, particularly in sensitive areas such as turtle nesting sites.

3.1.13. Ground water exploitation has to be regulated in the coastal zone to specified wells and specified quantities based on scientific assessment. Necessary technology should be adopted so that the saline water lenses are not disturbed.

3.1.14. Considering the fact that construction of sea wall for shoreline protection is a threat to the existing beaches and the colossal expenses involved, the whole process has to be reviewed critically. Restoration of beaches and protection of sea shore through natural shields such as mangroves and typical coastal vegetation have to be promoted with the participation of coastal communities.

3.2. Pollution Control

3.2.1. Industrial effluent disposal in the coastal water bodies has been regulated through the Environment (Prevention and control) and CRZ rules, but not effectively implemented.

Judicial intervention has recently pressurized the regulatory authorities to take action. The treatment plants shall be made mandatory for the industries which generate effluents. Effluents conforming to the prescribed standards shall only be allowed to be disposed in the water bodies.

3.2.2. Following the principle of "Polluter pays", industries may be levied the cost of environmental damages and the amount so generated shall be fully utilized for environmental management programmes.

3.2.3. There is no proper or adequate facility for collection, treatment and disposal of sewage in the coastal cities and towns of the State. As the population increases and urbanisation intensifies, a long term planning for the sewage collection, treatment and disposal should be initiated and implemented.

3.3.4. Sewage collection and treatment mechanisms have to be made mandatory for house boats operating in the backwaters.

3.3.5. There are no effective mechanisms to control the generation of solid wastes in large quantities in urban centres and tourism destinations in the coastal area. Local bodies should take urgent measures to control the solid waste generation and take eco-friendly measures for proper recycling or disposal of the wastes. Segregation at source and using the organic waste for biogas and fertilisers are the best options.

3.3.6. Specific standards for cleanliness should be adopted and monitoring mechanisms implemented in ports and harbours. Fisheries harbours have to be upgraded with sanitation facilities, boat fuelling area and better drainage systems.

3.3.7. Efforts should be made to reduce its ill effects of coconut husk retting by adopting modern environment–friendly retting methods. The present practice of discharging waste pith into the water should not be allowed.

3.3. Biodiversity Conservation and Sustainable Use

3.3.1. One of the pre-requisites for conservation is a strong quantitative and qualitative data base on the living marine resources of Kerala coast in order to frame conservation and management plans.

3.3.2. The maximum sustainable yield of the commercially exploited species should be determined in coastal and brackishwater habitats and harvesting should be regulated accordingly.

3.3.3. Sustainable harvesting of resources should be ensured by strictly adhering to the existing rules such as Kerala Marine Fishing Regulation Act and by assessing the maximum permissible limit of mechanised fishing vessels.

3.3.4. Mandatory registration and licensing of all motorized and mechanized boats, review of licensing every five years, cancellation of registration of vessels violating fishing regulations, and temporary moratorium for further sanction of mechanized vessels for inshore waters would also be considered to reduce fishing pressure.

3.3.5. Restriction of multiday fishing by fixing upper limit and fixing and capping the size and power of the boats in each sector by imposing upper limits for the length and horsepower, especially the large ring seines (Mainly for controlling mass destruction of juveniles).

3.3.5. Bycatch reduction methods should be made mandatory in trawl nets to reduce the loss of biodiversity, especially the destruction of RET species.

3.3.6. Monsoon trawl ban has helped in better fishery production and, therefore, this should be continued in the forthcoming years as well. Only non-motorised and low horse powered (up to 10 HP) OBM/IBM vessels should be allowed to operate during the closed season.

3.3.7. Stake nets are found to be highly destructive in the sustenance of brackishwater fishery resources of the State and therefore, they may be removed in a phased manner as per the recommendations submitted by the Stake Net Committee appointed by the Govt. of Kerala.

3.3.8. Appropriate areas in the estuarine and sea coast of the State for mangrove afforestation should be identified and mangrove planting through community participation implemented. Science clubs in educational institutions should be given training and funding for adopting mangrove plantations for its maintenance.

3.3.9. Promote alternate livelihood options to the fisher folk and involving them in ancillary industries would not only reduce pressure on resources but also provide better living conditions for them.

3.3.10. Empowr fisher women by organizing Self Help Groups (SHGs) in coastal panchayaths for conservation and sustainable use of biodiversity.

3.3.11. The higher diversity of fish and shellfish resources available in Kerala coast offers better prospects for diversification, especially with regard to development of new products and value addition.

3.3.12. Better and effective transfer of technology from the research and academic institutions to the stakeholders by winning their confidence and working with and for them.

3.3.13. The mariculture activities, particularly fish culture, are at its infancy in India, even now, without any commercial production systems. More attention has to be given to develop suitable eco-friendly low cost technologies for marine pisciculture along Kerala coast.

3.3.14. Declaration of certain coastal areas closed for trawling would also help in reducing overexploitation of resources as well as conservation of marine organisms. Establishment of community-owned systems of marine protected areas that are consistent with the social, economic, political and cultural characteristics of the region, with active community participation supported by local NGOs and government agencies.

3.3.15. Implementation of an integrated national conservation strategy involving *in situ* and *ex situ* and *in vitro* and *in vivo* methods for all marine Rare, Endangered and Threatened (RET) species has also become imperative. The sea ranching programmes needs to be strengthened in India in order to replenish stocks, especially that of exploited and RET species.

3.3.16. At present there is no concerted effort to make the coastal communities aware of the present ecological status of the ocean ecosystem and impacts due to the depletion of

biodiversity. Fishery co-operatives, self-help groups in coastal areas, NGOs and religious institutions should be networked along with government systems for this purpose. Similarly, conservation efforts should be strengthened taking clues from the rich traditional knowledge of the local fishing communities. The rich traditional and technological knowledge of the local fisher folk remains to be documented.

3.3.17. Protect all the remaining pokkali fields for sustainable integrated farming, as these are the areas used for eco-friendly rice fish culture.

3.3.18. Ban introduction of foreign trawlers into the EEZ of India, including in the name of 'joint' ventures.

3.3.18. Principles of Ecosystem Approach to Fisheries (EAF) and Code of Conduct for Responsible Fisheries (CCRF) should be adopted to manage marine fisheries of Kerala coast to sustain the productivity.

3.3.19. The trend of developing Special Economic Zones in certain potential fishing areas and fishermen hamlets for complementing high-tech projects should not be encouraged. Paradigm shift is needed to pursue the concept of development in these areas.

3.4. Combating climate change

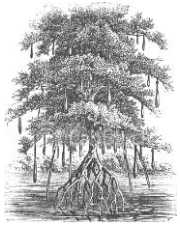
3.4.1. Considering the impending sea level rise, adaptation strategies including a proper rehabilitation programme for those who will be displaced shall be worked out and put in place sufficiently in advance.

3.4.2. Knowledge base has to be strengthened for better understanding of the impact of climate changes on fish stocks in our coastal waters with proper modelling studies as the first step towards planning and framing better management strategies.

3.5. Responsible Tourism

3.5.1. The responsible tourism guidelines should be followed for all the tourism initiatives in the coastal and marine areas.

3.5.2. The number of houseboats in backwaters should be strictly limited, based on carrying capacity studies and strict rules and regulations for waste management, especially in backwater tourism using house boats, shall be formulated and enforced. All house boats shall run on non-conventional energy sources such as solar and be fitted with green toilets/safe disposal of the wastes.



Fisheries

Sustainable development of fisheries, both marine and inland, ensures food and nutritional security, economic growth and socio-economic development of fisher community. In India, fisheries constitute an important economic activity contributing significantly to the national food security, income to the stakeholder community and for earning valuable foreign exchange. About 16 % of the total agricultural product is contributed by fisheries and it accounts for 1.1 % of total export (8.13 lakh tones for a value of Rs. 12901 crores) from India (2011-12).

In Kerala, fishing industry occupies an important position in its economy. Kerala's share in the national marine fish production is about 20-25 % and fisheries sector contribute 3 % of the GSDP of the state. Value share of Kerala to the total marine products export of the country is 15-19 %. However, the inland fish production sector is weak, contributing 17.76 % of the total fish produced during 2010-11. The potential of inland water resources for fish production have not been utilized optimally till date. The inland water bodies, including 44 rivers (85000 ha.), 53 reservoirs (44289 ha.), 53 back waters and brackish water bodies (65213 ha.), the polders of Kuttanad having a water spread area of 35000 ha., 17,000 ha. of Kole lands of Thrissur and Malappuram, 12,000 ha. of Pokkali lands in Ernakulam and Thrissur, 2500 ha. of Kaipad lands in Kannur can be suitably utilized for production of fish and shellfish.

Much of the fish is produced in an organic way. More areas of aquaculture can be brought under organic farming and an organised set up for Production, Procurement, Value addition and marketing of Fish/Prawn/Shrimps/Crabs/Mussels is very much deficient in Kerala which will help in generating more employment, income to the producers and quality products to the consumer community. The increasing potential of domestic marketing of quality fish and fish products can also be satisfied effectively.

I. Inland Fisheries Development

Stagnation in marine fish production and increasing demand for fish and fish products in national and international markets necessitates developing inland fish production. The potential of inland water resources for fish production have not been utilized optimally till date and it contributed 17.76 % of the total fish produced during 2010-11. The inland water bodies, including 44 rivers (85000 ha.), 53 reservoirs (44289 ha.), 53 backwaters and brackish water bodies (65213 ha.), the polders of Kuttanad having a water spread area of 35000 ha, Kole lands of Thrissur and Malappuram (17,000 ha.), Pokkali lands in Ernakulam and Thrissur (12,000 ha.) and Kaipad lands in Kannur (2,500 ha.) offers scope for production of fish and shellfish.

Issues to be addressed in inland fish production are the following:

- Dwindling area of wetlands (including rice fields), both freshwater and brackish water.
- Impoundments in rivers and changes in the hydrology of the ecosystem.
- Pollution of wetlands.
- Unsustainable and illegal fishing methods.
- Less diversified culture practices
- A few cultivable species, many of which non-native to the state/country
- Brackish water aquaculture mainly concentrating on shrimps, that too with high external inputs, causing pollution/degradation of coastal wetlands
- Monoculture of shrimps without crop rotation and crop holidays
- Diseases
- Introduction of exotics and loss of biodiversity
- Less thrust on value addition

The following suggestions are forwarded in order to ensure sustainable fisheries production, while ensuring development of aquaculture and promotion of inland fisheries.

1. Scientific investigations and explorations may be promoted to qualitatively and quantitatively explore the fish resources through national agencies and NGOs
2. At least 40-50% of the wetland area should be kept as such as sanctuaries for conservation of the diverse aquatic life.
3. The physical settings of the river, its habitats like the pebbles cobbles, sand, mud, bed rock and the riverine characteristics such as canopy cover and land use pattern on river banks must be preserved. Concreting river banks and removal of riverine canopy should be strictly prohibited. The Kerala Protection of River Banks and Regulation of Removal of Sand Act, 2001, Act 18 of 2001 may be referred. The permission for resorts, polluting industries, etc on the river side may not be given. Those existing may be thoroughly scanned and report on the pollution status/measures taken by them may be made available to the public.
4. A database on the pet traders and *status quo* of aquarium business is scanty. No consensus exists among the policy makers, middle men and collectors regarding the fishes to be imported / exported. The species enlisted as Endangered, Critically Endangered, Near Threatened should be excluded from trading. Measures may be taken to penalize the culprits. The research to develop breeding protocols of highly sought after species may be given high priority. Import of exotic species, especially prolific breeders in our natural settings/carnivorous species should be restricted.
5. The current curriculum of the courses offering the professional degree in fisheries given special emphasis on the culture fisheries and on technologies for exploitation. No emphasis has been given to understand the ecology, conservation, evolution, etc.
6. The ichthylogical research, akin to Smith's Institute of Ichthyology, may be promoted giving special attention to evolutionary biology and conservation biology. The University of Fisheries and Ocean Sciences may take the initiatives to promote research in this line.
7. Thrust should be on organic farming and integrated farming.

8. Continuous farming with a single species crop after crop should be restricted i.e. attractive schemes for crop rotation is to be encouraged.
9. Rotation of shrimp crop with fin fish, brackish water paddy etc. to be promoted in coastal areas
10. One paddy one fish farming system to be promoted.
11. The migratory pathways (normally small canals connecting the breeding ground and the rivers) of the fishes should be kept intact for the breeding/feeding migration of the fishes.
12. No more fish/scampi farming in reservoirs which are in wildlife sanctuaries/National parks
13. Still our aquaculture is anchored on the Indian Major Carps (IMCs) like Catla, Rohu and Mrigal. Many fish species with desired qualities for aquaculture are available in different parts of India. Let us promote the fish species native to the area for the aquaculture exercise. This will in turn help to mitigate the issues pertain to the exotic fish culture and simultaneously save the local varieties from endangerment.
14. More diversification in farming practices/species.
15. Community based approach is found to be the aptly befitting model for the conservation.

Target of the government is to raise the inland fish production to 2.5 lakh tonenes and sustainable development of the fisheries sector can be achieved by:

1. Bring 100,000 ha. of deep water paddy wetlands for paddy-fish/shrimp farming. One lakh tones of fish can be produced by these. 37,000 ha. of Kuttanad, 17,000 ha. of Kole, 20,000 ha. of Pokkali/Kaipad lands, 30,000 ha. of paddy lands with thalakkulams in Palakkad districts, 50,000 ha. of paddy lands in other districts can be brought into integrated farming.
2. Half of the existing water spread area of the reservoirs, except those within the forest areas can be brought into reservoir fisheries.
3. Mussel farming/oyster farming in backwater of Kerala can produce 25,000 tonnes of mussels/edible oysters.
4. Cage farming in rivers and backwaters (100,000 cages) can produce 20,000 tonnes.
5. Captive fisheries in inland waters yield 30,000 tones. More quality yield can be achieved by stock enhancement projects with native species in our water bodies.
6. Fish farming in ponds/irrigation tanks/check dams can yield 50,000 tones.
7. Mariculture/sea weed culture can yield 25,000 tonnes.

Marine fisheries

Nature has endowed the state with a long stretch of coastline extending over 590 km, which accounts for over 10 per cent of the coastline of the country. Among the Maritime states in India, Kerala occupies the foremost position in marine fish production, accounting for about 25 per cent of the total landings. Out of the EEZ of 2.2 million km^2 for India, 36000 km^2, is adjacent to the Kerala coast. The well-known Wadge Bank is situated within the exploitable limit of Kerala. The mud banks (*Chakara*) between Kollam and Kannur are associated with the seasonal capture of certain species of fish. There are nine maritime districts:

Thiruvananthapuram, Kollam, Alappuzha, Eranakulam, Thrissur, Malappuram, Kozhikode, Kannur and Kasaragod.

The taskforce on marine fisheries of Kerala in its report have highlighted many of the issues and management strategies to be adopted for better management of marine fisheries of Kerala, which are very relevant for sustainability of marine fisheries development of the state.

The major issues that are to be addressed for management of marine fisheries

- Open access fisheries – anybody can go for fishing
- Increased fishing pressure in the coastal areas- stocks decline
- Overcapitalization and unwarranted capacity overload – more vessels
- Overexploitation of resources in the inshore waters
- Inappropriate exploitation pattern – causing destruction
- Discards/indiscriminate exploitation of juveniles/sub adults mainly by trawlers
- Biodiversity decline mainly by habitat destruction and illicit/overfishing
- Damage to the benthos and benthic ecosystem, often destroying the food web of commercial species – mainly by bottom trawling
- Ecosystem degradation affecting the productivity and carrying capacity
- Lack of enthusiasm among the industries for extension of fishing to the deep sea- Under exploitation of oceanic stocks
- Inefficient domestic marketing system
- Lack of quality control
- Increasing fishing cost and diminishing returns
- Decrease in area available in the sea per active fishermen & consequent Conflicts among different categories of fishermen
- Lack of proper fishery management system (Participatory Fisheries Management) and their timely implementation
- Lack of effective enforcement of Kerala Marine Fishing Regulation Act
- Lack of adoption of Code of Conduct for Responsible Fisheries (CCRF)
- Absence of informed management regime
- Threats from climate changes and natural calamities (like the 2004 Tsunami)
- Impacts of global pressures on trade

Fleet expansion in Kerala (1973 to 2005)

Fleet	1973-77[a]	1980[b]	1998[c]	2002-03[d]	2005[e]
Mechanized					
Trawlers		745	4484		3982
Others		238	604		1522
Sub-total	1026	983	5088	4510	5504
Traditional					
Motorised			14662	29395	14151
Non-motorised			25383	21956	9522
Sub-total	21718	26271	40045	51351	23673
Grand total	**22744**	**27254**	**45133**	**55861**	**29177**

a: Marine Fisheries Survey (Frame Survey) 1973-77 (CMFRI)

b: All India Marine Fishermen Census 1980 (CMFRI)

c: Rapid Census 1998 (CMFRI)

d: Marine Fisheries at a Glance 2003 (Department of Fisheries, Kerala)

e: Marine Fisheries Census 2005 (CMFRI)

Excess capacity in marine fisheries of Kerala, based on optimum fleet estimates of Ministry of Agriculture (MOA, 2000)

	Existing fleet size (CMFRI, 2006)	Optimum fleet estimate (MOA, 2000)	Excess capacity	Percentage difference
Mechanized crafts	5467	4256	1211	28
Motorized crafts	14151	13413	738	6
Traditional crafts	9522	27873	-18351	-66
Total	29140	45542	-16402	-36

Trawling, a non selective and destructive fishing practice is mainly intended for catching shrimp. Shrimp trawling is associated with large by-catch, which is discarded. In addition to this, the multiday fishing trawlers are also discarding huge quantities (approximately 1 lakh tonne/year) of low quality food fishes. Incorporation of bycatch reduction devices in their fishing gear should be mandatory and initially subsidized to popularize its usage. In states of Kerala, Karnataka and Tamil Nadu, target groups such as shrimp (16%) and cephalopods (4%) together constituted only 20% and others such as finfishes (65%) and benthic organisms 15% constituted the rest of the trawl landings. Coastal resources up to 120 m depth are subject to high intensity of fishing pressure and is exploited at levels close to or exceeding optimum sustainable limit. Problems of juvenile finfish mortality, bycatch discards and general loss of biodiversity increased with the intensification of shrimp trawling. Diversification of the existing shrimp trawling fleet for the exploitation of offshore and deep-sea resources such as high valued tunas and tuna related fishes (billfishes, pelagic sharks etc.), through long lining techniques, oceanic squids by squid jigging is considered better than introduction of more number of new vessels. Combination fishing vessels which can employ techniques such as gillnetting/hook and lines in addition to conventional trawling, to exploit high unit value resources may also be encouraged

Responsible fishing methods and practices relevant to Kerala

Guidelines associated with use and development of fishing gear and practices delineated in the Code (CCRF) focus on (i) selective fishing gear and practices, (ii) environment- friendly fishing gears (ii) energy conservation in harvesting and (iii) enhancement of resources (FAO, 1995). Specific pointers from CCRF, in responsible fishing and practices, adaptable to Kerala include the following:

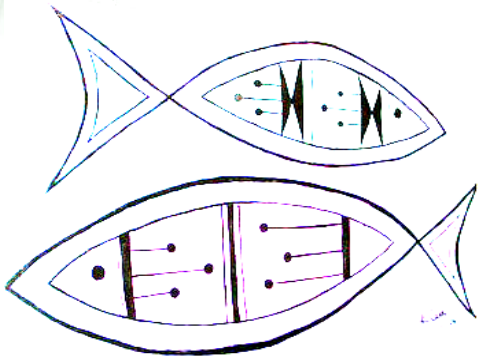
- Evolve regionalized consensus Code of Conduct for Responsible Fishing, in close participation with all stake holders (traditional, motorized and mechanized fishermen organizations), fisheries research organizations and fisheries managers.
- Take measures to control open access by strict enforcement of a system of licenses (authorization to fish) in traditional, motorized and mechanized sectors.
- Since the Coastal Regulation Zone (CRZ) notification of February 1991 and Coastal Management Zone (CMZ) notification of 2011 are in vogue, 200 meter width of coastal areas are to be statutorily earmarked as undeveloped zones, except for utilizing it for fishery related activities of the coastal fisherfolk. Various crops may be raised in the area with community participation introducing innovative farming technology.
- Identify and delimit Protected Areas in marine and inland water ecosystems.
- Periodically revalidate maximum sustainable yield of resources in the existing fishing grounds and determine fishing units in each category for sustainable harvesting of resources.
- Address the question of excess capacity squarely and take steps to remove excess capacity over a time schedule.

- Conduct periodic audit of fishing craft and gear combinations, their economics of operation and ecological impacts.
- Standardize the capacities, dimensions and specifications of fishing units in each category, particularly in the mechanized and motorized sectors. Subsidy/assistance for fishing inputs should be restricted to traditional fishermen in motorised and non-motorised sector.
- Evolve regulations for mandatory survey of mechanized fishing vessels.
- Maintain registry of all fishing vessels in waters under State jurisdiction with all essential details.
- Promote selective fishing gear and practices, which include (i) Optimum mesh size in trawl cod ends, (ii) Optimum hook size and shape for lines, (iii) Square mesh windows in trawls, (iv) By catch reduction devices in trawls, (v) Turtle Excluder Devices in trawls, (vi) Juvenile Excluder Devices in trawls, (vii) Trawl designs with improved resource specificity, (viii) Optimum mesh size for gill nets, (ix) Optimum mesh size for purse seines, and (x) Escape windows in fish and lobster traps
- Evolve an efficient monitoring, control and surveillance (MCS) system
- Effective use of Geographical Information System for fisheries management; monitoring and control of fishing effort and energy use.
- Evolve and promote a package of practices for energy conservation in fish harvesting.
- Develop ecosystem based management and capacity reduction initiatives, in collaboration with adjoining states sharing confluent and overlapping ecosystems and fishing grounds.
- Develop a Fisheries Information Portal for providing easy access to authentic information and facilitating fisheries research, management and business.
- Evolve a mandatory programme of training and certification for non-motorized, motorized and mechanized fishermen in safe navigation, responsible fishing, log keeping and reporting.

Ecosystem- Based Fisheries Management (EBFM)

The living aquatic resources are an integral part of their ecosystem and management of the ecosystem is a prerequisite for the well-being of fisheries resources. It has been widely recognized that fisheries management should adopt a broad-based spatial management strategy with the management of living resources and temporal restrictions such as closed fishing season appropriately integrated into the management regime depending upon the conservation needs of the ecosystem in question. To date, the best-known tool for EBFM is a network of fully protected marine reserves. Considering that the concept of no-fishing zone is a good strategic tool, fisheries managers in India should start working on the questions about how much of the fishing grounds should be placed in reserves, how many are needed, and where should they be. There seem to be three principles, which govern no-fishing zones.

According to the first principle, both biological and economic benefits can be maximized through closures ranging between 20 and 40 % of fishing grounds. The second principle is based on the expectation of maximization and equitable distribution of benefits through subdivision of the 20% reserve area to represent both biogeographic and ecological diversities within the reserves. The third principle stems from the question whether the derivation of maximum benefits is from the permanent or rotational reserves. Considering the location of fishing villages close to each other along the Indian coast, the selection of areas for no-fishing and the logistical, economic and social implications of dislocating and rehabilitating the fishers to fishing areas away from the reserves call for pragmatism and extreme care in planning.



Forests and forestry in Kerala

(Fundamentals)

An overview

Kerala's status as "God's Own Country" is to a large extent attributed to its rich and diverse forests, which support Kerala's economy through a wide array of products and ecological services. As per the most recent assessment by the Forest Survey of India (FSI, 2011), forests cover an area of 17,300 km2 or about 44.5 percent of the land area of the State. Although it is one of the most important natural capital of the State it is the most mis-used/ less understood resource, receiving very little investments to maintain and enhance its productivity in terms of ecological services and economic benefits. This is evident from the fact that of the 17,300km2 of forests, only 1,442 km2 or just about 8.3 percent of the forests are dense forests (defined as forests with a canopy cover of more than 70 percent). Moderately dense forests (with a canopy cover of 40 to 70 percent) account for 54.3 percent while the remaining area of 6,464 km2 (or 37.4 percent) is **open forests with only less than 40 percent canopy cover.** Giving due account to the variation in canopy cover, the effective forest cover that could fulfil the diverse functions of forests is less than half of what is reported as forest area.

Although most of the forests are under government ownership and managed by the Forest Department, the level of efforts (and investment) in managing them sustainably has been extremely negligible as evident from the preponderance of open and moderately dense forests. More particularly in most cases successive governments have ignored the "public trust doctrine" and used forests as a source of reserve land to be allocated for multitude of non-forest uses, resulting in the continuous decline in forest area. Although agriculture related deforestation has slowed down considerably during the last two decades (largely on account of declining profitability of small holder agriculture and increased opportunity on account of work-related migration to the Gulf countries), threat from emerging uses, especially real estate development, infrastructure development, tourism resorts, and so on, have increased considerably. Especially with the rapid growth of informal/ illegal economy, real estate development has registered rapid growth and forests have become a major target for land appropriation. The clamour for new investments, especially roads and other infrastructure that fragments the already depleted forests is to be seen in this context.

What will happen if the present trend continues?

If the present state of neglect persists, there will be several short term and long term consequences that will have a negative impact on the Kerala society as indicated below:

1. A significant decline in the state of watersheds in Kerala, affecting the quality and quantity of water and more important unpredictable seasonal fluctuations affecting supplies to all water dependent activities;
2. Continued loss of biodiversity that could foreclose future options, especially in developing new products and safeguarding agriculture from climate change impacts;
3. Worsening human-animal conflicts, especially in the context of declining quality of forests in providing food and water to wildlife, thus encouraging them to transgress into human habitations resulting in loss to life and property.
4. Decline in wood supplies and the increasing dependence on imports. Already there has been a significant reduction in the share of wood supplied by forests (a recent study estimates that in 2011 forests accounted for only 1.6 percent of the total wood supply, while imports was about 16.5 percent of the total supplies). Although this is justified in the context of the greater thrust given to conservation, reducing logging, in a way this also conceals the failure to manage forests more efficiently.
5. Efforts to add value to products and services have been extremely negligible and this has led to low income for communities that are dependent on forests for their livelihood.

Obviously if the present trend persists, the forest situation will decline continuously affecting the future welfare of all sections in Kerala society.

What we should strive to accomplish?

All over the world sustainable societies have strived to rebuild their natural asset base with particular attention being paid to improve the forest situation through large scale afforestation, reforestation and assisted regeneration of natural forests. There is an urgent need to augment the vegetation cover to enhance the diverse ecological services provided by forests. Japan and Korea, two of the most advanced countries in Asia and with very high population densities (349 and 488 persons/ km2 respectively in 2008) have through very systematic investments over time increased the extent of forests to 69 percent and 63 percent of their land area respectively through very focused efforts fully involving all the stakeholders. This is precisely what China is doing now by implementing one of the most ambitious forest development programmes in the world. With climate change problems becoming increasingly severe, conservation of forests and rebuilding the forest asset base will be a key thrust as regards the adaptation and mitigation strategies. Forests are already supplying a renewable, more energy efficient raw material in the form of wood that could replace more energy intensive products like steel, aluminium, glass and concrete. Efficient use of woodfuel, especially with improved devices (for example domestic scale biogasifiers) again could significantly reduce the dependence on fossil fuels, thus helping to reduce green house gas emissions.

The demographic and economic transition that Kerala will witness in the coming decades will require a radically different forestry than what it is today. Meanwhile extreme care has to be taken to ensure that forests doesn't become the new frontier for land grabs and real estate development that could severely undermine public welfare. At the same time there is also a need for increased involvement of local communities in managing forests, fully capitalizing on the much better developed local self government system in Kerala.

Considering the above Kerala should aim to accomplish the following by 2030:

i. The forest cover will be enhanced to 60 percent of the land area;

ii. Through gap planting, assisted natural regeneration and other conservation measures, the extent of open forests and medium density forests will be reduced by 50% with a corresponding increase in the extent of dense forests.

iii. Precision forestry based on a full understanding of ecological processes will be widely adopted ensuring the optimal production of ecological services and wood and other products.

iv. No product will leave Kerala without undergoing the full range of processing/ value addition adopting the latest available technologies.

v. Kerala will significantly increase its self-sufficiency as regards wood production, avoiding costly and carbon-inefficient long distance transport.

vi. Water will become a key output from forest management, and the tools and techniques of forest management will be fine tuned to fulfil this primary objective.

vii. Better management of ecosystem processes would enhance feed and water availability inside the forests, significantly reducing human-wildlife conflicts.

viii. Forestry will not be the exclusive domain of the Forest Department, but will be a people's movement with the local self government playing a critical role in conservation, development and management of forest and tree resources.

ix. There will be total transparency as regards the management of forests so that the scope for illegal activities will be drastically curtailed.

A general indication of how the above could be accomplished is given below:

Development of a modern system for real time monitoring of the state of forests

Despite the advancements in information technology and the potentials of remote sensing, our understanding of the state of resources and the changes thereof remains very limited. There is a need to have a totally independent, public domain facility to keep track of the state of forests, especially as regards land use changes, occurrence of forest fires, pest and disease outbreak and so on. A fully GPS based system should be developed to clearly demarcate the forest boundaries to ensure that there is no incursion. Every unit in charge of management of forests will be fully equipped to monitor, record and track changes of the state of forests.

Ecosystem approach to forest management

Notwithstanding the long tradition of managing natural forests, the last five decades have witnessed some of the most unscientific approaches to forest management, especially by way of large scale clearance of natural forests to establish exotic plantations to meet industrial wood demand. In the blind pursuit of a narrowly defined objective, fundamental mistakes have been made by way of violating ecological principles, undermining the provision of several ecological services. The entire system of forest management will be recast adopting an ecosystem approach, ensuring that (a) each forest is managed on the basis of a full understanding of the ecosystem processes to obtain an appropriate mix of products and services and (b) the health and vitality of forests are continuously improved. Such management will be closely linked to other land uses in the area, especially agriculture to ensure that agriculture fully benefits from the services provided by forests.

Restoration and rehabilitation of degraded forest lands:

As already indicated, vast tracts of land currently classified as forests have very low densities failing to fully tap the productivity potential. There is an urgent need to rehabilitate degraded areas so to enhance their productivity as regards wood and other products and ecological services. Much of the thrust of rehabilitation will be to revive the natural processes and the original vegetation existed earlier. Such forest rehabilitation initiatives will be linked to National programmes like MGNREGA as also taking advantage of the CAMPA funds.

Enhancing productivity of plantations already established:

Although Kerala has a long history as regards plantation management (having the credit of establishing the first teak plantation in the world in 1842), there have been major lapses in managing plantations and areas which should have provided a mean annual increment of 4 to 5 m3/ ha/ year is not producing even a fraction of that. Largely this stems from the decline in the quality of management, largely stemming from fundamental institutional deficiencies. With over 65,000 ha of teak plantations and an equal area of other species, production of wood from these plantations should in theory cater to a significant share of the annual consumption. Unfortunately this is not so in view of the extremely low productivity. There is an urgent need to implement an ecologically appropriate productivity enhancing programme to meet the emerging demand for timber and to reduce Kerala's dependence on imported wood.

A bar code based system for tracking forest products to reduce wastage/ loss:

The current system of logging, transport, storage, auction and disposal of timber adopted by the Forest Department is archaic. Timber from final felling and thinning from plantations take a long time (there are instances where los and poles rot in the forest depots) before they are finally sold in auction and removed and by that time there is considerable loss on account of quality decline. The entire system needs to be streamlined through electronic tracking, ensuring that material is sold in good condition as soon as trees are felled, so that both the government and consumers stand to benefit.

Panchayat Forestry Enterprises under Local Self Governments to manage most forests:

While forests will remain a public property, local self government institutions will play an important role in their management. To facilitate this, each Panchayat with forests within its area, will establish a Panchayat Forestry Enterprise, largely comprising members from tribal communities, women and local farmers. The structure and functions of the Panchayat Forestry Enterprises will be clearly defined on the basis of forest characteristics and the objectives of management. There may be situations where the Panchayat Forestry Enterprise will be assigned with the task of plantation management, in which case it will be responsible for all aspects of producing wood sustainably without, in any way, undermining provision of environmental services. There will also be situations where the Panchayat Forestry Enterprise will manage forests primarily for provision of environmental services. Each Panchayat Forestry Enterprise will have operational flexibility within a well-defined framework of "Dos and Don'ts".

There will be an effective system for monitoring the performance of the Panchayat Forestry Enterprises based on well-defined criteria and indicators.

Reorganization of the Forest Department

The Forest Department will be reorganized making it essentially a technical agency to provide technical and managerial support to Panchayat Forestry Enterprises and to function as an agency to continuously monitor performance of the enterprises and to pursue corrective steps. The Forest Department may also manage nationally important forests that many local bodies may find it difficult to manage in view of the limited resources. Here again the thrust will be to develop partnerships with local communities and the Panchayat Forestry Enterprises.

Much of the reinvention of the forest department will be to make it a lean and efficient technical organization, focused on technical services delivery.

Immediate priorities (for implementation during the next five years)

What has been proposed above would require considerable time to materialise and there will be innumerable challenges in their implementation, especially considering the strong vested interest in maintaining status quo and pursuing the "business-as-usual" approach. Yet, if there are no significant efforts to bring about a change or if there is more delay, the situation will continue to worsen and the earlier the action is taken to bring about a directional change in forestry, the better it is for the society as a whole. Some of the short term options that could be pursued in the next 5 years are indicated below:

1. Launch the development of a modern information system based on GIS/GPS/ LIDAR technologies to unambiguously delineate/ demarcate the forests as a first step in protecting/ conserving the forest asset base. Immediate priority in this regard will be given to the "hot spots" of encroachment, especially in Idukki, Wynad and Palghat districts.
2. Based on the above, identify the options to correct forest fragmentation that has taken place in the past and to ensure that wildlife corridors are re-established.

3. Build up a real-time forest information system that is highly transparent so that the opportunities for illegal appropriation of public resources is curtailed in toto.
4. Establish 15 Panchayat Forestry Enterprises as a pilot and develop all the plans, strategies, rules, procedures, etc. as regards their establishment and how the Panchayat Forestry Enterprises will manage the forests (including forest plantations) allocated to them. Within the next 5 years the entire system be developed, tested and standardized and at least 25 percent of the state's forest should be brought under the management of the Panchayat Forestry Enterprise. Managing forests so allocated should become an integral function of the Panchayats and all issues such as staffing, provision of facilities and regular monitoring should become an integral part of the Panchayat administration.
5. The Forest Policy and legislation will be reviewed and thoroughly revised to support the changes in management, especially to accommodate the role of Panchayats in managing forests.
6. An in-depth assessment of the state of forest plantations will be undertaken specifically focusing on their long term potential taking due account of the ecological services and a well-defined strategy for managing the plantations will be developed. Based on this at least 25 percent of the plantations (in particular Teak) will be brought under improved management.
7. Identify at least 25 percent of the open forests and implement a programme for their rehabilitation during the next five years. The entire thrust will be to promote rehabilitation of natural species in the area as also indigenous fruit bearing multiple use species that could augment food security. Adequate attention will also be given to enhance the habitat conditions of forests for wildlife so that animal intrusion to human settlements is minimised.
8. Develop protocols/ procedure for ecosystem approach to forest management based on a clear understanding of local ecological conditions. Within the next 5 years these protocols will be developed to cover all the forests and at least 25 percent of the forests will be brought under precision forestry adhering to the principles of ecosystem approach.
9. The entire system of harvesting timber, their storage and disposal will be streamlined using electronic bar-coding system to reduce potential pilferage (or other losses, especially decay on account of prolonged storage) and to ensure that timber, poles, firewood and other products collected are disposed off within three months of harvesting.
10. The functions and structure of the Forest Department should be subjected to an in-depth performance audit with a view to restructure it to transform it to a more effective professional/ technical body largely focused on providing technical support services and to monitor the performance of the Panchayat Forestry Enterprises. As such the Forest Department is a very top-heavy organization, but remains ineffective and non-responsive for several reasons.

Forest Conservation

(Actions required)

Two key areas that require major changes in forest conservation in Kerala conservation are (a) institutional arrangements for forest management and (b) the management technology. Suggestions in these regard are indicated below:

1. While forests should remain public property, its management should be handed over to Panchayat level Forestry Enterprises, largely comprising members from tribal communities, women and local farmers.
2. The structure and functions of the Panchayat Forestry Enterprises will be clearly defined on the basis of forest characteristics.
3. There may be circumstances where the Panchayat Forestry Enterprise will be assigned with the task of plantation management, in which case it will be responsible for all aspects of producing wood sustainably without in any way undermining provision of environmental services. There will also be situations where the Panchayat Forestry Enterprise will manage forests primarily for provision of environmental services.
4. Each Panchayat Forestry Enterprise will have operational flexibility within a well-defined framework of "Dos and Don'ts".
5. There will be an effective system for monitoring the performance of the Panchayat Forestry Enterprises based on well-defined criteria and indicators.
6. The Forest Department will be reorganized making it essentially a technical agency to provide technical and managerial support to Panchayat Forestry Enterprises and to function as an agency to continuously monitor performance of the enterprises.

Technology

7. The Panchayat Forestry Enterprise will manage forests and process all products using the most modern, environmentally sound and low-carbon foot-print technologies. A host of precision forestry technologies are already available and more can be developed to suit the specific needs of a particular place to fulfill particular objectives.

   The entire thrust of change in forestry will be to:

8. Strengthen the role of local level institutions with particular attention being paid to the involvement of local people (women, tribal communities and farmers) in managing forests as an integral component of local landscape.
9. Ensure that by way of local involvement, there is increased attention to fully tap the potential productivity, especially in restocking degraded areas, improved protection from illicit felling, fire and other problems.
10. Forests form an integral part of the local economy, especially through investments in local value addition.
11. A significant share of income from forests goes to local communities, especially women and members of the tribal community.
12. Democratisation of forest management from a highly bureaucratic system unable to manage forests to its full potential to a more responsive local public enterprise.

Conservation

13. Ensure one-third of the land area of the State be brought under forest as envisioned in the National Forest policy, 1988.
14. Areas with forest cover as mapped by the Forest Survey of India may be examined for their legal status and delineated to remove the discrepancies between the existing records of the Forest Department and the actual area and, also between the Forest Survey of India's maps and the actual area.
15. Exotic tree species, introduced as part of the social forestry scheme, shall be prevented from expanding to other areas curtailing natural regeneration.
16. The existing forests shall be conserved in totality and no forest shall be de-notified for any schemes including laying roads, irrespective of their public appeal.
17. Rehabilitate isolated hamlets/ villages from remote forest locations to peripheral areas, provided they are willing, ensuring proper rehabilitation packages including provision for livelihood, for consolidation of forest ecosystems.
18. The planters holding extensive lands under coffee, tea, rubber, cardamom in the high ranges and high altitude areas shall carry out assisted eco-restoration of catchments so as to improve flows and heal land degradation in a phased manner.
19. The government must appoint a team of eminent lawyers to present the cases in the High Court and Supreme Court related to violation of lease agreements, illegal custody of forest lands, fledging of leased land by the lessees, and all other violations of Forest conservation Acts
20. Forest lands leased out for plantations and located at the fringes of the forests shall be taken back for restoring ecological services, provided such lands pose threat to ecological security as assessed by appropriate technical authority to be appointed by the Government.
21. Ensure watershed and biodiversity conservation in the catchments

22. Evolve and implement an ecosystem and landscape based approach for forest management.
23. Bring steep slope of more than 30^0 under permanent forest vegetation.
24. Protect all shola - grasslands/ high altitude grass lands as reserve forest.
25. Natural flows in the forest areas shall not be prevented.
26. Promote massive eco-restoration programmes in the catchments to stabilise and to make the run off perennial from the catchments to the reservoir.
27. Ensure carbon credit for such programmes
28. People to be evacuated on account of various development projects, including dams and highways, shall be honourably rehabilitated and resettled before the initiation of the work related to development projects; such packages shall be implemented for all the existing cases arising from completed projects.
29. Restore elephant and other wildlife corridors to prevent further fragmentation of habitats**.**
30. Land between the elephant habitats under private ownership which acts as corridors for the movement of elephants (elephant corridors), shall be acquired as per the Land Acquisition Act, 1894, since it is for a public purpose.
31. Strengthen the habitat corridors being used traditionally by elephants and other wildlife, by strictly curbing tree cutting and other anthropogenic activities and, encouraging eco-restoration.
32. The Wyanad – Mysore highway through Bandipur Tiger Reserve shall be closed during night
33. Natural water holes on the traditional corridors may be maintained.
34. Make use of the Western Ghats Ecology Expert Panel Report and protect the forests and biodiversity outside the Protected Areas
35. All forest plantations should be converted from mono species to multiple species , preferably edible fruit bearing species and thus add to ecological security and the food security.
36. The Supreme Court order to declare 10 km radius of the protected area as Ecologically Sensitive Areas should be implemented without further delay
37. Implement the recommendations of the State Wildlife Board to declare the New Amarambalam and Kottyur forest area as National Park.
38. Social Forestry should consider distributing more edible fruit bearing tree species
39. Ecotourism should not be extended into the core zones of Protected areas.

40. Initiate studies to explore biodiversity within and outside the Protected Area net work and establish a system to monitor them on a regular basis and, ensure conservation of Biodiversity outside the forests also.
41. Involve local universities, research organizations, educational institutes, NGOs and local communities in the biodiversity surveys and thus build up local expert groups.
42. Private and or Public - private partnership projects shall not be allowed inside the forest areas, irrespective of their PA status. In the case of public funded researches, permission shall be given only after the scrutiny by a competent authority.
43. Identify biodiversity rich areas outside the PAs and include them within the existing PA depending on the proximity or declare them as separate Sanctuary, National Park, Conservation Reserve, Community Reserve or Biodiversity Heritage Site to be recommended by an Expert Committee.
44. Involve the Biodiversity Management Committee located around the PAs and forests in programmes related to biodiversity conservation.

Promote eco-restoration of degraded forest lands

45. The land area mapped as "forest cover" by the Forest Survey of India shall be examined on the ground to identify and delineate the degraded areas within the "forest cover".

These areas may be offered protection from grazing and other anthropogenic activities to encourage natural regeneration.

46. Degraded areas in the periphery of Protected Areas and Reserve Forests shall be identified within a definite time frame.
47. A massive eco-restoration of such areas shall be launched with full participation of the LSGs, Vanasamrakhana Samithies, SHGs, Kudumbashrees, civil societies, local communities, especially women, and public institutions.
48. No exotic species of plants shall be used in such programmes and, bird – dispersed species should be encouraged as it would help spreading of species much faster and that too without any monetary commitment.
49. Indigenous species of trees, shrubs and herbs with diverse economic, ecologic and cultural values should be preferred.
50. The respective organizations as mentioned under 50 shall be made responsible for the management of the areas under eco-restoration with the overall control, supervision and guidance of the Forest Department.
51. Periodic monitoring of the programme shall be conducted by a team to be constituted by the Forest Department and the LSG.
52. The Forest Department along with the LSGs with the involvement of civil societies shall launch awareness programmes to sensitise the public on the need for eco-restoration, especially in the context of water scarcity, climate change, ecosystem health and its sustainability and, also to discourage deforestation activities.

Forest fire

53. Preventive measures for the forest fire are to be strengthened with the total involvement of the Vanasamrakshana Samithies and other people's participatory programmes and, "encouragement awards" may be given for keeping the forest totally fire –free. NREG programme may be linked with this programme.

54. The local communities near the forest areas and educational institutions shall be motivated to undertake forest fire prevention campaigns and activities.

55. Mass media should be used to educate public about the impact of forest fire.

56. Tourism shall not be allowed in fire prone areas in summer and, the Tourism Department shall also be involved in activities related to prevention of fire in areas where tourist flow is high.

Service conditions of forest managers

57. The service conditions of the forest Guards and Watchmen should be substantially increased; they be given proper modern arms and ammunition to fight the poachers, their remuneration increased, sleeping bags and such basic requirements to live inside the forests in cold seasons should get immediate priority

58. Those watchmen who have completed 5 years of service should be made permanent. This will not cause much financial burden to the Government, provided the lease amount is increased and the delinquent lease amount is recovered

59. Those forest officers working in areas such as Marayur, Kanthanellur where risk from poachers are quite high, should be paid risk allowance and they be given life insurance at the cost of the State.

60. Local tribals should be absorbed in the forest department as Watchmen and Guards and they be appointed in the same locality

Quarrying and mining

Although it is high time to switch over to green technology, the most sought after building material in Kerala today are granite and sand. Regulation on sand mining has pushed the corporate to 'M sand' unmindful of the still worse environmental impacts. The lasting solution, probably, is to construct only minimum required buildings, strictly following green building technology. As it may not be possible overnight, some amount of mining and quarrying may be required.

Hence, recommendations are given to meet the bare minimum requirement and that too following well defined measures

1. All mining and quarrying for sand and hard rock shall be done only by the Government.
2. Delineation of prospective zones for hard rock quarrying, sand/clay mining in each district is to be carried out after geo-environmental appraisal and public hearing to be conducted by a team of experts to be appointed by the Government.
3. The existing procedures for hard rock quarrying have to be revamped to safeguard life and property of the people and workers.
4. Strict implementation of regulations for mining and quarrying in compliance with pollution control mechanism ensuring minimal disturbance to the environment.
5. Environmental clearance based on genuine mining/quarrying plan, mine safety plan, Environmental Impact Assessment (EIA) Report and appropriate Environmental Management Plan (EMP) prepared by competent authorities shall be made mandatory for allocation of sites for mining and quarrying.
6. The mining plan shall have details of proposed mining area and quantity, machineries, skilled and unskilled manpower, blast design, frequency of blast, quantity of explosives for each blast, mine/quarry closure plan etc. The mine safety plan shall be in accordance with the stipulations of Director General of Mine Safety, Govt. of India.
7. The EIA shall be carried out after obtaining Terms of Reference of the EIA from the environmental clearance authority which shall mandatorily include the impact of ground vibration, air overpressure, fly rocks on the structures, especially residential buildings, community facilities, historical structures etc in the vicinity/impact zone
8. The EMP shall address the mitigation activities to be carried out on a day to day and periodical basis as well as the final rehabilitation of the mine/quarry area. It shall also include the environmental monitoring to be carried out in the area, actions for prevention of pollution, safeguards against accidents and hazards, social responsibility statement etc. There shall be financial plan for the EMP as to the amount required for implementing the EMP, fund generation plan, fund assurance including bank guarantee for implementation of the EMP and social responsibility assurances.

9. The EMP shall be implemented concurrently with the ongoing mining operations to ensure adequate ecological restoration of the affected areas subject to the approval and under supervision of appropriate authorities like the Pollution Control Board.
10. No mining shall be undertaken in any Government owned land including revenue and purampoke land without the written consent of the Commissionerate of Revenue land.
11. A monitoring team consisting of geologist, expert in explosives, police, revenue, local environmental activists and, representative of the LSG has to visit the area of operation at definite intervals to ensure complying with the rules and regulations pertaining to quarrying and mining.
12. Discourage selective mining of high-grade ores leading to local accumulation of low-grade ores, causing environmental degradation
13. Quarrying that may lead to the destruction of hillocks and landscape of high lands shall be banned strictly and no hills shall ever be demolished irrespective of any purpose.
14. Mid-land lateritic landscapes in the northern Kerala, a characteristic ecosystem by itself, should be protected in its totality, and utilized while planning food security programmes by the concerned LSG.
15. Land owners shall have no right to sell or lease the land for the mining of rock including laterite, sand and clay. Necessary regulations shall be brought out for the same.
16. The proponents shall ensure environmentally safe disposal of the bye-products and wastes of all mining operations.
17. Quarry waste shall never be dumped along critical slopes.
18. Restoration of the mined area for tree planting, or converting the area for water harvesting/fish farming along with adequate safeguards against accidents shall be made legally bound responsibility of the miners themselves

Mining of minor minerals

19. Sand mining from rivers and river banks shall be regulated in accordance with section 9 (b) of the Kerala Protection of River Banks and Regulation of Removal of Sand Act**,** 2001.
20. Bench mark for minimum level of sand required in the river-bed to maintain the health of the river shall be fixed based on detailed studies.
21. The maximum that could be mined from each "Kadavu" in a year shall be determined by scientific agencies which shall be strictly followed without exception and, if violation is noticed, the license of the concerned person shall be cancelled immediately and renewal shall not be effected, at least, for a minimum period of five years.
22. Auditing of the sand every three years as stipulated in section 29 of the Kerala Protection of River Banks and Regulation of Removal of Sand Act**,** 2001 and Rule 30 of 2002 may be amended to make the same annually.

23. Assessment of the availability of sand may be done on a watershed basis by taking the river as a single unit and, it shall form one of the regular activities of the R&D institutions of the State, such as the Centre for Earth Science Studies, Centre for Water Resource Development and Management and, other competent organisations in the State. These organisations shall mandatorily include financial provisions in their annual plan funds for the same.
24. Innovative equitable river sand distribution systems such as Kalavara, System of Attumanal, and Neutral Distribution (SAND) should be promoted.
25. River Management Fund created as per section 22 of the Kerala Protection of River Banks and Regulation of Removal of Sand Rules, 2002 shall also be utilized to mitigate the negative impacts of sand mining and for river bank protection through vegetative measures.
26. Strict guidelines shall be formulated to control mining of strategically important heavy minerals, namely black sand (such as ilminite, monazite and rutile) and industrially important minerals, namely glass sand (white sand – silicates) and, the same may be enforced strictly.
27. Local Empowered Committee comprising representatives of Panchyat, Revenue and, civil societies shall be constituted to monitor strict adherence to the rules and guidelines related to mining.
28. While constructions should be eco-friendly as much as possible, alternative sources of sand such as paleo channel may be explored and should be assessed based on proper EIA.
29. Kerala Protection of River Banks and Regulation of Removal of Sand Act**,** 2001 may be amended incorporating sand mining from rivulets, reservoirs, floodplains, beaches, offshore and land and, provision for strict legal measures against violation of the regulations fixed by the Government from time to time in order to ensure the ecological security and functioning of the river systems.
30. The Kerala State Minor Mineral Conservation Rules, 1967 may be suitably amended considering the ecological security for sustainable development and, in the light of the National Mineral policy 1993, especially section 7.13, Mineral Conservation Act, 2006 (Central Act) highlighting environmental protection.
31. Comprehensive insurance coverage to all the workers involved in mining/quarrying shall have to be assured prior to the commencement of mining/quarrying activity.
32. Identification and promotion of alternative construction material and eco-friendly construction models and methods to avoid pressure on natural resources, mainly river sand leaving least environmental damages.

Green Energy Policy

Introduction

There is a growing demand for energy in almost all sectors such as agriculture, transport, domestic, industrial and commercial. Given the vital positive and negative impacts of energy, maximum care is needed in handling matters related to the sector. It shall be noted that, internationally, the most important thrust area for climate change mitigation is the energy sector. Efficiency improvement, conservation and greener fuels are the key words.

The present energy utilisation as well as the plans for meeting future needs is heavily dependent on fossil fuels. This is not sustainable and leads to very serious social and ecological damages. Oil will last only for 40-60 years, gas another 20 years, and coal till next century. Even as these resources are becoming scarce, competition, conflicts or even wars are possible on these last remaining resources. Unfortunately, the planners seem to be oblivious to these facts as they continue to move along the present unsustainable path. The energy use efficiency in India is among the lowest in the world. The scope for saving energy in each sector is so huge that, if realised, it will cater to the future needs in a big way.

The total energy requirement in India in 2003 was 439 Mtoe (million tons oil equivalent) as per Integrated Energy Policy (IEP-2006. Planning Commission). The IEP projects a total energy requirement of 1514 / 1823 Mtoe in 2031-32 (based on GDP growth rate of 8 /9 percent). The installed electricity generating capacity as well as the annual generation is slated to increase by about four times over the next four plan periods. Coal, petroleum products, nuclear and large hydro-electric projects are to meet the major share of the additional requirement as per the IEP.

Although the present note is mainly focused on electricity, different energy sectors are briefly discussed for a holistic understanding of the energy sector.

Transport

Transport sector is one of the major consumers of energy. The motorised transport sector in India mainly uses fossil fuels with very small share from other sources such as bio-fuels, electricity, solar energy, and hydrogen. As per IEP, we used about 120 million tons of oil in 2004-05 out of which, the internal generation was just above 30 million tons. The number of vehicles as well as the fossil fuel requirement is projected to increase manifold in the next two decades. As the internal generation is not likely to increase much, the dependence on imported petroleum products will increase heavily. This is a threat to energy security due to increased dependency on imported fuels.

The depleting fossil fuel reserves, climate change and atmospheric pollution have forced world nations to look for the following alternatives.

a) Fuel efficiency improvement is a major thrust internationally in this sector.

b) Bio-fuels are being used to replace fossil fuels which will have its impact on food production. R&D in using algae for making bio-fuels should also consider the overall ecological impact.

c) Electric vehicles can certainly be considered as a better option due to superior fuel efficiency and zero pollution on road. However, the electricity generation should exclusively be from green technologies, if this solution is to be truly eco-friendly.

d) Solar powered vehicles and hydrogen vehicles are slowly emerging.

Even if fuel efficiency as well as alternative energy sources are ensured, the transport policy and planning needs to be more holistic.

- Thrust shall be given to reduce the necessity of transportation of humans and materials through a radical restructuring of economy and governance. A fundamental policy shift towards the concept of *GRAMA SWARAJ* of Gandhiji is the need of the hour,

- Reliable and affordable public transport systems in place of private vehicles with a focus on railways, as it requires 25% less fuel than that of the road transport, is to be brought in.

Agriculture

The energy requirement in the agriculture sector is mainly for pumped irrigation. Tilling, sowing and harvesting machines also consume energy. Electricity and liquid fuels constitute the bulk of energy requirement for the sector with small contributions from wind and solar power.

In India, agriculture is one of the top consumers of energy with nearly 25 percent of total electricity consumption going to this sector apart from a large volume of petroleum products. However, as the agriculture in Kerala is dominated by cash crops with less or no irrigation requirement, the energy requirement of the sector is comparatively less in the State. The scope for efficiency improvement in energy use in agricultural sector is quite large; Bureau of Energy Efficiency (BEE) estimates that replacing the old inefficient irrigation motors with new energy efficient ones alone will result in 30 percent savings in electricity consumption for irrigation.

A holistic planning will look at reduced irrigation requirement through sustainable land use practices in tune with climatic conditions, improving irrigation efficiency through micro-irrigation technologies, watershed development activities and promoting organic farming.

Domestic energy needs

The total domestic energy needs in 2011 projected by IEP was at 192 Mtoe (million ton oil equivalent). Bulk of this is presently met from non-commercial energy sources such as firewood and cow dung. The share of electricity in 2011 was projected at 32 Mtoe, about 17

percent of the total energy needs. The projected total energy requirement in 2031 is around 272 Mtoe, with the share of electricity at 102 Mtoe, about 37 percent of the requirement, and from LPG about 20 percent.

The pattern of domestic energy use in Kerala is given below

a) 62 percent of households in Kerala are using firewood. With more efficient smokeless choolas, the need for firewood can be reduced by 40 percent and the health hazards from smoke can be avoided.

b) About 36 percent households use LPG, which is bound to increase.

c) At present only 0.6 percent of households are using biogas.

d) About 12,000 tons of wet wastes from kitchen, slaughter and fish markets are generated in the state. At least 30 percent of this can be converted through High Performance Temperature Controlled (HPTC), two chamber digesters to produce methane for cooking/heating and electricity and the residue can be used as manure. This will certainly reduce the LPG consumption.

e) Cooking habits that saves time and energy shall be promoted through regular campaigns. Pressure cookers and solar cookers shall be promoted.

f) Using electricity for cooking shall be strictly discouraged.

g) Green building technologies shall be promoted for all new constructions including smaller houses so that the total energy requirement will reduce considerably.

Electricity

The social and environmental impacts of the power sector till now are so huge that it is high time that the sector switch over to a sustainable path making a paradigm shift in its vision and deeds. The need for electricity shall be assessed on the basis of a comprehensive energy planning which in turn shall be governed by a holistic, sustainable development perspective for the nation/ states. *Given the inherent social and environmental issues with respect to the sector, electricity shall be treated as a scarce resource that has to be handled with maximum care and efficiency. Equitable access to electricity for all shall be ensured.*

Present availability of electricity and future demand projections at National level

The total installed electricity generation capacity in India as on 31-07-2012 was 2,06,456.03 megawatts as per the data available from the Central Electricity Authority (CEA). The source wise breakup is as follows.

Table 1. Break up of energy source

Source	MW
Thermal projects	1.37,386.18
Nuclear projects	4780
Hydro-electric projects	39,291.4
Renewable energy sources	24,998.46
Total	2,06,456.03

The total electricity generation in 2011-12 was 8,76,430 Million Units (MU).

As per the projections in IEP electricity requirement in 2031-32 will be 3880000 / 4806000 million units with installed capacity requirement of 7,78,000 / 9,60,000 MW (based on GDP growth rate of 8 / 9 percent). The draft national electricity plan has made demand projections of 13,54,874 MU by 2017 and 19,04,861 MU by 2022. Both these documents envisage continued dependence on conventional sources in future also. The IEP projects the thermal generation capacity to about 4,00,000 MW, hydro-electricity to 1,50,000 MW and nuclear projects to 67,000 MW by 2031-32.

The demand projections made by the authorities have always proved to be on the higher side. In the IEP and draft electricity plan by CEA the demand projections are made on the assumption that the GDP will grow at 8 / 9 percent for the next 20 years. The projection of future demand on the basis of targeted GDP growth percentage has been questioned by many experts. *Even the rationale behind the high GDP growth target itself is being questioned*.

Priorities for electricity planning

The basic priorities for electricity planning shall be:

a) Optimum utilisation of existing generation facilities
b) Reducing losses to the maximum possible extent
c) Promoting energy conservation
d) Promoting energy efficient devices wherever possible
e) For new generation, priority shall be on non-conventional sources that are less harmful to the society and ecology.

Targeted strategies for achieving the actual potential of the present system at national level:

a) Reduce the annual Transmission and Distribution loss of 2 percent from the second year of the 12th plan till the loss reaches 15 percent. Thereafter, reduce the loss further at one percent per annum to about 10 percent. (The CEA, with the help of the utilities, must immediately undertake a study to assess the actual loss on regional, temporal and sectoral basis. The detailed loss reduction plans shall be prepared on the basis of this study).

b) A participatory national campaign for energy conservation, involving the states, local self governments, educational institutions, associations of various consumer groups, NGOs and CBOs, and media shall be launched immediately with a clear monitoring mechanism and targeted savings of at least one percent per year.

c) The BEE is already labeling some of the high energy consuming gadgets. The possibility of including common low energy consuming gadgets also under labeling shall be explored and phasing out inefficient gadgets shall be planned.

d) Energy Conservation Building Code (ECBC), that has the potential to reduce electricity consumption in buildings by 30 percent shall be made applicable to all constructions in a phased manner.

The potential for savings through the above steps is larger than the present shortages, including that of the un-electrified households. Table 2 shows the true potential of the existing generation facilities.

Table 2. Potential additional electricity availability with present system

1	The total generation in 2011-12	8,76,430 MU (CEA website)
2	T&D loss at 25 percent	2,19,000 MU
3	Actual realisation at the consumer end	6,57,000 MU
4	Potential for savings through energy conservation and energy efficient devises - 15 percent of 3	1,00,000 MU
5	Reasonable demand met 3-4	5,57,000 MU
6	Savings through T&D loss reduction - 10 percent of 1	88,000 MU
7	Additional generation through enhancing thermal PLF by 15 %	1,70,000 MU*
8	Net additional availability from thermal plants with 15 % T&D loss	1,44,000 MU
9	Net additional availability at consumer end 4+6+8	3,32,000 MU

(* The plant load factor of thermal plants in 2011-12 was 73.32 percent only. It can achieve PLF above 90 percent).

Analysis of present consumption as well as future demand for various consumer categories will also establish that the additional energy requirement projected by the power ministry, the CEA and Planning Commission are on the higher side. Additional requirement for domestic sector over the next 10 years, considering total electrification and an average annual consumption of about 800 units per household (against 500-600 units at present) will only be about 1,30,000 million units. The agriculture sector shall not be allocated additional power. Efficiency improvement and reducing irrigation requirement shall be the norm for the sector.

The growth rate of demand for commercial sector is very high. A large portion of this additional demand is for extravagance that cannot be justified. Policies / plans must ensure that electricity shall not be provided for wasteful consumption. The demand for the industrial sector is growing at a faster pace. The present growth of the industry sector is unfortunately unsustainable and is ***compromising the ability of the future generations to meet their own needs.*** A thorough review of the industrial sector development along the sustainable growth path shall be carried out immediately by the Government for necessary corrective measures. The electricity demand growth for the sector then will be considerably less.

New and Renewable Projects

The potential of renewable energy sources has been grossly under estimated. . It shall be noted that in the recent past, in many countries, the investments in renewable energy projects are almost equal to or even outstripping that in conventional energy projects. In India, the targeted capacity addition during the 11^{th} plan from conventional sources was 78,000 MW and the target for renewable sources was 14,000 MW. While the achievement in capacity addition of conventional plants during 11^{th} plan is about 60 percent at about 50,000 MW, the achievement in RES is more than 100 percent at 14,600MW. If the actual potential of the present system as discussed earlier is realised, most of the additional requirement can be met with new and renewable sources. The importance of decentralised renewable sources with respect to T&D loss reduction shall also be considered.

The draft electricity plan by CEA gives the potential for wind projects in India at 45,000 MW. However, independent studies project a much larger potential for on-shore wind itself. The Jan-Apr 2011 issue of Green Energy by WISE shows wind potential for 2030 at 1,08,079 MW, if a moderate growth is targeted. With an advanced strategy, it could be 1,60,741 MW.

The Jawaharlal Nehru National Solar Mission's (JNNSM) projection of solar energy in 2031-32 is 1,00,000 MW and that for 2050 is 2,00,000 MW. The recent trends in solar energy sector suggest that solar energy is likely to reach grid parity very soon. It is pertinent to note that the cost of solar power has already come down to well below Rs. 10 per unit and will continue to come down further. In the second batch of 1^{st} Phase of Jawaharlal Nehru National Solar Mission, 350 MW capacity projects were auctioned for an average price of about Rs 8.75/ unit, with the lowest price being as low as Rs.7.49/ unit. Internationally the cost of solar panels has come down by 40 to 50 percent in 2011.

With the green initiatives, all the just demands over the next 10 years can be met with a maximum additional generation of 3,00,000 MU from new projects. Most of the additional demand can be met with renewable energy sources.

Electricity Scenario in Kerala

The total installed capacity availability for Kerala is more than 4,500 MW and the average annual generating capacity from these plants is more than 22,000 million units. The details are provided in table 3.

Table 3. Generating capacity of power sector in Kerala

Sl No.	Source	Installed capacity in MW	Av. anuual generation in MU
1	Hydropower	2000	7000+
2	Thermal stations	770	5000+ (@75% PLF)*
3	Central generating stations (CGS)	1700+	9650 (2012-13 allocation)
4	Wind and small IPPs	57	190
5	Total		22,000 (approx)

*(The targeted generation from the thermal plants for 2012-13 as per the order of Kerala State Electricity Regulatory Commission (KSERC) is only 847 MU, due to high cost of more than Rs.9 / unit. Purchase of 1,599 MU from traders is scheduled as the cost is generally less than that of thermal stations)

The maximum peak demand during last summer was around 3,500 MW. The projected electricity demand for 2012-13 is 19860MU.

Future demand

The demand for electricity in Kerala has been growing at an average of about 4.5% over long term. At shorter periods there has been higher growth at some periods; lower or even negative growth at certain periods. The growth in demand in the first decade of this century was less than 3% (from around 12,750MU in 2000-01 to 16,665MU for 2009-10). However, the demand growth between 2005-06 and 2009-10 was around 7 %.

The demand growth in Kerala in the last decade was mainly restricted to domestic and commercial sectors with industry or agriculture showing very little growth in demand. As the state is now almost totally electrified, the rate of growth in domestic sector due to new connections is likely to slow down. However, the actual per household consumption has been increasing over the last few years. It is expected that the latest tariff revision will result in slight reduction in demand. The high growth rate in commercial sector is likely to continue unless the government restricts wasteful energy use in that sector. A few major projects and growth in IT sector are likely to increase industrial electricity demand in the next 10 years. Some additional demand for railway traction is also expected. Long term scenario should look into the possibility of electrical vehicles replacing fossil fuels.

Considering the demand growth trends over the last decade and the expected development scenario in the state, the demand in electricity in the present decade is likely to grow at around 5 - 6% at *business as usual scenario*. Based on the actual consumption of 14,547.89 MU in 2010-11 and a growth rate of 6% over the next decade, the consumption and demand at 15 percent aggregate technical and commercial loss (AT&C loss) in 2016-17 and in 2021-22 is provided in the table below.

Table 4. Demand at *business as usual scenario*

Sl. No	Year	Consumption	Demand
1	2016-17	20636.46 MU	24278.19 MU
2	2021-22	27616.24 MU	32489.69 MU

The state authorities arbitrarily project very high future demand of about 6,000 MW by 2020 and suggest new thermal projects / capacity addition in existing projects to the tune of about 4,000 MW and hydel projects to the tune of 500 MW.

New large hydro-electric projects are not feasible in the State on socio-ecological considerations. The government's move to go in for a number of small hydel projects in the private sector should also be thoroughly reviewed and considered case by case subject to local conditions and status of the catchment or sub catchment. Details of each of these projects shall be subjected to public scrutiny and, only those projects that are socially, ecologically and economically acceptable and feasible shall be considered. ***Private sector shall not be promoted in energy sector.*** With the cost of imported LNG set to increase considerably along with increasing crude oil price, cost of electricity from thermal plants like the Cheemeni project, if implemented, will also be very high.

The proposed thermal and hydel power projects, if implemented, will result in additional energy availability of more than 27,000 million units. However, the additional energy requirement over the next 10 years, even at business as usual model, will be about 12,500 MU only. With green initiatives, the additional requirement will only be about 8,000 MU.

Before embarking on large capacity addition programmes, the bitter experience of the thermal stations in the state should be evaluated.

a) The five thermal power projects in the state with a total installed capacity of 771 MW were commissioned between 1997 and 2001.

b) At present, the two diesel plants with a total installed capacity of 234 MW are generally operated only during peak hours, that too at about 100 MW capacity only.

c) The NTPC station at Kayamkulam, with an installed capacity of 360 MW is running at about 150 MW capacity during summer.

d) The Kochi BSES plant of the Reliance group is mostly shut down. The KSE Board is incurring about Rs. 350 crores annually by way of fixed costs for BSES, KPCL and Kayamkulam plants.

e) Between June 2004 and November 2007, the total combined generation from Kayamkulam and Kochi BSES plants was less than two percent of its installed capacity.

f) During that period, KSEB paid Rs.820.49 crores as fixed charge, wheeling charges etc to these stations.

g) The cost for maintaining the thermal plants is taking a heavy toll on the finances of KSEB. ***The responsibility for this unnecessary expenditure lies squarely with the planners.***

h) If the capacity addition plans of the authorities are pursued as such, it will certainly lead to a similar situation with a much larger financial burden.

Priorities to meet future demand

In Kerala also the consumption as well as the demand including peak demand can be brought down considerably with energy conservation measures and with the introduction of energy efficient devices.

a) The scope for energy conservation through campaigns alone (involving the student community and the civil society) is estimated at not less than 5%. The Energy Management Centre (EMC) has projected huge potential for savings for various consumer groups.

b) The shift from conventional bulbs to CFL has reduced consumption in the state. As LED lamps are slowly coming to the market, it is time now to move from CFL to LED lamps. This can reduce both peak demand and actual consumption considerably. Similar scope exists for many other devices such as fans and motor pumps. Industries can also reduce their consumption through various measures including variable speed devices.

c) The government / KSEB shall consider providing incentives for shifting to energy efficient devices for all consumer categories. The potential for reducing consumption through energy saving devises has to be assessed. However, a 10 percent reduction can safely be predicted.

d) The AT&C (Aggregate Technical and Commercial) loss for the current year, as proposed by KSEB, was 17.7 percent. However, the loss in LT lines will be higher as the loss in HT / EHT section is comparatively less. Also, the loss during peak hours will be still higher. Despite, The KSEB has still not conducted proper studies to assess the actual loss, inspite of the repeated directions from KSERC. The KSEB shall immediately take steps to assess the actual loss from transformer level, with sufficient samples for specific loss figures during peak hours. The AT&C loss should be targeted to be reduced to 12 percent by the end of 12^{th} plan (2016-17).

With a conservative estimate of 10 percent reduction in consumption through energy conservation campaigns and introduction of energy efficient devices and by bringing down the

AT&C loss to 12 percent, the consumption and demand in 2016-17 and 2021-22 can be brought down as indicated in table 5

Table 5. Demand with green initiatives

Sl. No	Year	Consumption	Demand
1	2016-17	18,572.81 MU	21,105.47 MU
2	2021-22	24,855.62 MU	28,245.02 MU

There is scope for improving the efficiency of hydro-electric stations that can enhance the electricity availability by at least a few hundred million units. ***Re-forestation of degraded catchments of the hydel projects will improve the summer river flow and provide more water to the reservoir.***

In Kerala, the potential for wind energy was put at 600 MW by State Planning Board. However, with the emergence of smaller wind energy models that can work at wind velocities as low as 7 m/sec, the actual potential is expected to be substantially higher. Wind availability is estimated at 1,000 MW. Small wind turbines (of about 1 kilo watt capacity) can be installed for domestic needs at sites with sufficient wind velocity. Wind / solar hybrid systems are also possible.

State Planning Board had estimated that about 300 MW can be generated using biomass.

The savings of about 8 tones of firewood with improved choolas in 4 lakh households in the State (about 5 percent of total households), if converted into electricity through Panchayath level biomass gasifiers of 500 KW each, can generate 500 MW of electricity.

The diesel power stations at Kochi and Kozhikode are generally operated during peak hours only. It has been suggested that city waste of Kochi and Kozhikode corporations can be converted into electricity using the idle capacity of the two stations and this will have the added advantage of safe waste disposal.

On the long term, solar energy has to be in the central stage in Kerala too. Kerala gets good solar irradiation for about nine months in a year. Land availability and cost are said as the main obstacles in solar energy development. If roof top solar is promoted, the land issue can be overcome.

Roof top solar potential in the state is around 30,000 MW. At 1.2 MU / MW the annual energy available from roof top solar systems will be 36000 MU. If solar trackers are used, the generation will be higher. Floating solar panels over reservoirs / back waters can be considered after a thorough EIA. It has been suggested that solar panels can be installed over major roads including national and state highways.

As solar energy is not available round the clock, storage facilities have to be developed to ensure continuous availability of power. Storage is possible by generating hydrogen in day time and using that hydrogen to generate electricity during night. Investing in invertors can

also help in storing solar energy. As and when electric vehicles become popular, their batteries can be used to store solar energy.

Many solar applications are already cost effective and steps to promote them can go a long way in meeting the additional energy requirements.

a) The Government shall make solar water heaters mandatory for institutions such as hospitals, hostels, and hotels that need large volume of hot water.

b) Providing solar PV/ hybrid with solar and wind or solar and bio-mass energy is technically and economically most viable option for the remote areas. (Commercial solar energy establishments quoting Rs.40,000.00- Rs.50,000.00 per household for a few lights, a DC fan and a 14 inch B&W TV)

c) The Government must launch a programme with definite time-frame to establish Solar PV/ PV-wind hybrid systems in all government/ public offices and educational institutions to meet their electricity needs. LED lighting shall be part of the package so that the capacity requirement will be lower.

d) Street lights shall be shifted to (grid interactive) solar energy in a phased manner.

e) It shall be made mandatory that new constructions including houses must adhere to energy efficiency standards and, produce part of their energy requirements on their own through renewable sources.

f) The government shall restrict the supply of grid connected electricity to Large commercial establishments to the minimum and, bulk of the requirements should be met by their own through solar/ wind technology.

g) Advertisement hoardings shall not be supplied electricity through the grid; it should be generated by the respective companies through green technology.

h) In order to tackle the issue of disposal of used solar panels, it is proposed to collect a small cess on solar energy generated.

Meeting peak demand

The best option to tackle the peak demand is to reduce peak demand by:

a) promotion of decentralised solar power,

b) use of more CFL and LED lamps, and

c) Intensive campaigns for the same through TV channels and other media.

Although, technically hydro projects are at distinct advantage over other conventional sources with respect to peaking operation, the cost factor is not attractive for many new projects. When stations are planned as peaking stations, the installed capacity for the project will be several times higher than the firm power potential. Hence, the plant load factor (PLF) will be very low. At the proposed hydro-electric projects like Athirappilly and Pathrakadavu, the PLF

is so low that the cost of electricity even without considering the ecological and environmental cost will be unacceptably high at more than Rs 10 per unit. .

Apart from the ecological impacts of the hydel projects on the reservoir and upstream area, the aquatic ecosystem in downstream will also be severely affected by the intermittent flow due to peaking operation. The downstream water use will also be severely affected.

Providing solar inverters to commercial establishments with a condition that power from the inverters should be used during peak hours, can reduce the peak demand on the grid. Last year, the market price was between Rs.50,000.00 -60,000.00 for 1 kW inverter having three hours backup (consisting of 200-250 AH battery and solar panels to charge this battery). Scaling up the cost is likely to be still less. The urban centers shall explore the possibility of setting up units of 1 kW to 10 kW capacity solar inverters on a pilot basis on commercial complexes; on a cost sharing basis with 20 percent subsidy by the KSEB, 10-20 percent upfront contribution of the consumer and the rest as loan which can easily be paid back by the consumer with the savings from electricity bills. This will reduce the peak power demand from the grid for 3 hours for about 9 months in a year and will result in improved voltage levels and reduction in distribution loss.

The short term cost of electricity from traders, especially during peak hours in summer is very high in the southern region (S1 and S2), whereas it is lesser in other regions of the country. With the southern states slated to be integrated with the national grid in early 2014, the rates are likely to reduce.

Green Energy Corporation

It is proposed that the government shall form a Green Energy Corporation (GEC). It shall come under the environment portfolio. The corporation shall be responsible for promoting energy conservation activities. New and renewable energy sector shall be under the GEC. R&D activities shall be carried out / supported by the GEC. ANERT and EMC shall be brought under GEC. Green Energy Companies at LSG level with shares held by the residents of the panchayat only shall function as the second tier of GE Corporation. This company should *inter-alia* install high efficiency smokeless stoves, set up biogas plants, install and maintain SPV units and solar water heaters, run biomass based gassifier power stations, and do energy auditing. In short, it can provide total sustainable energy solutions.

A green squad consisting of 10 youngsters should be trained and maintained at the Panchayath level to do home services on non-conventional energy resources.

Housing

The objective of a housing policy should be to ensure a livable house to every citizen in a hygienic surrounding to live on. However, this basic concept of a house has taken a destructive course considering construction as a mode of investment and not as a instrumentality of utility and, an expression of social status or sign of amazing wealth, however, vulnerable it may look.

The attitudinal shift in building construction has landed up in spending enormous quantities of natural resources such as sand, steel, cement, rock, wood and other housing material, most of which are common properties. In addition, they consume enormous amount of energy, release large quantities of carbon dioxide, and use wasteful construction practices. Moreover, the flourish of the construction boom following this technology has made the construction material more dear in the market, and made an irrevocable dent on the natural resources, apart from creating enormous environmental problems. Ultimately, a house for an ordinary citizen remains a dream, especially to those who do not have a piece of land for the same.
In this background, a housing policy to provide reasonably comfortable housing to all citizen in the State in clean, hygienic and healthy surroundings, following green building technology and energy efficient design, lay out and construction material is to be formulated and strictly enforced.

1. Ensure minimum housing facility for all citizens limiting its size considering the scarcity in space and resources
2. Introduce rationing of land space and resources for housing separately for rural and urban areas
3. A system to determine the maximum size of a house depending on the strength of the family shall be evolved for both the rural and urban areas separately and those above the prescribed limit shall not be permitted
4. Bring out clear guidelines for green construction as given in the box below. And, the State Government should bring out a building code which *inter-alia* should stipulate that all constructions in the state shall follow green technology.
5. Such a guideline should curb luxury, as housing should be need based and not affordability based. The latter would encroach into the housing needs of thousands of houseless people.
6. One individual shall not own more than one house
7. Ceiling on land mortgage loans shall be restructured, to control unbridled construction boom and also land speculations

Green building guidelines

a. use of maximum renewable and natural resources and minimum energy and water;

b. improved building envelope and system design;

c. reduction or elimination of toxic and hazardous substances in facilities, process and their surrounding environment;

d. improved indoor air quality and interior and exterior environments leading to increased human productivity, performance and better health;

e. selection of materials and products that minimize safety hazards and cumulative environmental impacts;

f. increased use of recycled content and other environment – friendly products;

g. salvaged and recycling of waste and building materials created during construction and demolition;

h. prevention of generation of harmful materials and emissions during construction, operation, and decommissioning/demolition;

i. implementation of maintenance and operational practices that reduce or eliminate harmful effects on people and the natural environment

j. reducing the maintenance cost to the minimum possible and, minimising individual housing spaces, based on the need of the society at large.

8. Construction of houses following the Green guidelines shall be encouraged by fixing reduced tax for the house and lower interest on loans taken for such construction.

9. An assessment may be made to find out the reason for as many as 11,89,144 houses in the State (5.86 lakh in rural area and 6.03 lakh in urban area) are lying unoccupied (as per the Census of 2011) and find out how such unoccupied houses could be made use of and, how such situations could be averted in future.

10. It appears almost 80% of homes newly constructed are investments, mostly for speculative sale. Many own 2, 3 or more houses.

11. Legal provisions shall be made vesting the LSG/Revenue Department to take possession of the houses lying vacant for more than two years and utilize them till the period when the owners demand them for their stay.

12. House is a fundamental need and, hence speculative investment in housing shall be discouraged.

13. Make a concerted effort to distribute minimum land to construct a house to the landless with a definite time target.

14. All land sales shall be through only the government.

15. Real estate business has to be totally stopped in Kerala, if the wetlands, paddy lands and forests of the State are to be protected and food security ensured
16. Adopt stringent measures against violation of the provisions of the Land Reforms Act, 1963 and, excess land owned by anyone shall be taken over and distributed to the landless within a definite time frame.
17. Assignment of land to the forest inhabiting tribes shall be completed within a year in accordance with the Recognition of Forest Right Act, 2006.
18. Steps shall be taken to augment implementation of the provisions of the Land Reforms Act, 1963, incorporating such amendments as may be required considering the social changes that have been taking place since the last four decades of coming into force of the Act, with a definite time frame.
19. Proper rehabilitation programmes for the slum dwellers and squatters shall be developed and implemented with a definite time frame. Constructions for the same shall be eco-friendly and should blend with the surroundings.
20. Demarcate clear zones for infrastructure in each LSG protecting productive agriculture lands and ecologically sensitive areas such as wetlands, grasslands, forests, sacred-groves, and coastal ecosystems
21. Promotion of strategies for the decentralization of urbanization through the establishment of satellite cities and townships with the necessary infrastructure facilities and job opportunities.
22. Buildings shall not allowed to be constructed on revenue porampoku lying along either side of the natural course of water flow. And, also across the water flow. Such revenue porampoku shall be delineated.
23. A restriction on high rise building shall be imposed limiting the height to be within the green cover which shall become an essential part of the Guidelines for building constructions to be prepared and implemented as mentioned under 3.1.2 of the present policy.
24. Buildings shall be constructed without damaging the landscape and ecology of the area.
25. Housing colonies, which should be climate friendly and, friendly to the children and aged, on villa concept with maximum of three-storey with common facilities, play ground, biogas plant, water harvesting and recharging, energy efficient and non-conventional energy systems, shall be encouraged
26. All public buildings, existing and under construction, shall necessarily adhere to energy, water and other resource conserving technologies and practices.
27. Ensure the quality of water supply and provision for adequate sanitary facilities in all cities and towns, commercial centres, industrial establishments and rural residential areas.
28. Encourage planting of shade, fruit-bearing and ornamental trees on the roadside, in

market places and commercial centres, school compounds, hospitals, offices, places of worship and other public places and provide incentives and recognition for the same.

29. Establish parks and gardens in urban and rural public places for public use and for the promotion of environmental awareness
30. Vegetable gardens should be made compulsory in the compounds of all housing colonies and also in the premises of individual houses
31. Promote cultivation of medicinal plants in home gardens and private farmlands.
32. Bio-fencing shall be encouraged wherever fencing is required
33. Restriction of pavement to facilitate infiltration of water.
34. Preparation of Environmental Impact Assessment and Environmental Management Plan for activities such as development of new, housing flats, townships, industrial units/clusters, settlement colonies, major highway projects, commercial complexes, hotel complexes, hospitals, and office complexes.
35. Prevent environmental degradation and resulting health problems, related to communicable and non-communicable diseases, by educating the people on personal hygiene, sanitation and the use of pure drinking water.
36. Prevent spreading of communicable diseases by creating awareness on individual community hygiene.
37. Strict vigilance and action by concerned local authorities in villages, towns and cities for the speedy removal and disposal of all accumulating rubbish, waste and garbage, and for keeping the surroundings of human dwellings and places of activities, as clean and neat as possible.

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Solid waste management

1. Introduction

Kerala as a society and as a State was known for its achievements in health sector which was even comparable with status of economically developed Nations as well. It was a result of concerted effort from all sectors, strategic interventions and education through well perceived programmes and projects.

It is a tragedy that the same State is reeling under the issue of solid waste which is nullifying the hitherto achievements in the field of health and sanitation. Though the issue of waste in Kerala is the same which is felt across the country or across Asia even across the rest of the world, unfortunately it is more visible in Kerala just because of the contrasting features of social development in Kerala. More than this, a sensitive society in a place having the maximum outreach and connectivity through media also contribute to this visibility. High density of population and rapidly growing consumerist culture aggravate the situation.

We need to recognize that Kerala is not alone in fighting the issue of waste; even fighting just inside the political boundary of Kerala will not solve the issue of waste completely, since most of the materials discarded here are not produced in Kerala.

2. Background

Kerala witnessed half a dozen persistent resistance and people's movement against waste dumping or waste processing plants. Laloor in Thrissur may be the oldest struggles in Kerala followed by Njeliyanparambu (Kozhikkode), Vadavathoor (Kottayam), Chakkumkandam (Guruvayoor), Vilappilsala (Thiruvananthapuram) where people still continue fighting waste dumping / processing. Vilappilsala in Thiruvananthapuram showed Kerala, the power of people, who resisted political, police and judicial decisions to continue waste dumping.

Media reports on these issues made people more sensitive to issues related to waste in Kerala and waste dumping - no matter how small it is – was seen as dangerous, which unfortunately made it impossible to design and implement any kind of waste management system in Kerala.

Political leaderships, officials and consultants need to be blamed for this scenario, since their callousness and short sighted plans made technically viable plants a failure. Non transparent deals, autocratic planning and centralized facilities which invariably failed, made people to lose trust in Governments.

Very little efforts have been for confidence building process and those projects and programmes which were partly successful are also called off, that too at a wrong time.

The Government is now toying with fancy hi-tech , high cost, centralized large scale plants for treating and disposing waste in Kerala, which will be a big failure again. The technology, approach and strategy now proposed in Kerala were proved failure in India and outside. Still political leadership believes it will work. Newly proposed Waste to Energy plants , although with seemingly good intentions, appear to follow wrong directions which are actually violating all norms and rules.

3. Initiatives

Many LSGs in Kerala experimented solving the issue of waste. Some of them became successful at least in handling organic waste. The learning from these success stories pointed out three essential components; Decentralized facilities, Public Participation and Capacity building. These findings were key in shaping the strategy and action plan for Malinya Muktha Keralam by Kerala Suchitwa Mission. Kerala Suchitwa Mission was successful in laying the foundation for a progressive and sustainable action plan for solving waste and recovering resources in Kerala. The major achievements of KSM in this regard were;

1. ***Institutional Mechanism***: There were no institutional mechanism available for planning, implementing and monitoring waste management project. KSM helped creating systems within LSGs for this and helped to create Technical Support Groups at all levels of LSGs.
2. ***Standards for choosing and applying technology***: Technology vendors and suppliers often confused the LSGs in planning their waste management projects. KSM took a bold step in standardizing the technologies suitable for Kerala and came up with guidelines which helped LSGs in decision making and planning. This avoided exploitation by service providers and kept away end of the pipe solutions like incineration based technologies from Kerala.
3. ***Action plan with sectoral approach and milestones***: An action plan and policy for Kerala was formed with the leadership of KSM which had deep routes even in Gramasabhas.

4. Reason for Failures

1. Hesitation from newly formed LSGs to utilize the facilities and guidelines offered by KSM

2. Plant centric approach of LSGs, where they set up the plant first without investing on capacity building, behavioural change communication etc. The result was piling up of mixed waste in so called “Plants” which sent a wrong message about waste handling

3. Incomplete planning by LSGs where they planned only for organic materials leaving behind the non bio degradable discards un-attended.

4. Inconsistent campaigns also broke the trend set by KSM.

5. Improper Management of compost /biogas plants by LSGs and beneficiary groups

6. Reluctance of officials in following timeline in implementing plans

7. Reluctance from service providers in following State guidelines.

8. Dismantling of KSM, its processes, institutional mechanisms and standards by the Government.

9. Change in Government by going for centralized waste management plans especially waste to energy.

10. Political stakes

5. The Way forward

a. Revive and reschedule the action plan of KSM for Malinya Muktha Keralam
b. Reinstate / reconstitute the institutional mechanism for supporting planning, implementing and monitoring waste management projects
c. Set up regional Resource Recovery Parks supported by LSG level Resource Recovery Centres to recover non- bio degradable discards
d. Mobilize rag pickers / waste traders and integrate them into the waste management programmes. (Pune Municipality Model)
e. Build capacity in women / men SHGs involved in waste management programmes to convert them as service providers / technical supporters
f. Enforce ban on disposable plastic products throughout the State.
g. Initiate ward level or sector level composting / sorting facilities and minimize the load on common facilities
h. Make it mandatory for all commercial establishments and institutions to have own facilities for disposing bio degradable discards.
i. Launch a on going campaign to make a qualitative change in approach of people
j. Build confidence in public by walking the talk; make it compulsory for all elected representatives and government officials and government institutions to have own disposal facilities for organic discards.
k. Make it mandatory for all Government institutions to have material recovery facility to store sorted non-bio degradable discards.
l. Implement E-Waste (M&H) Rules in the State.
m. Develop regional sanitary landfills to manage rejects / residual discards. There should be transparency and mechanisms to ensure that only inerts / rejects / residuals are going to the landfill site.
n. Scrap all Waste to Energy Plants and other incineration based technologies.

o. Put in place action plan for phasing out / restructuring existing problem afflicted waste management plants
p. Compensation and rehabilitation programmes for people affected by waste dumping.
q. Develop unified Public Health Act for Kerala

6. Employment / Economic Opportunities

Malinya Muktha Keralam will generate more sustainable and small scale livelihood opportunities in Kerala, such as:

1. Local level service providers and technology consultants for homes and institutions on solid and liquid waste management.

2. Recycling and reprocessing industries.

3. Alternate products manufacturing.

4. Hiring service units to replace disposable cups and plates with reusable plates and cutleries.

5. Establish organic food outlets

7. Legal Framework

Develop a Legal Framework suitable for Kerala which will provide for effective measures and penal action for preventing unscientific waste management. The frameworks should consider EPA, MSW (M&H) Rules, and other national and international norms.

There should be provision for implementing Extended Producer Responsibility in at least selected commodities or materials.

Transportation

Kerala already has one of the best network of roads compared to other states for its size; about 1, 51,652 km, of which 1542 km is National Highways. The website of the Emerging Kerala itself boasts of the advantage that Kerala has, on its road connectivity. It says "*It is one of the most connected states in India*" and that "*Kerala's road density is 417 km/100 sq km and it is far ahead of the national average of 10.39 km/100 sq km. The length of road per lakh population is 509.23 km; much higher than the national average of 321.3 km.*" In such a well connected State, the natural question would be: whether we require any more additional links - rail, road or sea, or whether present routes and corridors are optimally.

The reality is that the roads in Kerala are not optimally used, because of the pathetic conditions of many of the roads. They need not only a face lift, but a through repair solving the frequent need for repair, and also addressing the needs with the changing times , shifting climates, adaptation to global warming, friendliness for the elderly, children and the differently disabled. Kerala is also one of the few States with the highest densities of vehicles. There are 53,97,652 registered vehicles, of which 9,01,663 are cars, 4,66,135 auto rickshaws, 32,17,204 motor cycles, 1,58,106 buses. There are three airports, one major and 17 non major ports in Kerala. Infact the maximum time to reach an airport in Kerala from any point is only 3 hours.

Developing the transport systems, needs to have a very detailed look at the present transportation infrastructure, and the actual need. While agencies such as NATPAC does such studies, it is seen that the pressures of exotic looking projects – such as mono-rails, high-speed corridors, express highways, elevated highways – many of them in PPP and BOT models take away the sense of ground realities – both social, local economic as well as environmental. This invariably ends up these projects in controversies, that later gain the banner of being "anti-development" while in reality it is probably "anti-nature", "anti-social" and even uneconomical.

General considerations

1. All development of transport systems in Kerala should be environment friendly and shall not damage landscape and local ecological features. No new roads, railways or airports shall be laid through or sited on ecologically fragile zones, natural forests, wetlands, paddy lands and mangroves

Roads

2. All existing roads should be improved to provide efficient and safe transportation and to reduce consumption of fuel, traffic congestion and environmental pollution. All roads under the various Panchayaths, PWD and NH which are in poor condition should be repaired on a war-footing and made weather proof with a guarantee for at

least 10 years. Bridges and Culverts in dangerous condition should also be repaired / replaced instead of going for high investment new corridors and roads.

3. Public transport system should continue to be run by the Public sector, and should be subsidised, considering the burgeoning fuel cost.
4. Renewable energy and non-polluting transport systems should be introduced, especially Compressed Natural Gas (CNG) for vehicles in a phased manner. Strict enforcement of pollution control norms needed.
5. While the existing roads through the forests, wetlands and mangroves may be maintained well, no new roads or rail lines shall be permitted at the cost of these ecosystems.
6. Landscape shall not be altered while laying roads (example: by demolishing hills, raising bunds across water bodies, rivers and streams). Where essential transport facilities have to be provided across water bodies, appropriate bridges may be constructed so that the ecosystem functioning will not be affected. Encourage transportation of material through suitable means such as water, rail and pipeline in place of road.
7. Develop transportation infrastructure including roads which does not adversely affect the environment during construction or operation.
8. BOT arrangements for construction of transport facilities should be done away with, as they infringe on the fundamental right of travel, and are irrational, foster corruption and drain the public funds.
9. Road democracy may be established, on the basic tenet that road is a public space.
10. Considering the possible increase in the number of vehicles and the limitations in widening roads, it is inevitable to effectively control the vehicular population by strengthening public transport systems and reducing/regulating private vehicles. Appropriate programmes and legislations have to be brought out similar to those in developed but land-scarce nations like Singapore.
11. The use of bicycles should be promoted in urban areas, as has been done in France and UK. User friendly pedestrian and cycle tracks should be part of urban roads.
12. The concept of climate and eco-friendly road must be made mandatory.
13. All roads should be planned ergonomically, while maintaining existing heritage structures and trees as far as possible, and ensuring rainwater run offs either harvested or used for re-charge.
14. Roads should compulsorily have drains and ducts, user friendly foot paths, avenue trees, preferably fruit bearing indigenous species such as neem, mango, jack, tamarind and ficus. Since roads are one of the sources responsible for heating up micro-climate, such avenue trees play a vital role, apart from their other functions.

15. Roads already in use shall be converted to climate and eco-friendly, and all the more road- friendly, in a phased manner.
16. Strict enforcement of updated traffic laws/rules for the safety of users and the passengers.
17. Enforce strict rules and regulations for environmental safety while transporting dangerous and hazardous materials.
18. Speed brakes and such measures as traffic holidays based on local conditions and expert studies, especially in the case of forests and PAs, are required to be taken to avoid threats to wildlife.
19. Enforce regulations on cases such as overhead wires, construction of arches and, fixing of advertisement hoardings across and in the proximity of roads.
20. The High-speed North-South Express Highway in whatever name is seen to be detrimental to the sustainability of the State and unnecessary and has to be fully avoided.

Railways

21. Given the geography of the state, Kerala's main artery lies north – south which can be efficiently met through the existing railways. Multimode transport with top priority for railways shall be promoted as the fuel needs for railways is less than 25 percent of that for road transport. There are additional benefits such as reduced atmospheric pollution, lesser need for additional roads with obvious social and ecological benefits, faster and safer transport, reduced financial burden on transport and also reduced negative health impacts due to travel.
22. The target shall be to have four track railway facilities over the next ten years. The outer tracks shall have short distance passenger trains whereas the inner tracks can have faster express trains and goods vehicles. With modern signalling system the average speed could be as high as 100 KMPH and never less than 40-50 KMPH, even for passenger trains. These should be laid, widening along the present lines, without much damage to the habitats.
23. The proposed Express Rail Corridor project is not the compelling need of the State and, should be rejected outright considering chiefly, the enormous capital investment that it requires, running cost, affordability of the public, the extent of land required (approximately 3500 acres) and, above all, the irrevocable damage that it would inflict on the ecology, environment, natural beauty and aesthetics and the social fabric of the State.
24. Efficient bus connectivity shall be provided from railway stations, mainly in east / west direction.

Airports

25. Kerala does not require any more airports – neither at Aranmula nor even Kannur.

26. Good Air buses should be provided from all existing airports to towns across the State to transport passengers, after assessing traffic and air timings.

Water ways

27. Develop inland water transport facilities using cleaner fuel such as CNG, LPG or powered by solar system which are cost effective and energy saving.
28. All the existing 17 ports in the state shall be renovated and upgraded for facilitating water transport.
29. National waterways should be completed from Trivandrum to Manjeswarm on priority.
30. Provide incentive for transportation through backwaters, canals and river systems.
31. A switch over from road to rail and water ways has to be adopted for transporting goods.

Long-term considerations

32. Moreover, two basic conceptual changes have to be adopted to ensure minimum additional land requirement for infrastructural development, thereby saving the natural resource base and, to make transport facility affordable for all classes of people. Firstly to reduce the necessity of transportation of humans and materials through a radical restructuring of economy and governance, essentially making every single Panchayath self-sufficient to the extent possible as preached by the Father of the Nation. Secondly make sure more efficient use of fuel, vehicles, roads and railways and, promote public transport system and discourage, as much as possible, private vehicles for individuals.

Recommendations for Immediate consideration

33. A minimum required road and other transport facilities may be worked out for the next 25 years, considering the population growth and the accompanying demands, ecological fragility of the land and the trends in the diminishing cultivable area, changing climate, new priorities – such as increasing fuel costs, pollution and needs of the changing demographic patterns.
34. An independent committee consisting of experts in transportation, scientists, environmentalists and expert landscape planners should be constituted to study the present systems, and suggest future needs and projects considering the social, economic and environmental conditions of Kerala. The committee should have wide consultations with all sectors of the public and other experts before coming up with recommendations.
35. The major transportation projects presently under consideration such as high speed rail corridors, north-south express highways, and mono-rails should be put on hold till a proper evaluation is done by the said committee.

Industrial development

In general, the industrial policy of the State should address prioritising and promoting projects that would help meet the basic requirements of the larger sections of the society through least possible damage to the environment. It should be realised that the ecological and environmental situation in Kerala is not best suited for large scale industries. The State is best suited for agriculture.

1. There are not many large scale modern industries in Kerala. Those in existence are not the least suited for the situation in Kerala. Polluting petroleum industries are not suited because of the intensively inter connected water ecosystem.
2. Electricity and water guzzling industries shall not be encouraged in the State
3. Light engineering industries which yield more employment and generate more value per unit of energy and unit of capital are to be consciously promoted, provided they could be environment-friendly. There are a large number of light engineering products being used in Kerala which are manufactured outside..
4. A very large number of consumer products are being imported in the State, alternatives can be manufactured locally, if they are environment friendly.
5. The State and the people should have a slogan ‘produce locally, buy locally, consume locally.
6. Each panchayat should establish locally feasible companies such as the following with people as stakeholders:
    a. Green Energy Company
    b. Local Economy Company to produce consumer goods
    c. Agro-Service Company
    d. Social Service Company
7. Traditional industries of Kerala, such as coir, handloom, cashew, wood based, bamboo and other fibre based, food-agriculture-milk based , ceramic based industries are to be promoted adhering to environment-friendly norms and techniques

8. At no cost shall we encourage investment-friendly industrial initiatives; it shall only be environment-friendly and people-friendly
9. Provision of incentives to environment friendly technologies involving recycling and reuse of wastes and the conservation of natural resources.
10. Insist on the installation of effluent and emission treatment plants in the industrial units and mining Those continually violating existing rules and regulations shall be closed down and shall be made responsible for ensuring alternative jobs for the workers and also to make compensation to them
11. Operation of the 'polluter pays' principle shall be strictly adhered to and punitive measures be taken against those industries who exceed permitted standards by charging them with effluent tax and resource tax.
12. Special Economic Zones shall not be permitted, especially at the cost of wetlands and paddy lands and in the Western Ghats region. Those demarcated shall be revisited.
13. Industrial units should be decentralised, as far as possible, to the Panchayath level and should be run by the Panchayth and people. Involvement of Corporate bodies shall be discouraged in such ventures
14. Ensure setting up and running of industries adhering strictly to the environmental guidelines.
15. Strict enforcement of pollution control norms by Pollution Control Board in various types of industrial units, depending upon their process/technologies and pollution potential; particular attention being paid to highly polluting industries.
16. Strict implementation of the treatment required for industrial effluents and solid waste disposal/management.
17. Common effluent storing/treatment facilities in industrial estates.
18. Regular monitoring of the quality of the industrial effluents, solid and gaseous emissions, and prompt action on complaints by the local people.
19. Incentives and recognition to industries for effective pollution control and reduction of wastes.
20. Establish green belts in the vicinity of/around industrial establishments.
21. Formulate regulations and enforcement of norms in respect of auto emission. Encourage the use of environmentally benign automobiles/motor vehicles and up-gradation of emission standards for automobiles in urban areas initially and in phases over the whole State.
22. Prepare 'on-site emergency' plans for hazardous industries and off-site emergency plans for districts in which hazardous units are located.
23. Setting up of Environmental Cells in industries for implementing Environmental Management Plans and for compliance with the requisite environmental laws.

24. Incorporation of the costs for environmental safeguards as an integral component of the total project cost.
25. Dissemination of information to the local public and workers on hazardous substances and measures to ensure safety of workers and people.
26. Promote zero industrial waste generation technology.
27. Formulate effective methods of treatment facility to deal with e-waste in IT industry and households.

വ്യവസായ മലിനീകരണം (Industrial pollution)

കേരളം വ്യവസായവൽക്കരണ പ്രക്രിയയിലേക്ക് പിച്ചവയ്ക്കാൻ ആരംഭിക്കുന്നത് 1934-ലാണ്. അത് എറണാകുളം ജില്ലയിലെ ഏലൂരിൽ ഇന്ത്യൻ അലുമിനിയം കമ്പനി സ്ഥാപിച്ചുകൊ ാണ്. കേരളത്തിൽ ഉൽപ്പാദിപ്പിച്ച വൈദ്യുതി ഉപയോഗിച്ചു തീർക്കുന്നതിനുവേ ിക്കൂടിയാണീ കമ്പനി സ്ഥാപിച്ചത്. പിന്നീട് 1943-ൽ FACT, HIL, IRC, TCC, കോമിൻകോബിനാനി തുടങ്ങി ഒട്ടേറെ വ്യവാസായ സ്ഥാപനങ്ങൾ ഏലൂരിൽ സ്ഥാപിതമായി. കൂടുതലും രാസാധിഷ്ഠിത വ്യവസായങ്ങൾ. അങ്ങിനെ 280 ഓളം വ്യവസായങ്ങളുമായി ഏലൂർ - എടയാർ മേഖല കേരളത്തിന്റെ വ്യവസായ തലസ്ഥാനമായി മാറി. അതോടൊപ്പം കോഴിക്കോട് ജില്ലയിൽ സ്ഥാപിച്ച മാവൂർ ഗ്വാളിയോർ റയോൺസ്, തിരുവനന്തപുരം ജില്ലയിലെ ട്രാവൻകൂർ ടൈറ്റാനിയം പ്രൊഡക്റ്റ്സ്, ഹിന്ദുസ്ഥാൻ ലാറ്റക്സ് ലിമിറ്റഡ്, കൊല്ലത്തെ കേരള മിനറൽസ് ആന്റ് മെറ്റൽസ്, ഇംഗ്ലീഷ് ഇന്ത്യാ ക്ലേ, IRE തുടങ്ങിയവയും കേരളത്തിന്റെ വ്യവസായ പ്രവർത്തനത്തിന്റെ മുഖമുദ്രകളാണ്. മറ്റൊരു പ്രധാന വ്യവസായമേഖല പാലക്കാട് ജില്ലയിലെ കഞ്ചിക്കോടുള്ള പഴയ വ്യവസായ മേഖലയും പുതിയ വ്യവസായ മേഖലയുമാണ്. ഈ ര ിടത്തുമായി 45 ഓളം ഇരുമ്പുരുക്ക് വ്യവസായങ്ങൾ പ്രവർത്തിക്കുന്നു. കൂടാതെ ടെക്സ്റ്റൈൽ, ഡൈ തുടങ്ങിയ വ്യവസായങ്ങളും ഉൾപ്പെടെ 400 ഓളം റെഡ് കാറ്റഗറി വ്യവസായങ്ങളും ഉ ്. കൊല്ലത്ത് ചെറുതും വലുതുമായി 3200 വ്യവസായസ്ഥാപനങ്ങൾ സ്ഥിതിചെയ്യുന്നു. അതിൽ 250 എണ്ണം റെഡ് കാറ്റഗറിയിൽ പെട്ടതാണ്. ആലപ്പുഴയിൽ 2500 ഓളം സ്ഥാപനങ്ങൾ പ്രവർത്തിക്കുന്നു. കേരളത്തിൽ ആകെ 25000 ത്തോളം ചെറുതും വലുതുമായ സ്ഥാപനങ്ങൾ പ്രവർത്തിക്കുന്നു. കൂടാതെ 1500 മെറ്റൽ ക്രഷർ സ്ഥാപനങ്ങൾ പ്രവർത്തിക്കുന്നു. കേരളം എന്ന കൊച്ചു പ്രദേശത്ത് വിന്യസിക്കാവുന്ന വ്യവസായ സംരംഭങ്ങൾ ഇതിനകം സ്ഥാപിതമായിട്ടു ുന്നാണ് എന്റെ പക്ഷം.

വ്യവസായ മലിനീകരണം

വ്യവസായ മലിനീകരണത്തിന്റെ പ്രത്യക്ഷ ഉദാഹരണമായിരുന്നു മാവൂർ. പ്രകൃതിവിഭവങ്ങൾ അത്യാർത്തിയോടെ ചൂഷണം ചെയ്യുകയും വെള്ളവും വായുവും കരയുമെല്ലാം അമിതമായി മലിനീകരിച്ചുകൊ ് രോഗാതുരതയുടെ ഒരു പരമ്പര തന്നെ മാവൂർ സൃഷ്ടിച്ചു.

ഏലൂർ - എടയാർ മേഖലയിലെ 75 വർഷത്തെ വ്യവസായ പ്രവർത്തനങ്ങൾകൊ ് കേരളത്തിന്റെ ജീവനാഡി എന്നു വിശേഷിപ്പിക്കാവുന്ന പെരിയാറിന്റെ താഴെ ഭാഗവും കൊച്ചി കായലും ഉൾപ്പെടെ ഭീകരമായി മലിനീകരിക്കപ്പെട്ടു. ആയിരക്കണക്കിന് മത്സ്യത്തൊഴിലാളികൾക്ക് ഇതുമൂലം ഉപജീവനം മുട്ടുന്ന സ്ഥിതി സംജാതമാവുകയാണ്. നിരവധി മത്സ്യഇനങ്ങൾ അപ്രത്യക്ഷമായി. കരയും, വെള്ളവും, വായുവും അത്യപകടകരമായ രീതിയിൽ മലിനീകരിക്കപ്പെട്ടു. രോഗാതുരത കേരള ശരാശരിയേക്കാൾ വളരെ ഉയർന്ന നിരക്കിലേക്കായി. ഇതെല്ലാം വസ്തുതാപരമായും ശാസ്ത്രീയമായും തെളിയിക്കുന്നു 14 ഓളം ആധികാരിക പഠനങ്ങൾ. 1999-ൽ അന്താരാഷ്ട്ര പരിസ്ഥിതി സംഘടനയായ ഗ്രീൻപീസിന്റെ പഠന പ്രകാരം ലോകത്തെ 35-ാമത്തെ മാരകവിഷമേഖല, ഇന്ത്യയിലെ മൂന്നാമത്തെ മാരകവിഷമേഖല, 2009-2010-ലെ കേന്ദ്ര പരിസ്ഥിതി മന്ത്രാലയത്തിന്റെ പഠനപ്രകാരം ഇന്ത്യയിലെ 24-ാമത്തെ ഗുരുതര മലിനീകരണ പ്രദേശം. സർക്കാർ പഠനപ്രകാരം രോഗാതുരത കേരളത്തിനേക്കാൾ കൂടുതൽ എന്നിങ്ങനെ ഒട്ടേറെ വിശേഷണങ്ങൾ. ഇങ്ങനെ തിരുവനന്തപുരം TTP യാണെങ്കിലും, കൊല്ലത്തെ KMML ആണെങ്കിലും, ആലപ്പുഴയിലെ ഡൈ യൂണിറ്റുകളും മാക്ഡവൽ കമ്പനിയാണെങ്കിലും, പാലക്കാടുള്ള വ്യവസായ മേഖലയാണെങ്കിലും അതീവ ഗുരുതരമായി മലിനീകരണ പ്രശ്നങ്ങൾ നിലനിൽക്കുന്നു.

എന്താണ് പരിഹാരം?

കഴിഞ്ഞ $7^1/_2$ പതിറ്റാ□ ുകാലത്തെ വ്യവസായ പ്രവർത്തനം ചില സുപ്രധാന ചോദ്യങ്ങൾ ഉയർത്തുന്നു

1. കേരളത്തിന്റെ വ്യവസായ വൽക്കരണ പ്രക്രിയയുടെ മുന്നുപാധി നിശ്ചയിച്ചതിൽ നമുക്ക് പിശക് പറ്റിയിട്ടു□ ാ?

2. നമ്മുടെ ഭൂപ്രകൃതിയെയും കാർഷിക ഉൽപ്പന്നങ്ങളെയും വേ□ വിധത്തിൽ പരിഗണിക്കാതെയുള്ള വ്യവസായ നയം ആർക്കാണ് യഥാർത്ഥത്തിൽ ഗുണം ചെയ്തത്?

3. പ്രാദേശിക സമ്പദ്വ്യവസ്ഥയും തനത് വ്യവസായങ്ങളും വേ□ വിധത്തിൽ പരിഗണിക്കപ്പെട്ടോ?

4. അശാസ്ത്രീയമായ വ്യവസായ പ്രവർത്തനംമൂലം പരമ്പരാഗത വ്യവസായങ്ങളും തൊഴിലിടങ്ങളും (മത്സ്യമേഖല ഉൾപ്പെടെ) എല്ലാം എന്നന്നേക്കുമായി നഷ്ടപ്പെടുന്ന സാഹചര്യം ഉ□ ായിട്ടില്ലേ?

5.കുറഞ്ഞ ഭൂവിനിയോഗവും കുറഞ്ഞ മലിനീകരണവും എന്ന യുക്തി ഭദ്രമായ നയങ്ങളിൽ നിന്നും നാമെങ്ങനെയാണ് വഴിമാറിയത്?

ഈ ചോദ്യങ്ങൾ ഉള്ളിലിട്ടുകൊ□ ുവേണം നമുക്ക് പ്രശ്നപരിഹാരമെന്ന തലത്തിലേക്ക് എത്താൻ.

എന്റെ നാളിതുവരെയുള്ള ഇടപെടലുകളിൽ നിന്ന് എനിക്ക് ബോധ്യമുള്ള ചില കാര്യങ്ങൾ ഞാൻ മുന്നോട്ട് വയ്ക്കാം.

1. കേരളത്തിലെ എല്ലാ ജില്ലകളിലും വ്യവസായങ്ങളും ഹൈറൈസ് ബിൽഡിംഗുകളുമായി ബന്ധപ്പെട്ട് വളരെ സമഗ്രമായ ഒരു വാഹകശേഷി പഠനം (ക്യാരിയിംഗ് കപ്പാസിറ്റി സ്റ്റഡി) നടത്തണം. അതിന്റെ അടിസ്ഥാനത്തിലേ ഇനി വ്യവസായ സംരംഭങ്ങൾ അനുവദിക്കാൻ പാടുള്ളൂ.

2. കേരളസംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ് സമ്പൂർണമായും അഴിച്ചുപണിക്ക് വിധേയമാക്കുക.

എ. ചെയർമാനായി PCB ഉദ്യോഗസ്ഥരല്ലാത്തവരെ നിയോഗിക്കുക. നിഷ്പക്ഷരായ ശാസ്ത്രജ്ഞർ, IAS, IPS ഉദ്യോഗസ്ഥർ ഇവരെ പരിഗണിക്കാം.

ബി. ബോർഡിലുള്ള ട്രേഡുയൂണിയൻ, രാഷ്ട്രീയ ഇടപെടലുകൾ പൂർണമായും ഒഴിവാക്കുക. രാഷ്ട്രീയപാർട്ടികളുടെ നോമിനികളെ ബോർഡിൽ നിയോഗിക്കുന്ന രീതിയും ഒഴിവാക്കുക.

സി. PCB യുടെ പ്രവർത്തനത്തെ നാലു വിംഗുകളായി തിരിക്കുക. വ്യവസായത്തിനും പരിസ്ഥിതി സംരക്ഷണത്തിനുമായി ഓരോ ജില്ലയിലും ഓരോ ചീഫ് എഞ്ചിനിയർമാരുടെ നേതൃത്വത്തിൽ പ്രവർത്തനം നടത്തണം. അതുപോലെ മുൻസിപ്പൽ സോളിഡ് വേസ്റ്റ് കൈകാര്യം ചെയ്യുന്നതിനായി ഒരു ചീഫ് എഞ്ചിനിയറുടെ നേതൃത്വത്തിൽ പ്രത്യേകം സ്ക്വാഡ് ഉ□ ാകണം. ആശുപത്രി മാലിന്യങ്ങൾ കൈകാര്യം ചെയ്യുന്നതിനായി ചീഫ് എഞ്ചിനിയറുടെ നേതൃത്വത്തിൽ മറ്റൊരു വിംഗ്. ഇ-വേസ്റ്റ് കൈകാര്യം ചെയ്യാൻ മറ്റൊരു വിംഗ്. അങ്ങനെ ഓരോ മേഖലയിലും പ്രാവീണ്യമുള്ളവരായിരിക്കും അത് നയിക്കുന്നത്. ചെയർമാനും മെമ്പർ സെക്രട്ടറിയും പ്രവർത്തനങ്ങൾ ഏകോപിച്ചാൽ മതിയാകും.

ഡി. അതുപോലെ മലീനീകരണം ശ്രദ്ധയിൽപ്പെട്ടാൽ സ്പോട്ടിൽ ശിക്ഷിക്കാൻ കഴിയുന്ന വിധത്തിൽ PCB യുടെ പ്രവർത്തനത്തിൽ മാറ്റം വരണം (മോട്ടോർ വാഹനവകുപ്പും മറ്റും ചെയ്യുന്നതുപോലെ)

ഇ. വ്യവസായ മലിനീകരണവും PCB യുടെ പ്രവർത്തനങ്ങളും നിരീക്ഷിക്കുന്നതിനായി പരിസ്ഥിതി പ്രവർത്തകരെക്കൂടി ഉൾപ്പെടുത്തി സംസ്ഥാനതലത്തിൽ Pollution Monitoring Committee രൂപീകരിക്കണം.

എഫ്. ഓരോ പ്രദേശത്തും വ്യവസായ മേഖലയിൽ ഏലൂർ - എടയാർ മേഖലയിൽ സുപ്രീം കോടതി നിരീക്ഷണ സമിതി രൂപീകരിച്ച പ്രാദേശിക പരിസ്ഥിതി കമ്മിറ്റിയുടെ മാതൃകയിൽ അധികാരത്തോടുകൂടിയ പ്രാദേശിക കമ്മിറ്റികൾ രൂപീകരിക്കുക.

3. എല്ലാ നദികൾക്കും നദീതട അതോറിറ്റികൾ രൂപീകരിക്കുക.

4. വ്യവസായ മാലിന്യങ്ങൾ അടിഞ്ഞുകൂടി നാശോന്മുഖമായിക്കൊ□ ിരിക്കുന്ന പെരിയാർ അടിയന്തിരമായി പുനരുജ്ജീവിപ്പിക്കുക. മത്സ്യത്തൊഴിലാളികൾക്കു നഷ്ടപരിഹാരം നൽകുക.

5. പെരിയാറിന്റെ തീരത്ത് രാസവ്യവസായങ്ങൾക്ക് സമ്പൂർണ നിരോധനം ഏർപ്പെടുത്തുക

6. എല്ലാ വ്യവസായ മേഖലയിലും പരിസ്ഥിതി ആഘാത പഠനം നടത്തുക.

7. നദീതീരങ്ങളിൽ നിന്ന് 5 കി.മീ. മാറിയേ എന്തു വ്യവസായങ്ങൾക്കും അനുമതി നൽകാവൂ.

8. ജലമലിനീകരണ നിയന്ത്രണനിയമവും വായു-പരിസ്ഥിതി സംരക്ഷണനിയമവും കാലോചിതമായി പരിഷ്ക്കരിക്കുക.

9. PCB അക്രഡിറ്റേഷനുള്ള എല്ലാ ലാബുകൾക്കും NABL അക്രഡിറ്റേഷൻ നിർബന്ധമാക്കുക.

10. നാഷനൽ ഇംപ്ലിമെന്റേഷൻ പ്ലാൻ നടപ്പിലാക്കുക.

Proposed Kerala State Green Land Policy

Vision

Ensure food, water, housing, fuel, livelihood security and basic living amenities to every citizen of the State, maintaining sustainability of the ecosystem in harmony with the integrity of landscape.

Preamble

The longevity of any civilization is decided by the capability of the land it occupies, while the land capability by itself reflects on the ecological security, the integrity and interaction of lives, life supporting and ecological process of the system. Therefore, land use should essentially fine tune human requirements with the living, changing landscape maintaining the ecological capital and planning a development paradigm harvesting the ecosystem benefits with equity and sustainability.

This being the fundamental tenet of land use, the State of Kerala is under unmistakable threat from an imminent eco-catastrophe that would make life miserable for the people, especially the downtrodden. The unscientific land use unmindful of the indubitable impacts that throw on the land itself and the lives it sustain, the historical lack of societal control on the land management and, conversion of land as the most sought after commodity for amassing material wealth have lead to the present scenario where the land is debilitated, production plummeted, water resources depleted and contaminated; landlessness continues to haunt while land mafia flourishes.

Of the 38.86 lakh ha of the total geographical area of the State, only 2.68 lakh ha is food crops (6.86%), out of which paddy land forms 2.47 lakh ha (6.35%). The area under coconut-dominant mixed crops is 7.6 lakh ha (19.63%), while that of mixed crops 5.1 lakh ha (13%) and forest 8.8 lakh ha (22.72%). Plantations consisting of rubber, cardamom, coffee, tea, cashew and pepper cover 6.5 lakh (16.5%). The total built up area is 1.54 lakh ha (3.96%), out of which residential area is only 0.36 lakh ha. (More details on land use are given in box 1).

Against the 40 lakh tones of rice required annually, the State could produce hardly six lakh tones currently. Conversion of paddy land and other food crops into cash crops appears to be the major reason. Total paddy land during 1957 was 7.63 lakh ha which went up to 8.81 lakh ha in 1975 only to be plummeted to 2.34 lakh ha in 2011. Similar decline was noticed in other food crops also; tapioca from 2.14 lakh ha to 0.75 lakh ha and, pulses from 0.48 lakh ha to 0.04 lakh ha during 1957 and 2010 respectively. As against this, rubber which was only in 0.6258 lakh ha during 1953 went up to 4.7 lakh ha in 1999 but shrunk to 3.51 lakh ha in 2008 and again went up to 5.25 lakh ha in 2010; coffee which was confined only to 0.1261 lakh ha in 1953 extended up to 0.85 lakh ha in 2010. Most paddy lands were converted into rubber,

banana, coconut, areca and tapioca, affecting not only the rice production but also the hydrological cycle of the area thus affecting the productivity of the adjacent areas.

The rise of plantations in the high ranges debilitated the ecology of Kerala, as they came up at the cost of gorgeous rainforests that clad the high ranges giving salubrious climate, copious rain, store and regulate flow; birth to 41 west flowing rivers and thus playing a vital role in the hydrological cycle linking the highland, midland and coastal areas that lay the foundation for sustainable development in Kerala. Moreover, since the micro-climate and soil fertility is greatly influenced by the land use, the plantations certainly have had adverse effects on this count as well. Value of the natural ecosystem services would exceed many a times than the profits accrued from the plantations.

Drinking water has become scarce in many parts of the state, contrary to the expectations that the State would have surplus water because of the high precipitation, as much as 3000 mm; many of the rivers in the State have become seasonal. Over exploitation of the remaining water for domestic and industrial uses, pollution from industrial effluents, chemical pesticides used in the plantations and other catchments, sewage/solid waste from industries, municipalities and corporations pose serious threat to clean water availability. It is ironical that instead of taking all out efforts to make available the cleanest water for the citizens as promised in the Constitution, monopolies have been encouraged to sell water to them, that too at a cost more than that of milk till recently. Paradoxically, in some cases ground water is exploited for the same; making water, the fundamental requirement of life, almost unavailable to the local community. And, today one of the biggest financial burdens of the LSGs is the supply of drinking water to water-thirsty localities.

Wetlands, the cradle of civilization, has been treated as wastelands and reclaimed for profit making ventures, knowing little that they are the most productive ecosystems in the world. At this point it is to be mentioned that the one indispensable aspect that should be considered before launching any profit making industries at the cost of forests and wetlands is that these two ecosystems, at the present extent of them, offer an intangible service worth a minimum of Rs.1,34,172 crores annually to the State and, our agriculture and life depend solely on it. These unnoticed services are more than the annual revenue income of the State (Rs. 68,924 crores during 2012 - 2013). Yet, they are punished, often for the profit of a few.

It is rather unfortunate that the remaining wetlands are all polluted at various levels. Industrial effluents, domestic wastes, chemical pesticides and fertilizers are the culprits. Green revolution, introduced as a solution for hunger, failed miserably to solve hunger on long-term, but ended in contaminating the environment; the soil lost its vitality, the once rich biodiversity in the agro-ecosystem disappeared and, the air, water and food got increasingly contaminated leading to various health hazards. The Alwaye – Eloor industrial belt and the cashew plantations in the villages of Kasaragode remain as representative monuments of human blunder in its attempt to boost industries and agricultural productivity respectively in the State.

Sand and clay mining and, quarries for various resources from the highlands, midlands, and coastal areas, mainly for helping the construction boom, have made serious inroads into the ecosystem fabric of the State, leading to innumerable environmental problems, affecting mainly the common people. While one has to welcome the industrial growth for the essential

commodities, those that violate safe guard measures and preying upon the essential natural resources of the State on which every citizen has a right, cannot be tolerated. Kerala with its nature of terrain, soil and climate is predominantly and par eminently suited for agriculture. It would be unwise to convert this land for fast track development focusing on resource intensive industries. The highland, midland and coastal zones with all its vegetative features are all vital interconnected organelle forming the body of the God's own country. Let us depend on them for our own sustainable existence by harvesting the ecosystem services that they render to us. Our development paradigm must undergo a drastic change keeping the ecosystems as Natural Capital investment of the State and interweaving the welfare measures on the interest that they offer as ecosystem services.

This is particularly pertinent in the context of global warming and the climate change. Although India's share of Green House Gases is much less compared to that of the developed nations, it just cannot escape from the devastating effects of global warming and climate change. One imminent threat, apart from the climate change that the country is already facing, is the sea level rise, predicted to be 1.5 m by 2050, and the subsequent loss of land area and property in the coastal belt, incursion of sea water into the rivers and their disastrous consequences on agriculture and drinking water.

Housing, another fundamental requirement of life, is not yet available to 7.1 lakhs families, of the 334 lakh population of the State, as per the census report of 2011. More sadly, 3.33 lakh houseless people do not have a bit of land to construct even a tiny dwelling place, as the land itself is not available to them; not because the land is not available; it is just not affordable to them. Thanks to the booming land sharks.

Out of the 7.1 lakh houseless people, 3.72 lakh have land but could not build a house, because of the scarcity of material at affordable price. A harsh reality driven by the force of affluent class by their investment in construction sector for roaring profits! Ironically enough, there are 11,89,144 houses in the State lying vacant as per the 2011 Census. This is mainly because; house is not treated as a place for living, but a commodity to make lucrative business and investment.

The non- affordability of housing material and land for house building, coupled with the lack of land for cultivation for those who cultivate reflects seriously on the social justice. Equity and availability of land for a house to dwell and adequate land for farming to increase productivity have to be ensured. It may also be noted that there are lands under private and public possession being underutilized for primary production, seriously impairing the State's possibilities of increasing production of food and other necessary agriculture products.

This warrants a serious rethinking of making it obligatory on the part of the land holders to invest their land for primary production; to meet at least partial requirement of their own families and substantially help the State to supply food to those who do not have this essential capital, the land, only on which food can be produced. This highly decentralised approach will not only take care of food production on the ground but also ensure that land is not misused for other non-priority purposes, such as real estates, shopping complexes, and business establishments as an investment option.

While the Land Reforms Act of 1963 was effective in re-distributing land, a follow up of the Act has been missing all these years, resulting in fragmentation of the food producing lands (wetlands and mid-land hills), characterised by paddy lands, homesteads and plantations. Along with fragmentation, the commercial utilisation of land as a resource for exploitation (such as mining, large shopping complexes, malls, special economic zones, tourism resorts, golf courses, and demands like airports as a private enterprise) has also taken priority over food production, leading the Gods own country as a State with a great social "model" to boast off, masking the food and ecological insecurity.

These, essentially, are to be seen in the context of the national policies on the various global trade regimes, in the wake of Free Trade Agreements and WTO, quite unmindful of their indisputable debilitating effect on the State's economy. *Therefore, Kerala needs to place high priority in its development paradigm to make its agriculture and livelihood sustainable.* The Food Security Act that is being discussed also does not appear to yield even a glimmer of light to the perennial food scarcity of the State. The promise that was made by the First Prime Minister of India, that Kerala's food requirement would be taken care of by the Centre and that the State should focus more on cash crops to bring in foreign exchange, is no more valid. The open competition is all set to wipe its plantations and cash crop economy. The problem will be compounded by the Centre's inability, even with the best of its efforts, to extend adequate support for Kerala's increasing food needs, as more and more States are being protectionist and do not like to part off the food they produce. Kerala will, certainly, have to take the daunting task of tending for it in the future. It may not be fully possible. Nevertheless it may not be impossible for the State with the kind of its natural resources, traditional wisdom and human resources to reduce the dependency on the neighbours for food, provided there is a strong determination among the public and a reorientation of its priorities.

The land use policy presented below reflects on all these vital issues concerning the people of the State, especially the downtrodden, to give at least a semblance of justice to the dream of the Father of the Nation on a socialist society and, the social justice ensured in the Constitution of India. The success of the green agenda, uncompromisingly required for our survival, lies very much on how prudent the land is ustilised.

Definition of land

Oxford Dictionary defines land as "the surface of the earth that is not sea." This definition is expanded by the FAO to cover explicitly all physical features of earth including the human settlements and the resultant modifications brought on to the land. Definition of the FAO (1994) has further been refined as follows for the purpose of this policy.

"Land encompasses the entire earth surface other than sea, but covering all attributes of the biosphere immediately above or below this surface, including near-surface climate and soil; terrain forms such as wetlands, rivers, rivulets; near-surface sedimentary layers and associated groundwater reserve; all biotic elements and, human settlement along with the accompanying past and present physical changes such as terracing, water storage or drainage structures, roads, and building."

Objectives of the Policy

1. Ensure a piece of land and a small house for the landless in the State
2. Formulate a land use policy that would assure the fundamental requirements such as food, water, livelihood, housing, and minimum amenities of life to all, ensuring social justice
3. Ensure the arrest of bourgeoning land mafia in the State to ensure social justice
4. Provide adequate information to evolve a Master Plan for the land use in Kerala for the next 25 years
5. Ensure public awareness on land use focussing on land and water conservation, food security and ecological integrity

Functions of land

Land is:

*the basis for life support systems through the production of biomass that provides food, fodder, fibre, fuel, timber and other biotic materials for human use, either directly or through animal husbandry including agricultural and inland and coastal fishery (**the production function**).*

*the basis of terrestrial and gene reserves for plants, animals and micro-organisms, above and below ground (**the biotic environmental function**.*

*the source and sink of greenhouse gases and form a co-determinant of the global energy balance: reflection absorption and transformation of radioactive energy of the sun and of the global hydrological cycle (**the climate regulative function**).*

*the source for regulating the storage and flow of surface and ground water resources, and influences their quality (**the hydrological function**).*

*the storehouse of raw materials and minerals for human use (**the storage function**).*

*having a receptive filtering, buffering and transforming function of hazardous compounds (**the waste and pollution control functions**).*

*the physical basis for human settlements, industrial plants and social activities such as sports and recreation (**the living space function**).*

*a medium to store and protect the evidence of the cultural history of mankind and a source of information on past climate conditions and past land uses (**the archive of heritage function**) and.*

*the space for the transport of people inputs and procedure, and for the movement of plants and animals between discrete areas of natural ecosystems (**the connective space function**).*

Adopted from FAO (1995)

Table 1. Land use in Kerala

Category	Area in km^2
Built up land	1537.99
Paddy	2468.53
Paddy reclaimed for other crops	936.3
Paddy reclaimed for residential area	22.01
Paddy - fallow	391.49
Plantations	19500.63
Semi-evergreen/Evergreen forest	6792.44
Deciduous forest	1964.8
Forest plantation	1293.51
Degraded land under plantation crops	341.9
Underutilised/degraded notified forest	240.93
Grassland	171.22
Land with scrub	1438.03
Land without scrub	92.93
Mining/Industrial wastelands	20.24
Barren rocky/sheet rock area	334.50
Coastal sand	11.52
Sands/riverine	27.90
Water bodies/wetlands	1279.06
Total	**38865.93**

Source: Kerala State land Use Board (based on 1:12,500 scale using IRS-LISS IV (P6) satellite data

Policies

Major policies to accomplish the various agenda set out in the preamble are listed below.

1. *Provide adequate land for ensuring food and livelihood security*
2. *Ensure and enrich availability of water through appropriate land use.*
3. *Ensure minimum housing facility for all citizens limiting the size considering the scarcity in space and resources.*
4. *Ensure clean and healthy living environment in urban centres.*
5. *Ensure adequate land for public utilities such as education, health, entertainment, markets, play grounds, public space, parking areas and recreation.*

6. *Ensure adequate land for industries promoting local economy without harming the environment.*
7. *Regulate pollution of land, water and air from industrial, residential and other establishments.*
8. *Regulate tourism ensuring protection of landscape and local culture and, conservation of ecosystem and biodiversity.*
9. *Evolve an ecosystem approach to biodiversity conservation and forest management ensuring and enriching down steam ecological and livelihood sustainability.*
10. *Ensure transport facilities without damaging landscape and ecology.*
11. *Maintain landscape of the area to ensure ecological security and sustainable development.*
12. *Extend a hassle-free, transparent and accountable service to the public on all matters related to land*
13. *Prepare a Master Plan for Land Use in Kerala*
14. *Implement the Land policy in a time bound manner*

Policies, Strategies and Action plans

Policy 1

Provide adequate land for ensuring food and livelihood security

Strategy 1: Restore paddy areas converted to other agricultural practices.

Action Plans: Major actions to be taken include:

1.1.1 Completion of the survey of paddy land and reconfirmation of the same using satellite imageries, and joint field verification by a team of revenue and Agricultural departments with representatives of local NGOs working in the field;

1.1.2 Re-conversion of paddy lands converted into various crops including rubber plantation;

1.1.3 Declaration of paddy lands as Paddy Reserves.

(For details see under wetlands and paddy lands)

Strategy 1.2: Conserve the present paddy lands and those to be restored

Action Plans

1.2.1 Strictly follow the Paddy lands and Wetlands Conservation Act, 2008;

1.2.2 Conversion of paddy lands shall never be allowed even for housing of the owner for which the government should provide minimum land in the adjacent non paddy area;

1.2.3 Repeal the exemption given for "Public Purpose" in the Act of 2008, as otherwise all projects would be brought under public purpose.

(For details see under wetlands and paddy lands)

Strategy 1.3: Agriculture development programmes shall be implemented without damaging the landscape ecology and environment

Action Plans: All Agricultural development schemes should be based on watershed, organic and, locally specific technologies for soil and water conservation. (For details see under agriculture and food security)

Strategy 1.4: Increase productivity of land under plantations

Action Plans

1.4.1 Plantations seeking alternate crop other than the permitted one shall be allowed, provided such land use would be ecologically more sustainable and that it does not violate the provisions of the Land Reforms Act, 1963 and the provisions of the present land use policy;

1.4.2 Plantations that violated the Lease Deeds shall be taken over by the government and the land put under more alternate more productive use adhering to ecological principles;

1.4.3 Land holding without legally valid ownership by private parties, namely plantations, institutions and, individuals should be confiscated and vested with the Land Bank to be set up by the Revenue department;

1.4.4 Government owned plantations such as Plantation Corporation of Kerala, Kerala State Farming Corporation and Kerala Forest Development Corporation shall keep a definite percentage of their land for food production and medicinal plants, both to be done organically.

(For more details see under wetlands and paddy lands)

Strategy 1.5: Diversify food crops to meet the food requirements

Actions Plans: (1) **Encourage** mixed cropping, integrated farming and crop rotation; (2) crop based approach shall be changed to farm based for increasing productivity.

Strategy 1.6: Promote homestead farming as part of land use strategy

Actions Plans: Every homestead should be encouraged to grow pulses, tubers, leafy vegetables, edible fruit bearing trees and, medicinal plants, including cultivation of paddy/ millets like ragi, suitable to the land (more details see under agriculture and food security).

Strategy 1.7: Ensure that farming is a respectable and profitable enterprise so that the farm land will not be altered.

Action Plans:

1.7.1 Consider farming as a service to the nation rather than an engagement for livelihood for the poor;

1.7.2 Provide farmers with adequate compensation and remuneration for not converting the land into any other purpose and sticking to farming in spite of the nature born uncertainties and calamities;

1.7.3 Fix a monthly salary for the farmers, those who really work in the field, depending on the area under cultivation and a bonus based on production

Strategy 1.8: Ensure that the land owner does not alter the physical features of the land** to **such an extent that affects the ecology and productivity of the adjoining areas.

Action Plan: (1) Although section 13 of the Constitution ensures ownership of, and confers absolute rights on, land for individuals, families or institutions, the right to physically change the land use that affect the ecology and productivity of the adjoining areas, the natural water flows, soil regimes and agricultural practices has to be prohibited without impinging on the fundamental rights of an individual enshrined under section 13 and 31(A) of the Constitution.

Strategy 1. 9: The land owner is duty bound to ensure food and water security for him/her and also contribute for others.

Action Plans

1.9.1 Every **land** owner shall ensure maximum food production of his/her choice, from the land owned;

1.9.2 In case the owner cannot engage himself/herself, the land shall be given on lease for willing parties, preferably LSGs.

1.9.3 It shall be the responsibility of the Agriculture Officer to see that no land is lying idle in his/her jurisdiction;

1.9.4 Water harvesting and other measures to save water shall be followed

(For more details see under agriculture and food security)

Strategy 1.10: Launch a massive campaign called "Land for food" to create awareness on land use and food security

Action Plans: A massive campaign focusing on to convert every bit of vacant land for food production has to be launched (For more details see under agriculture and food security)

Policy 2

Ensure and enrich availability of water through appropriate land use

Strategy 2.1: Conservation and sustainable use of wetlands (Wetlands include ponds, tanks, lakes, kole lands, reservoirs, rivers and rivulets, and mangrove ecosystems)

Action Plans

2.1.1 **A** comprehensive Kerala State Wetland Conservation and Sustainable Use Policy shall be brought out and, appropriate legislations be made to implement them;

2.1.2 Schemes should be launched to make use of the wetland resources for the benefit of the people without causing damage to its wealthy biodiversity assets;

2.1.3 A Wetland Register may be prepared for each Panchayat and it should be considered as the Natural Capital stock of the Panchayat;

2.1.4 No wetlands shall be reclaimed whatsoever may be the purpose; (5) A Wetland Authority, with adequate power and total autonomy may be put in place to look after all matters related to wetlands.

(For more details see under Wetland Conservation)

Policy 3

Ensure minimum housing facility for all citizens limiting its size considering the scar city in space and resources.

Strategy 3.1: Introduce rationing of land space and resources for housing separately for rural and urban areas

Action plans

3.1.1. A system to determine the maximum size of a house depending on the strength of the family shall be evolved for both the rural and urban areas separately and those above the prescribed limit shall be taxed heavily.

3.1.2. Bring out clear guidelines for house construction by using local, renewable and traditional material and technology, minimising individual housing spaces, based on the need of the society at large.

3.1.3. Such a guideline should curb luxury, as housing should be need based and not affordability based. The latter would encroach into the housing needs of thousands of houseless people.

3.1.4. Ceiling on land mortgage loans shall be restructured, to control unbridled construction boom and also land speculations.

3.1.5. Construction of houses following the guidelines as mentioned under 3.1.2 shall be encouraged by fixing reduced tax for the house and lower interest on loans taken for such construction.

3.1.6. An assessment may be made to find out the reason for as many as 7.3 lakh houses in the State (5.1 lakh in rural area and 2.2 lakh in urban area) are lying unoccupied (as per the Census of 2001) and find out how such unoccupied houses could be made use of and, how such situations could be curtailed in future.

3.1.7. Legal provisions shall be made vesting the LSG/Revenue Department to take possession of the houses lying vacant for more than two years and utilize them till the period when the owners demand them for their stay.

Strategy 3. 2: Ensure a piece of land and a house to every citizen

Action Plans

3.2.1. House is a fundamental need and, hence speculative investment in housing shall be discouraged.

3.2.2. Make a concerted effort to distribute minimum land to construct a house to the landless with a definite time target.

3.2.3. Adopt stringent measures against violation of the provisions of the Land Reforms Act, 1963 and, excess land owned by anyone shall be taken over and distributed to the landless within a definite time frame.

3.2.4. Assignment of land to the forest inhabiting tribes shall be completed within a year in accordance with the Recognition of Forest Right Act, 2006.

3.2.5. Steps shall be taken to augment implementation of the provisions of the Land Reforms Act, 1963, incorporating such amendments as may be required considering the social changes that have been taking place since the last four decades of coming into force of the Act, with a definite time frame.

3.2.6. Proper rehabilitation programmes for the slum dwellers and squatters shall be developed and implemented with a definite time frame. Constructions for the same shall be eco-friendly and should blend with the surroundings.

Strategy 3.3: Buildings shall not mar the ecology, landscape and aesthetics

Action Plans

3.3.1. Demarcate clear zones for infrastructure in each LSG protecting productive agriculture lands and ecologically sensitive areas such as wetlands, grasslands, forests, sacred-groves, and coastal ecosystems

3.3.2. Buildings shall not be allowed to be constructed on revenue porampoku lying along either side of the natural course of water flow. And, also across the water flow. Such revenue porampoku shall be delineated.

3.3.3. A restriction on high rise building shall be imposed limiting the height to be within the green cover which shall become an essential part of the Guidelines for building constructions to be prepared and implemented as mentioned under 3.1.2 of the present policy.

3.3.4. Buildings shall be constructed without damaging the landscape and ecology of the area.

3.3.5. Housing colonies, which are climate friendly and, friendly to the children and aged, on villa concept with maximum of three-storey with common facilities, playground, biogas plant, water harvesting and recharging, energy efficient and non-conventional energy systems, shall be encouraged

3.3.6. A proper Public Utility Impact Assessment should be made before giving license for the construction of any building or housing flats having more than three floors.

3.3.7. Vegetable gardens should be made compulsory in the compounds of all housing colonies and also in the premises of individual houses

3.3.8. Bio-fencing shall be encouraged

3.3.9. All public buildings, existing and under construction, shall necessarily adhere to energy, water and other resource conserving technologies and practices.

Policy 4

Ensure clean and healthy living environment in urban centres

Strategy *4.1: Ensure adequate green cover to reduce pollution, heat and soil erosion in urban area*

Action Plans

4.1.1 All existing plots with or without buildings shall maintain adequate green cover by planting indigenous tree species, preferably fruiting.

4.1.2 Plots not maintaining such minimum required green cover shall be liable for Environment Service Tax (EST) which will be fixed scientifically and notified.

4.1.3 All road sides including those in the residential colonies shall be planted with indigenous trees.

4.1.4 Biodiversity gardens and sacred groves shall be developed and maintained as "green lungs" in the residential areas and public places in cities and towns.

Strategy 4.2: Ensure protection and conservation of all wetlands and water bodies in urban areas

Action Plans

4.2.1 All wetlands and water bodies including wells in the urban areas, whether private or public shall not be filled or put to disuse under any circumstances.

4.2.2 Cementing /concreting compound around the houses/buildings shall be curbed with suitable regulations to ensure maximum recharge of ground water.

4.2.3 Specific projects for protection and conservation of water bodies in the urban centres shall be developed by the respective Local Self Government and implemented with the help of residential associations.

Strategy 4.3 Ensure adequate space for people and environment friendly infrastructure protection and development.

4.3.1 Ensure protection of existing important structures/areas such as heritage buildings and areas, parks, monuments, and roads by regulating development in these zones.

4.3.2 Urban planning shall include adequate open recreational space for children, aged and families.

4.3.3 Definite parking areas should be delineated in all the towns and cities.

4.3.4 All city and town roads shall ensure adequately wide cycle tracks and foot paths, the latter also to be comfortable for physically handicapped.

4.3.5 Urban farming using organic techniques shall be promoted to provide for maximum possible production of vegetables and fruits for local consumption.

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Policy 5

Ensure adequate land for public utilities such as education, health, entertainment, markets, play grounds, public spaces, parking areas and recreation

Strategy 5.1: Ensure adequate public utilities in every local body

Action Plans

5.1.1 All land held by the Government and or revenue land which is already in use for public purposes such as open ground, common recreation and play ground, grazing ground, drying grounds for agriculture purposes, cloth washing and drying ground, forested areas, and fuel wood plantations shall be protected for such purposes. Necessary notifications shall be issued for the same.

5.1.2 Considering the increasing poor physical fitness of the children of Kerala, adequate open ground with trees along the borders should be ensured for every 100 children.

5.1.3 Each LSG should maintain adequate green zones and, all the sacred groves should be protected.

5.1.4 Each LSG should prepare a Master Plan for the land in its jurisdiction meeting all the requirements mentioned under 5.1.1 to 5.1.3 above.

5.1.5 Data on revenue land in each LSG should be available with respective LSG and village level revenue office in soft and hard copies as well as in their respective web sites.

5.1.6 The State shall declare all sacred groves as Biodiversity Heritage Sites, if they qualify the criteria laid out by the National Biodiversity Authority and, recurring incentives may be given to the owners of the land where the sacred groves are situated, for preserving the same.

5.1.7 Greening public places should be made compulsory and that it should have a mix of indigenous trees, herbs and shrubs which demand less water while enrich local biodiversity.

5.1.8 Discourage masonry walls for public places and encourage green fencing to save energy and resources.

5.1.9 All public utility facilities should ensure in house, eco-friendly waste management, water harvesting and recharging and, efficient energy systems which would also serve as a model for the public.

5.1.10 No wetland shall be filled for developing public utilities as mentioned above.

Strategy 5.1: Ensure adequate public utilities in every local body

Action Plans

5.1.11 All land held by the Government and or revenue land which is already in use for public purposes such as open ground, common recreation and play ground, grazing ground, drying grounds for agriculture purposes, cloth washing and drying ground, forested areas, and fuel wood plantations shall be protected for such purposes. Necessary notifications shall be issued for the same.

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5.1.19 All public utility facilities should ensure in house, eco-friendly waste management, water harvesting and recharging and, efficient energy systems which would also serve as a model for the public.

5.1.20 No wetland shall be filled for developing public utilities as mentioned above.

Policy 6

Ensure adequate land for industries promoting local economy without harming the environment

Strategy 6.1: Prioritise land for industries which cause minimum damage to the ecology and environment and help improve livelihood and economy of local community

Action Plans

6.1.1 Assess utilization of the land already allotted to or acquired by industries and the area set apart for industrial growth.

6.1.2 Land underutilized, unutilized or not used for the allotted purpose shall be earmarked for the purpose of setting up new industries.

6.1.3 No hazardous waste generating industries shall be permitted.

6.1.4 Promote only pollution free industries in the State.

6.1.5 No agricultural land and wetlands shall be allotted for industries.

6.1.6 Ensure that setting up of an industry in the State shall in no way affect the social, cultural, ecological and ethical characters of the area and it should be in consonance with the policies of the LSG.

Strategy 6.2: Restrict allocation of land to the minimum required for any industry

Action Plans

6.2.1. Land allotment shall be based only on the actual requirement and in no case shall excess land be allotted

6.2.2. In case where excess land has already been allotted, natural vegetation should be allowed to grow in such areas and, in case the area is devoid of significant vegetative growth, indigenous trees should be planted.

6.2.3. In no case shall landscape of the area be allowed to change.

6.2.4. Ensure that the land already given to the existing industries is fully utilised and, utilised only for the purpose for which it was allotted. Otherwise, such land should be resumed by the Government

6.2.5. Existing industries and newly envisaged industries shall compulsorily take up water harvesting and recycling to reduce the burden on common water resources such as rivers, wetlands and ground water.

Strategy 6.3: Ensure that people who are evacuated for the purpose of setting up industries are rehabilitated and resettled honourably with adequate compensation ensuring no loss to the evacuees.

Action Plans

6.3.1. Proper rehabilitation packages shall be formulated in advance and the evacuees rehabilitated and resettled much ahead of starting the industries.

6.3.2. Ecosystem services enjoyed by the local community but deprived by the existing industries shall be justifiably compensated in terms of periodically recurring monitory rewards, this being in addition to the job opportunities, as salary is meant for the services rendered to the company by the employees as per terms of appointment.

6.3.3. In case the site concerned is a drinking water source for the community, the industry shall make alternative arrangements for the same at their own cost and implement it in a time bound manner.

6.3.4. A genuine Environmental Impact Assessment including cost-benefit analysis shall be done prior to sanctioning land for industries, provided that in such analysis the cost should

involve not only the production cost of the company, but the environmental cost which essentially includes environmental pollution and the resultant health hazards and, the ecosystem services (tangible and intangible benefits) that the area have been offering annually. Such EIA should be done only by bona fide agencies with representatives of civil societies.

6.3.5. Land given for industries for a particular enterprise, if not utilized within the stipulated time frame, shall be taken back by the Government.

Policy 7

Regulate pollution of land, water and air from industrial, residential and other establishments

Actions to be taken to keep the industrial and residential area free of pollution are given in section on Pollution

Strategy 7.1: Ensure eco-restoration of all industrially contaminated areas

7.1.1 Identify through comprehensive scientific studies all industrially contaminated areas.

7.1.2 Develop comprehensive eco-restoration approach for such areas.

7.1.3 Establish a Special Purpose Vehicle with high level of expertise under the Environment Department and implement the restoration in a time bound manner and, the expenses for the same shall be met by the concerned industry following the "polluter pays" principle.

Policy 8

Maintain landscape of the area to ensure ecological security and sustainable development

Strategy 8.1: Development projects shall be so designed to cause little damage to the landscape

Action plans: Constructions of buildings and campuses should be designed in such a way that the landscape is not altered, the water flows not blocked or diverted, the hills are not razed, wetlands are not filled (More details in section on Quarrying mining

Strategy 8.2: Prevention of landslide and management of landslide prone areas

8.2.1 Prevent construction of roads, buildings and other infrastructure and also unscientific agricultural practices on or across steep slopes and already identified land slide prone areas.

8.2.2 All land slide prone areas shall be demarcated and zoned and, location specific prevention and land use management programmes implemented

8.2.3 Rain water harvesting structures shall not be promoted in slopes above 20^{o}

8.2.4 Such areas shall be demarcated as disaster prone zones and discourage settlements.

8.2.5 Proper rehabilitation and resettlement programme may be initiated for people living in the landslide prone areas and those affected by landslides.

8.2.6 LSGs and civil societies in the landslide prone areas shall be trained and equipped for rescue operation; financial provision for the same shall be given in the annual plan of the LSG

8.2.7 Although land policy should cover tourism, forest cover, forest management, and eco-restoration of forest lands, they have been considered under separate heads with details.

Policy 9

Extend a hassle-free, transparent and accountable service to the public on all matters related to land

Strategy 9.1: Make readily available the land data to the user sectors and general public

Action Plans

9.1.1 Launch a programme to establish a public accessible computerised Data Bank on land with a definite time frame of two years.

9.1.2 Introduce/strengthen e-governance in all land related services.

9.1.3 Digitize the land map and give information such as survey number, ownership, type of land, land use and, restriction if any, and other details as available with the village records.

9.1.4 Use free and open source software extensively in all the line agencies. Appropriate human resource development programme through capacity building may also be introduced.

9.1.5 Post all the information in the web site of the Revenue Department.

9.1.6 Establish a system to answer any queries on land through online and also through toll-free centres to be set up at District Collectorates and at Commissionerate of Land Revenue to ensure prompt services.

9.1.7 The land owned by the Government (Purampoku), in each category such as wetlands, wastelands, floodplain, may be clearly demarcated and area measured separately in each LSG.

9.1.8 The land leased out to various plantations and industries with the actual area being used, the area converted into purposes other than for which it was given, shall be demarcated and the area measured separately.

9.1.9 The built up area and unused land in Government land encroached by individuals, industries, estates, institutions and others shall be demarcated with the extent of area.

9.1.10 History of transactions of each plot also should be available along with the survey number.

9.1.11 Revenue records of historical importance shall be digitized and conserved and be made available on-line.

9.1.12 Touch screen kiosks shall be installed in all Thaluk Offices for the file tracking and also for getting information on land.

9.1.13 Fair value of land shall be scientifically assessed periodically for different classes of land and posted on the websites of LSGs and Revenue Offices.

9.1.14 Land Card/Revenue Card giving information of all the land possessed by individuals should be issued within a definite time frame.

9.1.15 Forest land under occupation prior to 1.1.1977 shall be clearly demarcated and the area measured and recorded with the details of the occupant and patta issued to all the eligible occupants. However, no land encroached after 1.1.1977 shall be entertained for patta.

9.1.16 Land shall be categorised into various Zones on the basis of physiography, vegetation, climate, and soil and water availability and posted on the website.

9.1.17 Details of the land and property owned by the Government outside the State shall also be collected and put on the website of the State.

9.1.18 A Kerala State Revenue Manuel shall be finalised and published and also be made available on-line.

9.1.19 Details such as the name and designation of the Officer of the Revenue Department, the cost and time required for delivering a service and related information shall be published and displayed in all the Revenue Offices.

Strategy 9.2: Establish a suitable administrative system to oversee and ensure that the activities of the line departments/Boards/Authorities and organisations are in conformity with the declared Land Policy of the State

Action Plans

9.2.1 The LSGs with the support of the Revenue Office shall be primarily responsible for implementing the Land Use Policy in their respective jurisdictions.

9.2.2 In case of land for a public purpose covering more than one grama panchayat, decisions shall be taken at the Block level.

9.2.3 An Appellate Authority under the Chairmanship of the District Collector shall look into disputes, if any, that may arise while implementing the land Policy in any given LSG.

9.2.4 If the aggrieved party believes that justice was not shown to him/her by the district level Appellate Authority, he/she may approach the State level Appellate Authority (Secretary, LSGD) for the final disposition.

9.2.5 Janakeeya Adalaths at village levels will be organised periodically by the Revenue Department.

9.2.6 Facilities in the Revenue Offices including Village Offices will be upgraded substantially for efficient functioning.

Strategy 9.3: Establishment of a transparent, efficient system in protecting and allotting the Government land and property.

Action Plans

9.3.1 The Revenue Department will have full powers to transact, protect and use the land owned by the Government inside and outside the State.

9.3.2 All information on every bit of land inside Kerala and that belonging to the State lying outside Kerala, shall be collected in detail as given under section 12 (1) of this policy and deposited with the Revenue Department.

9.3.3 Revenue lands on expiry of lease period, can be renewed if the lessee has not violated any of the conditions laid out in the expired lease. Fresh lease could be considered on the rates and conditions to be stipulated by the Government on recommendations of a Committee constituted by the Government for the same.

9.3.4 In the case of violation of lease conditions, especially if land use practices had been altered, the lease should be terminated, irrespective of the stage of the lease period.

9.3.5 Urban lands in the custody of the Government shall be utilised in accordance with the recommendations of a Committee of Experts from various fields such as urban ecology, landscape and town planning, constituted by the Government.

9.3.6 Where the urban land is already under use for public purposes, such as open grounds, common recreational and play grounds, grazing area, drying yards, local open markets, green areas and sacred groves, shall be protected from any other use.

9.3.7 An effective mechanism to prevent encroachment into Government land should be put in place at each LSG with the involvement of locally committed social workers.

9.3.8 An empowered Committee called "Local Land Guard Committee" comprising representatives of LSG, Revenue Department and social workers is to be constituted at every LSG whose duty shall be to monitor, take cognisance and report the incidence of encroachment to the notice of the Government, follow up and ensure that such land is confiscated and encroachers brought to the law.

Policy 10

Preparation of a Master Plan for Land Use in Kerala

Strategy10.1: Prepare a Master Plan for the land use in Kerala within two years

Action Plans

10.1.1 Obtain all the data on land in Kerala as specified under this policy within a year.

10.1.2 A Committee of Experts constituted by the Government with adequate representatives from civil societies shall be entrusted with the work of preparing the Master Plan taking into consideration of the growth in the population and demands for the next 25 years for different eco-regions.

10.1.3 The work should start from the Panchayath level with its full participation and should proceed to Taluka level and then District level.

Policy 11

Implementation of the Land policy in a time bound manner.

Strategy 11.1: Implement the Land Policy within two years

Action Plans

11.1.1 The Government will take a decision to implement the land policy within the 11th Plan Period with the Department of Revenue playing the lead role supported by the LSG, Agriculture and, Water and Irrigation Departments.

11.1.2 The Revenue Department which will be the nodal department responsible for implementing the Land Policy, will call for a meeting of the head of all line departments, immediately after the Cabinet's approval of the Policy, and discuss the strategies to implement the same.

11.1.3 A cell to be called "land Policy Implementation Mission (LPIM)" will be constituted with representatives from line departments and civil societies, and Revenue Minister as Chairman to oversee the implementation of the policy within the declared time frame.

11.1.4 A Coordination Committee with honourable Chief Minister as Chairman, Revenue Minister as Vice Chairman and head of line Departments will be constituted to oversee the implementation and ensure coordination of other related departments.

11.1.5 Work will be allotted to concerned department and officers with definite time frame and, they will be held responsible for the delay, if any, in the implementation of that part of the policy entrusted upon them.

11.1.6 The LPIM will review the progress of implementation every two months, whereas the Coordination Committee will meet at every three months.

11.1.7 Enactment of appropriate laws, amendments to existing laws and issue of necessary Government orders for the successful implementation of the policy shall be done by the respective departments in a time bound manner.

11.1.8 A committed team shall be formed including representatives of civil societies who shall be made responsible for taking the message of Land Policy to the public

Sustainable Tourism – Preserving Culture and Heritage

The potential for tourism in the God's own country depends greatly on the preservation and promotion of the priceless natural bounty that the State is blessed with; its grass carpeted rolling hills flanking the luxurious shola forests in the mountain top, the gorgeous rainforests that clad the high ranges, panoramic view of the valleys, incredibly coloured butterflies and other life forms, the chirps of warblers and music of thrushes and, above all the salubrious climate of the Western Ghats, coupled with the ever attractive, absorbing beauty of the backwaters. We really are making the natural beauty of our State a marketing commodity and selling it to those who enjoy it.

Therefore, if tourism has to be a sustainable business, it has to be developed in harmony with environmental and ecological considerations, realising fully well that even sustainable tourism will have its impacts on the very ecological integrity of the area on which the tourism itself is built on. Hence, for developing tourism in Kerala, one must make doubly sure that our forests are not destroyed, hills are not razed, Paddy lands, Kayals and wetlands are not reclaimed, waters are not contaminated and above all, the biodiversity are not hampered. They embody the real God's own country.

Most of the present development projects suggested in the Tourism sector is unfortunately ending up as a heap of consutructions in these pristine areas, eventually destroying the very basis for its presence in the area.

If Kerala is looking for tourism to boost its economy, it should have a sustainable tourism policy with the following guidelines.

General Guidelines

1. Tourism within the State shall not compromise the landscape and, ecological and cultural security. We must demarcate tourism localities accordingly and conduct it with restrain.
2. Infrastructural facilities to be developed for promotion of tourism shall be minimal, uncompromisingly eco-friendly and based on land-use planning formulated on the principles of conservation and sustainable use of biodiversity, and totally blending with the landsacpe of the area.
3. Tourism activities should be developed in consultation and with total consent of the concerned panchayath/, municipality/ corporation and the Biodiversity management committee with the full involvement of the local community/residents as the case may

be. The tourism projects should be integrated with other development programmes of the Panchayaths

4. Areas of tourism within the Panchayath should be identified considering the ecological and environmental fragility and importance with full participation of the local community.
5. While developing the sustainable tourism programme, all the existing rules and acts in relation to areas such as land, forest conservation, biodiversity conservation, should be consulted and adhered to.
6. Before launching a sustainable tourism project in a particular area, an Environmental and Social Impact Assessment has to be undertaken by a competent authority with the involvement of local communities bringing out the possible impact that it may cause to the biodiversity, ecology, and environment, apart from the social, cultural and economic scenario.
7. Specifically the EIA should cover *inter-alia, land use for infrastructural facilities,* requirement of building material and their sources, damage, if any, to forests, wetlands, water resources including ground water, risk of erosion, impact on wildlife movements, habitat changes that may follow, risk of forest fire, unregulated fishing, increased risk of sale of souvenirs from endangered species such as shells, coral reeves, turtle shells, disposal of sewage and waste water, solid waste, contamination of land and water resources
8. Socio-economic and cultural impacts of tourism should cover inter-alia, the impacts of influx of people from different culture, the risk of drug abuse and prostitution, especially on children and youth; impacts on health and the integrity of local cultural systems and values; erosion of traditional practices and lifestyles; and impacts on the accessibility of indigenous people to their resources and sacred sites.
9. The project should consider the local priorities and realities, multi-stakeholder involvement and bring out the anticipated income and the share that would go to the local communities which would act as an incentive for biodiversity conservation.
10. All such sustainable tourism project developers and owners should be responsible and accountable to the Panchayaths as well as State Tourism department. Corporate monopoly and exclusive rights of resources including such areas as forests, beaches, river banks, rivers, waterbodies for tourism, a business essentially harvesting the yield of Natural Capital – a common property, shall not be allowed.
11. There has to be an equitable sharing of the benefits accrued from tourism, as the income is based solely on the integrity of the ecology and environment for which the local community plays a crucial role. This must be apart from the dignified employment opportunities to the local community.
12. The Tourism project should allocate a fixed part of their income to promote products from local enterprises , through SHGs, Kudumbasree and local SSI units, to help local economic development.

13. A share of the income from tourism should be reinvested to for conservation and sustainable use of biodiversity, such as conservation of protected areas, natural education and research programmes, or local community development.
14. In no case shall tourism projects affect the indigenous livelihood, resources and access to them.
15. Precautionary measures have to be taken to prevent any damage to biological diversity, ecosystems, and natural resources, and of social and cultural damage and, restoration of past damages wherever possible.
16. Involve local communities in the monitoring of the impacts of tourism on the land, forest and waters within the range of their activities
17. Infrastructural facilities developed for tourism such as transport, communication and medical care shall be accessible for the indigenous communities, and they shall be permitted to use with pride
18. Panchayath level policies should form the base for formulating the State level policies.
19. In general, buildings in city surroundings should not rise above the canopy level; it should blend with the surroundings, have provision for biogas using their own waste, water harvesting systems and a well designed waste treatment plant that works.
20. In case of the forest areas, living facilities should be simple and no concrete structures should be allowed.
21. Discourage tourism activities that will displace the local communities from their traditional sustainable employment opportunities.
22. All energy requirements should as much as possible be met by non-conventional sources.

Coast / Waterbody

23. Hotels and other infrastructural facilities shall not be built within 500 meter from the High Tide Line or from the outer borders of the coastal ecosystem whichever is higher, 100 meter from the borders of rivers and water bodies and, no buildings shall come within the ecologically fragile zones.
24. Those who have already constructed buildings violating the Coastal Regulation Zone Notification, 1991 shall be punished and evacuated as per the laws.

Forests / Plantation areas

25. Infrastructural facilities for tourism in the leased and free hold plantation areas, if tourism is permitted, shall be built without affecting the tree cover, landscape and ecological security of the area.
26. Tourism projects in Protected Areas mainly forests and ecologically sensitive areas and, in the proximity of tribal colonies and dwellings of other vulnerable communities should be avoided. Minimal facilitation centres are the only facilities that may be allowed in the area.

27. Tourists should not be permitted inside the core area of Protected Areas.
28. No tourists shall be allowed to carry non-degradable material such as polythene bags inside the forest area, especially PAs.

Backwaters / Kayal tourism

29. Backwater tourism, especially house boats, generating wastes shall ensure that the waters are not polluted. Strict rules and regulations for waste management, especially in backwater tourism using house boats, shall be formulated within six months and enforced.
30. Licence for the boats violating the rules shall be cancelled and penalised appropriately.
31. A total ban shall be imposed on all discharge of human excreta and other wastes into the backwaters by the tourism resorts and house boats.
32. A carrying capacity study to be initiated and all new licenses be kept on a moratorium till such a study is complete and recommendations are discussed and accepted.
33. The existing number of boats, if found in excess of the carrying capacity, shall be withdrawn in a phased manner.
34. All house boats shall run on non-conventional energy sources such as solar and be fitted with green toilets/safe disposal of the wastes.

Emerging Kerala proposals

35. The programmes proposed at the Emerging Kerala have to be looked into in the backdrop of a set of guidelines as suggested above. A local-level carrying capacity study and a Environmental and Social Impact Assessment is warranted for all projects suggested under the programme. The time has come to realise that huge investment is not what is required for encouraging tourism in the 'God's Own country'; it is the mindset to protect Kerala's Natural Capital and provide the most simple, culturally and ecologically specific facilities such as thatched roofs, earthen and mud paved walk ways, hygienic huts and local culinary delights made of organically produced food crops.

IT Industry

In a state where unemployment is a huge issue, the new opportunity that Information Communication technology provided to tap outsourced jobs lead to the emergence of a new Industrial sector in the state driven by private firms. This sector is considered suitable for the state considering that a) the state has a pool of qualified human resource which is a major requirement of this sector b) it is non-polluting and c) does not require large area of land

The state initiated an IT park in Trivandrum (Technopark) and later another one in Kochi (Infopark) to help private entrepreneurs wanting to take advantage of human resource in the state to set up their companies here. Both these parks attracted and groomed IT firms which focused on IT exports. Around 50000 IT professionals work in IT industries operating from these two IT parks. The government policies to facilitate the development of this sector raise some serious challenges. State had been the basic infrastructure provider and real estate developers for the IT sector until recently. However there is a growing push to replace state with private sector as real estate developer for IT Industry. Kerala is a densely populated state where land is very scarce. Kerala is a state where Land reforms were implemented and there is a ceiling on the extent of land that one can hold. Despite this there are homeless people, people with just a dwelling place and those who live in slums. In this context it is important to look at land utilization and related policies and its role in IT Industry development. Growth in employment generation through growth in the industry is assumed to be the objective. Role of real estate developer in this growth process is to be realistically analyzed. Demand on land and other natural resources is to be minimized or else it will become another sector not suitable for Kerala.

The IT industry scenario in Kerala is examined with an environmental concern and we are exploring here the question how we can ensure industrial growth with minimal stress on our environment.

The Current Scenario

IT industry and Kerala

The IT exports from the state are approximately 3500 crores per annum. The IT exports in 2006 were just 400 crores. Despite the absolute amount worth of IT exports being so low compared to other Indian states, the growth rate in the past 4 years were the highest in India. This could be an indication that the policies pursued by the state of late were not detracting the IT investors nor is it detrimental to the incubation of IT firms from the state. Hence when new demands are made it should be considered whether these demands are actually necessary for IT industry and whether they are optimal and sustainable.

It is also to be noted that state is gaining a lot from the IT sector growth in locations like Bangalore. A lot of our skilled human resource migrate to these locations and work there. Hence contribution of the sector to the development of the state is not confined to firms in Kerala.

Pushing for other business in the name of IT

There are people who consistently showcase lack of metro life style, lack of pubs, nightlife and international schools for IT firms not opting for Kerala. Projecting these as a prerequisite for IT industry is certainly not factual. Might be businessmen view IT professionals as potential customers who have the money power to consume such products. Other than that there is no direct relationship between IT industry and such business.

Bulk land consumption

Kerala with its high density of population and awareness about pollution was not a preferred haven for manufacturing industries. IT industry was considered an industry suitable for Kerala because it is less land consuming and less polluting. But most of the IT parks have large area of land. This large area is not reflective of their necessity or even their optimistic projections but this is mainly because they treat it as an investment. The fact that Deposit Insurance and Credit Guarantee Corporation (DICGC) give security for only one lakh rupees per deposit in the event of a bank failure also makes them invest more on Land. Often huge and unrealistic projections were published to justify retaining such land banks. This was the major impact of IT industry on our environment – consumption of much larger chunks of land than necessary.

Policy of the central government – towards SEZ

The IT firms which were 100 percent Export Oriented Units (EOU) were exempted from paying income tax under the Software Technology Parks of India (STPI) scheme. Under this scheme, irrespective of where in India your office is located, as long as it is doing IT exports that firm was eligible for incentives. But now this scheme is canceled. The Central Government's Special Economic Zone Act, 2005 stipulates that if an IT firm has to be qualified for incentives, that particular firm should be situated in a Special Economic Zone (SEZ). The Central Government came up with The Special Economic Zone Act in 2005. This creates an unnecessary 'clustering' which is totally uncharacteristic of IT industry. This also forces IT firms to function from an SEZ. The minimum area for an IT/ITES SEZ is 25 acres. Instead of finding their own minimum amount of office space (or even a work desk at home), these firms have to either get a minimum of 25 acres and register it as an SEZ or look at a rented space in an SEZ with much higher cost.

Misinterpreting state IT policy for giving away bulk land

Till 2005 the state's IT policy visualized IT parks as an incubation center and expected IT firms to graduate and construct their own campus in the state. Firms like NEST and USTechnology had opted for their own campus this way. Infosys too took a space in Technopark, was satisfied with the way things worked out here and opted for their own campus in Trivandrum. In fact the state's IT policy then had a provision to provide incentives to firms consuming less land. As per that policy, if a particular firm, on completion of 2 years

of operation employs more than 100 people in 0.3 acres then the value of the land would be reimbursed by the Government as an incentive. But this clause was misinterpreted by the government in 2005 and they used this clause for providing 100 acres of land free of cost to SEZ developers. Smart City project Kochi was one of the first SEZ projects in the state. The interpretation said that Smart City would provide 33300 jobs in 10 years and hence they are liable to get 100 acres free of cost. The number of jobs (33300) was reached just by extrapolation [(100/0.3) *100] and was not based on any project plan. The very clause in IT policy which to give incentives to IT firms consuming less land itself was misinterpreted to provide bulk land to real estate players.

Bringing in Real estate players to consume even more land

The SEZ Act allows the real estate developers – which are not IT firms- to use the tag 'IT Developer' and construct SEZs in which at least 50 percent of the land should be set aside as processing area. Using the unrealistic projected employment opportunities as a shield against public, the real estate firms are using SEZs as an opportunity to run their business. Thereby they get to hold land over the land ceiling, get clearances more easily and project their activities as a favor and public service rather than their business. SEZ Act specifies the minimum acres of contiguous space that each sector specific SEZ should have. An IT sector specific SEZ should have a minimum of 25 acres of contiguous land. Most of the other industry sectors require at least 250 acres of land. In Kerala it is very difficult to find such a huge area and most SEZ developers manage to get land less than 250 acres of contiguous land. Hence they all approach with a project of IT SEZ. The Act and rules force them to set apart 50 percent of the land for IT sector. But most of these developers do not undertake any study or put in any effort to understand the potential of getting IT firms for that many acres leave alone have an agreement with any IT firm. Instead their focus is just on the other 50 percent of land and its real estate usage. In short, with the SEZ Act real estate players sweet named 'IT developers' are allowed to hold twice as much land than what their already unrealistic projections have claimed as necessary for IT industry

Unrealistic Construction in SEZs

The Floor Area Ratio (FAR) for IT industry was set as 5 and later an amendment put FAR for Government Approved IT parks in Kerala as 3.25. Both these are much higher than FAR for other sectors. Moreover there is no FAR specified for SEZs. Other than the percentage of land to be set aside as processing zone, there is no bar on the amount of construction allowed in processing area versus the construction in non-processing area. Hence most of these IT SEZs have more constructed space in the non-processing zone. The Smart City project in Kochi was one of the first SEZ projects to be announced in Kerala. The initial papers back and forth between Dubai Internet city and Government of Kerala discussed 1000 acres and the project was about constructing a township. Imagine the stress such a project would have had on Kochi. The present agreement between Government of Kerala and Smart City promoters has a clause which binds them on the construction for industry against the construction in non-processing zone. Seventy percent of the total amount of built up space would be set aside for IT industry at any point in time. This ensures that the project area would not be used for real estate purposes. (The SEZ rules prevent a developer from selling land. Hence the real estate

activity is restricted to constructing and leasing out).

But unfortunately the SEZs which were later recommended by the state did not have any sort of binding agreements.

Construction in the neighborhood

It is not just the construction inside the SEZ. As soon as a project is announced, the same real estate firm or other firms acquire land in the neighborhood and sell it at exorbitant prices. The flats are marketed and brought as 'investments'. There is no check on the number of houses that a person can hold and the propaganda about IT industry in the neighborhood is used as a tool for selling multiple flats to the same buyer. All this together ensures that the stipulated park and its surrounding area suddenly become a concrete jungle. In fact the area where the construction is relatively less would be the processing zone inside SEZ.

Forcing water bodies to be filled

The SEZ rule also mandates that the entire area be contiguous. Any water body through that will make the land non-contiguous as per the SEZ Board of Approval. Even an exclusive bridge will not make it 'contiguous'. In a state like Kerala this will force water bodies to be filled.

Demand for a particular location – real estate perspective

It is not just the extent of land consumed but also the location which puts heavy stress on the environment. Earlier it was claimed that the parks should be located near airports, where there is a metro culture and in an urban location. Now the real estate prices and priority is in ecologically fragile and scenic locations. Most of these locations are remote and rural. Hence investors have started looking at marshy lakeside locations. The project in Valanthacaud Kochi is an ideal example. It is not airport in the vicinity, not metro culture, not lakeside but it is the real estate value that the business is looking for. What other reason could one give for opting such a marshy, lakeside land full of mangrove forest?

Towards Distributed parks

The state through its 2007 IT Policy made it clear that rather than huge IT parks in one or two cities, we are looking at having smaller IT parks distributed across the state. Kerala has a unique urban distribution throughout the state. The connectivity and other parameters are also evenly distributed. We have major firms operating without any issue from Trivandrum, Kochi, Thrissur and Kozhikode already. Hence we need not overload one city with a huge IT park. We have set up SEZ spaces in Kollam, Cherthala, Koratty, Kannur and Kasargod too. This will help IT industry to grow without cramping our cities and will reduce the pressure on housing, water supply and transportation. There is a social angle to this as well. Since people have to flock out of their villages and towns in search of a job, our villages have lost its youthful crowd. It is like an old age town. If we can ensure that youth can stay at home and work that would bring back social life to these towns and villages as well. especially to the home itself. A long time felt inevitable need for securing the social fabric of families which would certainly reduce the old age homes.

What needs to be done

1) Since bulk lands are not required for thriving IT industry, people demanding for the same may have dubious motives. IT fraternity must expose this real estate agenda, as otherwise, IT industry itself will become unsuitable for Kerala.

2) IT does not need SEZs at all. The policy that incentives to IT exports will be provided only if the exporting firms operate from an SEZ lacks logic. Incentives, if any, should be for the activity and not for the location from where it operates.

3) Information Communication Technology ensures that physical neighborhood is not needed for communication. Almost all domains make use of this technology to ensure communication. That is the characteristic of IT. Even firms operating from SEZ would have a part of their project operating from another continent. Hence clustering these IT firms together is not at all necessary and this artificial constraint for contiguous land should be taken off. The SEZ Board of Approval's position that water bodies will make the land non-contiguous lays heavy stress on our environment.

4) The SEZ Rules insist that the land should be vacant. Though 'Vacant Land' is defined in the Rules and it says structures where commercial activity is in progress, the particular rule says 'The identified area shall be contiguous and vacant and it shall have no public thoroughfare". Here the word 'vacant' is used and not defined. Might be because of this the Development commissioners insist that all buildings in SEZ area be cleared before they recommend for SEZ. This ambiguity also mandates unnecessary construction without exploring possibilities of reusing the building.

5) Our state IT policy should clearly have a check on the number of people employed versus the area consumed. Providing incentives on land should be discontinued and the policy should clearly state that.

6) Kerala has a unique urban distribution throughout the state. The connectivity and other parameters are also evenly distributed. We need to concentrate on smaller distributed IT parks than huge IT parks in one or two cities.

7) The basic infrastructure for making entire Kerala an IT destination is already in place. We have set up SEZ spaces in Trivandrum, Kollam, Cherthala, Kochi, Koratty, Kozhikode, Kannur and Kasargod. All these SEZs are promoted by the State and hence the entire space will be utilized for the industry. If the central government continues its policy of forcing IT units to operate from SEZ, then the state IT department should act as a Developer and provide SEZ space which will ensure that the entire land is used for industry rather than waiting for private real estate players and providing incentives on land.

8) Right now there is 1065.9 acres of notified IT SEZ land lying unutilized. Request for new IT SEZs especially in towns where SEZ space is there for the taking should not be entertained.

9) The SEZs promoted by private developers – despite all the noise – none of them are operational in the state. There should be a strong check on construction and its time lines. It should be ensured that excess land above the land ceiling is not given for real estate activity. Insisting that land given for industry should be utilized for industry is not anti-developmental. The SEZ act says that a minimum of 50 percent of the land should be set aside for industry. When the state insists that more than 50 percent land be used for industry it is well within the SEZ Act.

10) When the state recommends a piece of land for SEZ, the state guarantees that the promoter has 'irrecoverable rights' on the land. Before giving such a commitment the state should have a binding agreement which ensures that the land would be used, used for the purpose it is acquired for and the time frame. This will ensure that the land is not kept as a land bank. If we had done so, then these many hectares would not have been idle. If this much land were actually available for IT units then the demand on additional land would also have been minimal.

11) For IT industry it does not matter where the office is as long as it is connected. Hence the demand for any particular piece of land should not be entertained. Disturbing ecologically fragile land in the name of IT industry is criminal.

12) The single window clearance which is often advocated to make an investor's task of setting up industry easy has become a tool to bypass statutory authorities. Single Window should mean a single place where the investor can approach and get answers. But this window should ensure that the application complies with all legal obligations by crosschecking with the appropriate department, get the feedback and pass it on to the investor. Instead this 'Single Window Clearance' is now interpreted as industry department's right to encroach into the rights of revenue, IT, Forest and other departments. The policy should clearly ensure that the 'Single Window' is just a coordinator for ensuring that the investor's request is properly processed by concerned departments and not a mini-government on its own.

13) Construction in IT industry can be mandated to be green. They can be specified to use the cutting edge in green technologies and beyond mere certification norms. Though construction in not specific to IT, the construction norms by IT could act as a catalyst for setting these standards to other industries and even to the public. Some of the features that can be made mandatory are :

    Solar power : both active and passive :

    Active- solar photovoltaic for electric power. Thermal for heating. One specific area can be solar air conditioning .Very good technologies have been developed. Some of them are said to break even in a couple of years.

    Passive: use of design features like orientation, placing of openings, landscaping etc.Use of materials like compressed stabilised blocks, breathing walls and roof etc.

    LED lighting solutions and effective daylighting

    Waste management- Bio gas plants are a very good solution for organic waste. There are

artistic ways of Upcycling other waste products also. Like we have industries making Pen from waste paper.

Water harvesting and waste water recycling.

Use of Eco friendly mode of transport within the SEZ ,like bicycles, electric cars etc.

14) IT can play a very important role in monitoring and could act as indicators of ecological importance. IT enabled land markings and monitoring of forest areas are efficient and not so expensive. We could have similar systems for City traffic or in tiger tracking. Hunting in prohibited areas could be effectively tracked. Sensor enabled monitors for continuous evaluation of quality of water is some examples. Central Pollution Control Board (CPCB) has mandated installation of continuous monitors in cement plants.

15) Further, the rapidly developing and maturing Information, Communication Technology (ICT) tools in combination with domain specific spatial information systems can very effectively be put to use. This has been demonstrated for wetlands in Kerala (www.keralawetlands.in) by the Kerala State Biodiversity Board a few years ago. It is suggested that building on this experience, all the vital areas of development involving natural resources such as land use, agriculture, forests, wetlands, fisheries, tourism can be very effectively be monitored Panchayath-wise as given below:

a. State of wetlands, forests, agriculture and others based on agreed upon criteria
b. Depiction of the status for ease of understanding and quick action in set colour patterns e.g. Red, Green, yellow etc.
c. Actionable items not addressed to/agreed upon by various stakeholders in similar colour patterns
d. Suggested interventions and their possible impacts
e. Provisioning of legal, administrative status for the above processes
f. Conflict resolution mechanisms over the governance and management of the natural resources to be developed and put in place and
g. Scoring the performance of elected representatives - at multiple levels on - the integrity, effort put in addressing the natural resources issues in governance and management.

List of contributors

1. Agriculture, biodiversity and food safety
Indira Devi, P., Usha, S., Leena Kumari, S., Harilal, K.N.

2. Conservation of wetlands and paddy lands
Vijayan, V. S., Sridhar, R., Shaji, S.

3. Rivers of Kerala- Time for Revival
Latha, A., Ravi, S.P.

4. Coastal and marine ecosystems of Kerala
Biju Kumar, A., Gopalan, U.K., Dinesh, C., Purushan, K.S., Shaji, C.P., Peter, P.T., Charles
5. Fisheries
Dinesh, C., Biju Kumar, A., Gopalan, U.K., Purushan, K. S., Shaji, C.P., Peter, T.

6. Forests and Forestry in Kerala: *Nair, C.T.S.*

7. Forest Conservation

Vijayan, V.S., Harish, V., Nair, C.T.S.

8. Quarrying and mining

Ajaykumar Varma, R., Vjayan, V.S., Sreekumar

9. Green energy policy
Ravi, S.P., Menon, R.V.G., Parameswaran, M.P., Damodaran, V.K.

10. Housing

Vijayan, V. S., Chandra Dutt, Sajan

11. Solid waste management
Shibu, S., Ajaykumar Varma, R.

12. Transportation
Neelakantan, C.R., Vijayan, V.S., Parameswaran, M.P.

13. Industrial development
Vijayan, V.S., Parameswaran M.P .

14. Industrial Pollution

Jayakumar, C., Sridhar, R., Purushan

15. Proposed Kerala State green land use policy

Vijayan, V.S., Sridhar, R., Usha, S.

16. Sustainable tourism- Preserving culture and heritage

Vijayan, V.S., Harish, V., Tony Thomas

17. IT industry: *Joseph Mathew*

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Chairperson: Smt Sugathakumari

Vice-Chiarman: Prof. M.K. Prasad

Co-chairman: Dr. V.S. Vijayan

Convenor: Dr. R.V.G. Menon

Co-convenors: Dr. S. Usha, Shri V. Harish, Shri V. Harilal

The Kerala State Environmental Convention is organised jointly by the civil society organisations involved in sustainable development, conservation of natural resources and protection of environment. This document is the draft prepared for KSEC by a team of experts working in various disciplines. Your suggestions may be forwarded to:

Dr. V.S. Vijayan
Salim Ali Foundation
Ayyappankavu Road
Kanimangalam, Thrissur 680027
Mob: 9446372880
vsvijayan@yahoo.com