NATIONAL LAW SCHOOL OF INDIA UNIVERSITY
BENGALURU

REPORT ON THE CONSERVATION AND SUSTAINABILITY OF NANDI HILL ECOSYSTEM



BANGALORE ENVIRONMENT TRUST

COMMONS CELL AND

CENTRE FOR ENVIRONMENTAL LAW RESEARCH AND ADVOCACY

NATIONAL LAW SCHOOL OF INDIA UNIVERSITY

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12 February 2019

Dr. Manjeri Subin Sunder Raj, *Asst. Prof of Law*, &
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PART I:

INTRODUCTION

A. THE CONTEXT – GENESIS OF THE RESEARCH WORK

Continuous expansion of Bangalore, both in terms of population and territory is adversely affecting the natural ecosystems in the surrounding areas. Nandi Hills is one of the most eco-sensitive areas nearby Bangalore which is home to several exotic species of birds. It is also a very popular weekend getaway, where a lot of people visit and this has created a situation wherein some sort of a control need be visualised and put into effect.

Apart from the problems that are caused as a result of overcrowding and vehicular pollution, the existence of the Bangalore International Airport, too does have a significant impact on the Nandi Eco-system, as it is a safe haven for a large number of migratory birds. It is also to be noted that around six riverine systems have their origin near this area.

Apart from these concerns, growing developmental activities and a booming real estate business has also been changing the eco-system. Water abstraction and pollution as a result of large scale construction activities have now started to change the calm and serene atmosphere in and around the area. Large tracts of land are being put to cultivation and unscientific methods resorted to also do cause a lot of harm, not only for the rich soil that is present but also to the water bodies that are present.

Given all this, it is quite clear that the eco-system in and around the Nandi Hills area is to be protected and taken care of. In light of some of the problems that are raised, Dr. A N Yellappa Reddy had proposed to Prof. M K Ramesh that some action need be taken and this research exercise is a culmination of a series of discussions and deliberations that has taken place between the Bangalore Environment Trust and the Law School, along with other stakeholders.

B. OBJECTIVES OF THE RESEARCH

- To examine the Ecological, Cultural, Historical, Economic and Tourism related significance of the Nandi Eco System;
- To explore the steps that are required to be taken to regulate activities in the above mentioned areas of interest;
- To take stock of the steps that are currently being taken to protect and preserve Nandi Hills;
- To examine whether Nandi Hills need be treated as a Heritage Site to afford better protection.
- To identify steps that can be taken to prevent Land Grabbing and Land Encroachment by coming up with a proper, revised Land Record system.
- To come up with a plan of action which incorporates development fostering conservation;
- To evolve a blue print to conserve and protect the Nandi Hills ecosystem.

C. METHODOLOGICAL APPROACH

Going by the large number of internal deliberations that the team had with the Bangalore Environment Trust and a number of experts, the Research Team engaged in some ground work involving desk research. The also did go on a field visit to Nandi Hills and got a first-hand information on the various problems that the ecosystem face.

Based on the desk research and the field visit inputs, the Research Team proceeded to have internal deliberations and discussions which has ultimately helped in coming up with this draft report.

D. INSTITUTION AND THE RESEARCH TEAM

1. THE INSTITUTION:

NATIONAL LAW SCHOOL OF INDIA UNIVERSITY (-NLSIU), is the premier Law Teaching and Research Institution in India. Started a little over 26years back as a bold experiment in legal education in Bengaluru, "the educational capital of India", the institution has constantly and consistently remained number one in Legal Education in India. With the Chief Justice of Supreme Court of India as its Chancellor and headed by Prof. Dr. R.Venkata Rao, Vice Chancellor, the University is a model for the collaboration of the Bar, Bench and the Academia for decision-making and putting in to practice law-learning in the societal context. With Programs in Bachelors and Master's Degree in Law, the University has Doctoral Programs that transcend disciplines. Masters and Diploma Programs in several niche areas of law, through Proximate Education Program have made NLSIU as the favored destination of the seekers of legal knowledge. It has to its credit academic and research collaboration with over 40 top notch Law Schools, across the globe. The Faculty of the Law School have been approached for assistance by Central and State Governments in evolving policies and laws on a wide variety of areas of law and in building capacity in Law for a number of institutions and organizations, both in the public and private sector, in addition to global organizations like World Bank, ADB, UNDP, UNEP etc. There are over a dozen Centers of Excellence in the Law School and Professorial Chairs that cover a whole range of issues that include, Human Rights, Environment, Natural Resources, Intellectual Property, Cyberspace, Consumer Interest, Interests of the Child, Social Exclusions, Alternation Dispute Resolution, Corporate Governance, Gender Justice, Infra-structure Development, etc. The Law School is also credited with inspiring the creation of a number of Law Schools in India, besides providing the template for developing curricula, methods and methodologies of teaching and research in law.

The research would be undertaken by the COMMONS CELL, a Center of excellence in the National Law School of India University. The Centre was set up in the year 2009 for developing the Indian Jurisprudence on the subject of Commons- that establishes the symbiotic relationship between the community and the natural resources, with the Government performing the role of Public Trustee. Under the aegis of the Commons Cell a regular Course on the Law concerning Natural Resources Management (- with primary

focus on Land Rights, entitlements, Land Reforms and Land Management etc.), is offered for the students of B.A, LL.B (Hons.). The Agriculture and the Law Unit, with in the Commons Cell engages in research work on a variety of issues concerning Land Acquisition, Resettlement and Rehabilitation, Land Reforms, Land Revenue etc.; in the preparation of and teaching modules on different aspects Law and Agriculture and in organizing workshops and seminars on the subject. It was recently involved in preparing a draft bill on a Comprehensive Law on Water Resource Management, for the state of Rajasthan. The Commons Cell works in close association with three other Centers of Excellence within the Law School namely, (i) Centre for Environmental Law, Research and Advocacy (- CEERA- the first Environmental Law Centre in India , in a Law School setting that has carved a name for itself in Environmental Law Education and Research in India -;) (ii) Environmental Law Clinic (- established in 2012, is a unique outfit that combines imparting environmental law education with practical skills and their application; it is a virtual network of Environmental Law Professionals drawn from the Academia, Law Practitioners and Judges, from all over India and aims act as a forum and facility that diagnoses environment-related problems, at the local level and offer therapeutic solutions, that range from grievance redressal and problem solving, conflict avoidance to conflict resolution through, primarily, a non-formal frame of accessing justice and its dispensation) and (iv) the Professorial Chair on Urban Poor and the Law, instituted by the Ministry of Urban Poverty Alleviation and Housing, Government of India.

The Conglomerate of these Research Centers, act as the Finishing School for both Law Professionals and people drawn from Academic Institutions, Judiciary, Administration, Industry and Civil Society Organizations. Annual Summer School Program for over a dozen Universities in North Europe (- Nordic Countries), is one of the major highlights of its activities. Two annual Journal Publications, of which one is on-line, a quarterly News Letter and a web portal, embellish the research output of these Centers.

All the four Research and Extension outfits are headed and coordinated by three members of the Faculty namely, Dr. Manjeri Subin Sunder Raj, Assistant Professor; Dr.Sairam Bhat, Professor and Dr.M.K.Ramesh, Professor. The members of the Faculty, in these Centers, are assisted by a host of Researchers and a large number of students, in the Law School. Students, Researchers and members of Faculty from a number of Law

Schools, both from within India and abroad, do associate with the research activities of these Centers as Visiting Faculty and do internship here, all round the year.

2. THE RESEARCH TEAM:

- Co-ordinator: Dr. Manjeri Subin Sunder Raj, Assistant Professor of Law, NLSIU
- Research Officer: Mr. Raghav Parthasarathy, CEERA
- Advisors and Research Guides: Prof. Dr. M.K.Ramesh, Professor of Law, NLSIU and Prof. Dr. Sairam Bhat, Professor of Law, NLSIU

While the above mentioned ones constituted the Core Team, Research Assistance was provided by a host of Students pursuing B.A., LL.B (Hons.) degree in the Law School and also by the students of Christ University.

PART II:

THE REPORT

A. INTRODUCTION

Popular among the folks for tourism, trekking, adventure sports, bird watching and retreats, Nandi Betta or Nandi Hill is situated in the district of Chikkaballapur. Historically, Nandi Hill was called Nandidurg. During the Chola period, Nandi Hills was also called as Ananda Giri[1], meaning the Hill of Happiness. The hill got its name because it resembles a sleeping bull (Nandi). Nandi Hills is a unique biodiversity spot and the flora resembles that of a distinctive high hills. Nandi Hill forms a part of chain of hills namely, Brahamagiri, Channagiri, Divyagiri/Dibbagiri and Skandagiri or Kavala durga in Chikkaballapur Taluk[2].

The landscape of the hill is craggy and rugged. The hill is also a popular tourist spot, as it is situated at an altitude of 1479 meters or 4851 feet, above the sea level. The area covered by the hills is around 2,837 hectares. Nandi hill forms an Eco-Geo-Hydro fulcrum serving the city of Bangalore along with other cities in different state of Andhra Pradesh and Tamil Nadu, through two rivers, which originates from the Nandi hill namely, Arkavathi, Chitravathi, Papagni, Uttara Pinakini or Pennar, Dakshina Pinakini or Ponnaiyar and Palar. On top of the Hills exists a Kalyani where, water is collected after undergoing natural filtration through several plants and trees. The ecosystem of Nandi Hills was so pristine that, in 1936, Mahatma Gandhi stayed at Nandi hills for a period of 45 days to recuperate from high blood pressure and consumed the naturally filtered water deposited at Amrutha Sarovara. There are several villages nearby one of them being, Muddenahalli, which was the birth place of Bharath Ratna Sir M. Visvesvaraya and a cave by name Brahmashrama, where Ramakrishna Paramahamsa meditated during his spiritual quest.

The hill is marked as state forest, as it comprises several other hillocks (over 1,400m) with several peaks, amongst all of these, Nandi hill stands tallest. It is interesting to note that though Nandi Hills has a general pattern of scrubs and deciduous types of vegetation, altitudinal variation in the floristic composition can be seen owing to the influence of several ecological factors. It has impressive flora and fauna with around

[1] Nandi Hills, Legend, http://horticulture.kar.nic.in/nandi.htm
[2] Botanical gardens to boost eco-tourism, https://www.deccanherald.com/content/611385/botanical-gardens-boost-eco-tourism.html

150 different varieties of species. As of today, though the original forest has not totally disappeared, the majority of the area is covered by secondary growth which consists of thorny scrubs. The hill is a habitat for migratory birds, making it a popular location for birdwatchers and photographers. Top of the Nandi Hills which is covered by forest hosts a number of tourists, and, is one of the popular tourist spots in and around Bangalore. The area is a wintering site for many migrant species or warblers, flycatchers and thrushes. The hill slopes are the home of the Yellow-throated Bulbul, a species endemic to the hill of peninsular India. Further, the hill touching the clouds makes it a picturesque location.

Among the plethora of popular tourist spots there exist two ancient temples i.e., Yoga Nandeeshwara and Bhoga Nandeeshwara. Yoga Nandeeshwara is a temple renowned for a huge and majestic statue of Nandi situated on top of the hill. Bhoga Nandeeshwara temple is in the foothills which was built in the 9th century by the Nolamba dynasty and subsequently developed by Rashtrakutas, Gangas, Cholas and Vijayanagara during their respective rule. It has a rich archaeological and cultural history attached to it. Opulent in its carvings and sculptures, the temple is dedicated to Lord Shiva. The architectural outline is a witness to the contribution made by different dynasties. Currently under the aegis and protection of the Archaeological Survey of India, the temple is of national importance as it is one of the 242[3] protected monuments in Karnataka.

Nandi hill was previously, a place where Tippu Sultan, the erstwhile ruler of the princely State of Mysore had a small palace for himself. Contribution of Tippu Sultan to the development of Nandi Hill ecosystem is lauded even to this day. The place is reminiscent of Tipu's rule and the Tipu Sultan trail is a popular tourist attraction. Tipu Drop is a spot from where prisoners were dropped from a 600m high cliff which is now mostly closed with barricades and walls.

Further, during the British rule, several buildings were built for their occupation through summers, as the weather in Nandi hills remained cool throughout. Two of the iconic buildings named after Nehru (Nehru Nilaya) which was the erstwhile residence

[3] About 1076 temples in the country are under the protection of Archaeological Survey of India, 27th March, 2018, http://pib.nic.in/newsite/PrintRelease.aspx?relid=178091

of Mark Cubbon and Mahatma Gandhi (Gandhi Nilaya) stands to this day. This area of 97 acres is under the control of the Horticulture Department whereas the other areas of the Hill are under the control of the Forest Department.

B. SIGNIFICANCE OF NANDI HILL ECOSYSTEM

The natural ecosystem at Nandi Hill hosts a number of species including migratory birds and provides shelter to many of the globally threatened and biome restricted assemblages like Oriental White Eye or the Yellow-throated Bulbul, Pied Thrush, Eurasian Blackbird, Indian Blue Robin amongst various others[4]. The hill is also considered as an abode for raptors, but due to increasing human intervention, the bird population in the region is slowly witnessing a decline.

Historical and Archaeological

Nandi hill is a place of historical significance and has a history The Archaeological Survey of India has granted Protected Monument Status to Bhoganandishwara Temple[5]. The temple has a history of over 1200 years dating back to Nolamba and Rashtrakutas. Architecturally, one of the most significant specimens of Dravidian order dates back to 9th century. The other location of historical significance being Tipu Sultan's lodge[6] on the hilltop, and the monument also enjoys the protection as a Centrally Protected Monument under the aegis of Archaeological Survey of India. A small rectangular building was used by the British as their summer resort post 1700's.

Terrain

The terrain of Nandi Hills being mostly rocky consists of slopes, which are covered with scrubs and vegetation being sparse. It comprises of medicinal plants like Eucalyptus and *Shorea talura* along with Coffee Arabica. The trees grown in this area acts as a substrate for cloud condensation, as trees are covered with water, creates a sensitive ecology catalyses growth of varied flora and fauna. More than 100-150 plants which grows there has unique capability to filter the rain water. There are several plant species and ornamental plants with natural pigmentation, which produces indelible ink and the entire hill range has great potential for climate

[4] Checklist of Birds of Nandi Hills, https://indiabiodiversity.org/checklist/show/67

[5] Centrally Protected Monuments – List of Centrally Protected Monuments under the Jurisdiction of Archaeological Survey of India, Bengaluru Circle, Bhoganandishwara Temple - http://asibengalurucircle.in/centrally-protected-monuments

[6] Centrally Protected Monuments – List of Centrally Protected Monuments under the Jurisdiction of Archaeological Survey of India, Bengaluru Circle. Tipu Sultan Lodge, Nandidurg - http://asibengalurucircle.in/tipu-sultans-lodge-nandidurga

regulation and soil formation. The pigmentation of the flowers takes place because of the weather conditions prevailing on the hills. The rivers which originated from the area, fulfilled almost up to 30% of the Bangalore's water requirement and contributed for 1.25 Tmc of water.

Farming activities

The soil fertility in the foothill area is well known as it facilitates good agricultural activities. Nandi Hill offers social security to nearby people as there is abundant scope for agricultural activities. Farmers grow variety of crops along with the popular Bangalore Rose Onion and Bangalore Blue Grapes, both of which are granted Geographical Indication by the Central Government[7]. The Hill is the birth place of six rivers and this largely served the needs of the people in and around the area and to the city of Bangalore. The district of Chikaballapur is dependent on monsoon rain for its agricultural activities and Nandi Hill region is no exception to this. Water flown from this area rejuvenates the ground water table and supports the farming activities. Unique combination of flora and fauna complemented by pleasant weather resulted in the growth of exotic vegetation in and around the area.

Rivers

Nandi Hill region, though, have six rivers are not perennial and is monsoon dependant. Rivers provide for water to several districts and is utilised for agricultural activities. The agrarian base in the Chikkaballapur district is vast and since the major chunk of land is under cultivation it requires constant water supply.

Since the past decade, area around Nandi Hills has turned commercial due to the establishment of a Bangalore International Airport at Devanahalli, which is near to the Nandi Hills. The hillock was already a popular tourist destination and the coming up of international airport nearby only made the matters worse. Further, the area is facing plethora of issues which are dealt in detail in the forthcoming chapters.

[7] Geographical Indications Registry, http://www.ipindia.nic.in/registered-gls.htm (accessed on June 8, 2018).

C. ISSUES FOR CONSIDERATION AND ENQUIRY

The objective of this exercise is to bring out policy recommendations for the conservation and protection of Nandi Hills ecosystem. Nandi Hills which is known for its scenic beauty is facing numerous issues. The issues have cropped for the reason that there has been tremendous amount of commercial activities undergoing including tourism, land alienation from agricultural to non-agricultural, sand mining and quarrying are few among the number of other issues. Further, the land area of Nandi Hills is concentrated with tourists thronging the place in their private vehicles i.e., cars and two wheelers, leading to pollution and contributing to the environmental degradation. Since, the hill is situated close to the Metropolitan area it is quiet common for people to visit these areas as tourists, which causes disturbance to the bird and their habitats. The following are the issues which have been identified after a field trip was undertaken to Nandi hills[8];

i. Tourism;
ii. Governance;
iii. River conservation and groundwater depletion;
iv. Forest fires;
v. Land Grabbing;
vi. Sand Mining and Quarrying;

The aforesaid issues along with the possible solutions are discussed in the forthcoming chapters.

i. Tourism

Popular among the tourists and the adventure sport enthusiasts, Nandi Hills is under the control of two departments i.e., the Karnataka State Horticulture Department and Karnataka State Forest Department. The Horticulture department maintains an area of 97 acres on top of the hill which includes a garden for the tourists. Due to routine thronging of tourists, pressure on the area is great with a considerable problem of

[8] The issues pointed out in the Report are identified after visiting the Nandi Hills and after undertaking interaction with various officials working in the Nandi hills, on 03.05.2018, as a part of study tour organized by the National Law School of India University, Bengaluru for the Researchers and the second year law students.

litter, noise and physical disturbance. Nandi Hills is located close to Bengaluru International Airport. Due to its proximity to the airport, Nandi Hill is witnessing numerous commercial and residential ventures that are underway in the region.

The Horticulture department along with the Karnataka State Tourism Development Corporation is converting Nandi Hills into an eco-tourism destination, which makes it all the more essential to strictly enforce the laws. The tourists in the area visit the spot with variety of eatables, drinks, Pan Masala or Guthka, cigarettes, liquor and in various activities by venturing into those areas which are meant to be protected and deserves to be free from human intervention. But, today, the Nandi hill is on the verge of destruction. The increasing number of tourist population amalgamated with lack of enforcement of laws and rules is only creating havoc and contributing to the deterioration. The area on top of the hill is filled with plastic and bottles strewn everywhere without proper mechanism for its disposal, which is not only a hazardous to the environment but it also takes away the beauty of the hills. Though, it is essential to develop a place like Nandi hill into an eco-tourism destination, at the same time there should be proper governance system to protect the area to pull it back from the zone of destruction. The human intervention in the area is so frequent that the faunal habitat is facing threat and is slowly disappearing. The area, particularly in the weekend, host packs of tourists who wander around the area in the midnight causing disturbance.

The concept of eco-tourism has emerged for the reason that it is one step towards the protection of the eco-sensitive environment. In order to protect natural resources from being exploited unabatedly, the focus on eco-tourism as better alternative is increasingly being pursued. The fundamental of eco-tourism being that, a responsible tourism that seeks “to conserve the environment and improve the well-being of local people”. The International Ecotourism Society has defined the term eco-tourism as, “responsible tourism is not limited to ‘green’ recreational facilities”. There are number of the eco-tourism centres are in Karnataka, however, Nandi hill seeks to bring about new qualities in interactions between visitor and the visited while limiting damage – or simply changes – caused. The promotion of such concept seeks to protect

Karnataka's rich forestry and other precious resources from intrusions and degradation.[9]

Littering and Waste management

The other important aspect is with regard to the littering and the waste management in and around the Nandi Hill area. The visitors travelling from different parts of the state and the country consume packed food items and there is no proper facility to dispose the same. It was witnessed that the area did not have dustbins and garbage disposal bags installed in places wherever it was required. The garbage bins were conspicuous by its absence, which paved way for the visitors to throw the plastic and other waste items as per their whims. The issue of garbage disposal is not limited only to the visitors, but also to the shops and restaurants operating in the hilltop who resort to burning the plastic waste in order to get rid of the waste generated there or throw it in the open, which later on gets scattered to different places through air and other natural factors. However, the issue is not only with regard to the disposal of non-degradable waste items, but also the degradable items which can be used as manure, if treated. Improper management of waste causes water, soil and air pollution, apart from the unmanaged waste being littered.

The major issue with regard to the non-biodegradable waste which remains unmanaged like plastic and rubber, if thrown around the hill area, will get deposited in the cracks and the soil which will release harmful chemicals and can trigger several kinds of adverse effects. The plastic and rubber particles, if gets deposited in the cracks, will change the course of water flow drastically affecting the major rivers and their flow. In the major cities, the garbage disposal is mainly through landfills. Nevertheless, the landfills are overflowing and are not really suitable for area which boasts of fertile soil combined with pleasant weather. The waste management is one of the major issues needs to be addressed by taking remedial measures.

[9] State of Environment Report, State of Karnataka, available at <http://www.moef.nic.in/sites/default/files/SOER-Karnataka-2011-EMPRI%28I%29.pdf>

Heritage spots

Several spots of archaeological significance are in existence from several centuries deserving protection. Especially, the temples and the other monuments are ancient and the extension of protection to these will go a long way in conserving the monuments of historical importance. Grant of recognition to several sites like Tippu Drop, Tippu Palace, Yoga Nandeeshwara Temple on top of hills are exposed to both nature and humans, which can cause irreparable damages leading to a state beyond recovery.

ii. Governance

Nandi Hills which covers an area of approximately 2800 hectares is under the governance of different authorities, like the Forest Department and the Horticulture department. Presence of two authorities is not contributing to its development and is mostly leading to confusions causing various related issues to crop up. The same are escalating becoming a major cause for other issues. Governance, being the primary issue has to be resolved thereby only one authority and not many authorities. The issue of lack of coordination between the departments has already been acknowledged by the different ministers. Whereas, the issues relating to the governance are handled by different authorities will inevitably lead to confusions and distortions. As the different departments are functioning with different objectives, the functioning of those departments to their fullest possible extent may not be possible for the reason that the area is governed by multiple authorities. The issues relating to tourism has to be dealt by the Tourism ministry; issues' relating to the administration on top of the hill is taken care by the Horticulture ministry; and, the rest of the area is taken care by the Forest Department.

Tourism Ministry works with the objective of development of tourism and the promotion of tourist activities in and around the hills area. There were also talks about setting up of adventure sports in the Nandi Hill area, which has not only created a lot of ripples in various circles, some demanding for its withdrawal and some supporting it. However, the setting up of adventure sports in the hills will only worsen the situation and does not in any way contribute to the development of the area in the ecological perspective. The issue of tourism and the number of visitors are increasing

day by day and the same has to be regulated. However, the area also cannot be completely taken away tourism department, as there are several temples and monuments which are ancient and protected.

The Department of Horticulture is taking care of the area on top of the hills, wherein saplings and trees planted are nurtured and taken care of by the Department. Department does not have any powers to enforce the laws to regulate the tourist activities in their jurisdiction. Powers of the Horticulture department exercising jurisdiction on top of the hill is very limited and it does not have the powers similar to those conferred to the Forest officers to protect the forest cover in the region. The need of the hour is to either hand over the land to one single department in order to strictly enforce the laws and regulations.

iii. River Conservation and Groundwater Depletion

The river Arkavathi, for a very long time, since 1895 to 1972 was the lifeline for Bengaluru, as it provided for drinking water to the city. First, it was the Hessarghatta reservoir, and then the Thippagondahalli reservoir, which provided fresh water to the city. In the upstream, river provides water for to Doddaballapur town and a rapidly industrialising area around it. Within 10 to 15 km of the Nandi Hill range, reservoirs of the various rivers which originate here are providing drinking water to towns with populations of 50,000 to 100,000. These towns are growing and their economic need for water too is increasing. Agricultural activities in these areas are also dependent on groundwater. The farmers cultivating here are mostly dependant on the monsoon for their water needs for agricultural activities. However, the problems are increasing for the reason that the ground water table is drastically going down due to extraction of water by digging bore wells to satisfy the immediate needs, without resorting to compensate the depleted resources.

The Arkavati River which originates in Nandi Hills is one of the tributaries of the river Kaveri. It is joined by its tributaries Kumudavathi, Suvarnamukhi, Vrushbhavati before it joins Kaveri at Sangama. The river was significant for the fact that it supplied substantial volume of water for the domestic needs as it was estimated to supply around 20% of the water requirements to Bengaluru city. But due to increase

in land value several issues regarding sand mining, encroachment and industrial pollution have considerably affected the course of the river. The polluted waters of Arkavati have had its impact on the ground water quality and in many of the areas on the course of the river. Whereas, due to the polluted water, the farming activities has been severely affected. The activities in and around the area has led to the change in the course of the river.[10]

Rainfall is the most important climatological factor in Nandi Hills. Rains occur irregularly from May to September. It is also the source for six rivers as already mentioned previously, originating in these ranges. These rivers are the main lifeline to lakhs of people in Karnataka. However, the rivers are not immune from the cumulative effects of human activity. Most of the lakes and ponds in the Nandi Hills ecosystem, from where most of these rivers originate, have depleted and become acidic. Protecting the ecology and the environment of the ranges will protect the rivers and fresh water. This will also help an orderly development of the place in a sustainable fashion. Unless an institution is created and armed with powers to manage this sensitive area we will see the gradual demise of a culture centred around water and the death of six rivers. The time to act is now and that would be water wisdom.[11]

Groundwater is the water that is found beneath the earth's surface, in cracks and the spaces between rocks, sand, and soil. It is stored in these spaces, and moves gradually through geologic formations of sand, soil, and rock called aquifers.[12] Containing approximately 21% of freshwater, groundwater is the largest source of usable freshwater in the world. If a groundwater system that has not undergone human intervention is considered, it will be seen that the system is in a long-term equilibrium. The discharge and recharge are both natural processes, and mutually balance each other. The level of groundwater remains relatively constant over time. Natural fluctuations do occur, but they are minor in nature, and become increasingly insignificant with increase in the time variable. However, human intervention in the

[10] The River Arkavathi is one of the tributaries to river Kaveri. It originates in Nandi Hills, Chikkaballapur, and is one of the largest mountain rivers, in Karnataka. The River Arkavathi, https://www.karnataka.com/nandi-hills/river-arkavati/

[11] Saving six rivers, available at<http://www.thehindu.com/features/homes-and-gardens/green-living/saving-six-rivers/article6643274.ece>

[12] What is Groundwater?, GROUNDWATER FOUNDATION, available at http://www.groundwater.org/get-informed/basics/groundwater.html (Last visited on 8 May, 2018).

form of pumping through bore wells (and other means of artificial extraction) leads to disruption in the natural equilibrium. This is because withdrawal occurs at a rate that is much faster than deposit, which leads to rapid depletion of the balance. Groundwater is indeed a crucial resource, and in the near future, it will probably be more valuable than other precious stones and minerals that it shares the earth with. One of the reasons for the decline in groundwater table can be reduction in the level of precipitation. However, in the case of Nandi Hills, this cannot be the sole reason. This is because records taken from rain gauges across a long-term period indicate that the level of rainfall has remained fairly constant.[13] Another reason can be evapotranspiration (the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants). However, rates of evapotranspiration have remained fairly constant as well, indicating that increase in temperature has not led to decline in the groundwater level.[14]

It was found out from a study undertaken by the experts from Ashoka Trust for Research in Ecology and Environment (ATREE), in collaboration with scientists from the University of California at Berkeley, has concluded that "over-extraction of groundwater through pumping and the large-scale planting of eucalyptus" are the main reasons for depletion of the groundwater table.[15] The same could also be the reason for the ground water depletion in the Nandi Hill area.

Projects which includes the large scale construction, like the apartments, malls and other economically beneficial infrastructure are coming up in and around the Nandi Hills area which is jeopardising the ecological balance of the area, as the dust particles from the construction activities in the air will settle down on the hills, which will affect the natural water refining mechanism imbibed in the plants and trees. Further, the issue with regard to government granting sanction to such activities in itself

[13] Mihika Basu, What killed the Arkavathy?, BANGALORE MIRROR (August 11, 2016), available at https://bangaloremirror.indiatimes.com/bangalore/others/what-killed-the-arkavathy/articleshow/53640223.cms (Last visited on May 8, 2018).
[14] Id.
[15] Why is the Arkavathy dying?, ASHOKA TRUST FOR RESEARCH IN ECOLOGY AND ENVIRONMENT (ATREE) (2010), available at http://www.atree.org/research/ced/lwl/arkavathy_drying_21042015 (Last visited on 8 May, 2018).

manifests the intention of the government to convert the area into an economic hub than to protect it as an ecological hub.

Ground water occurs almost everywhere beneath the land surface. Natural sources of freshwater that become ground water are:

a. Areal recharge from precipitation that percolates to the water table;
b. Losses of water from streams and other bodies of surface water such as lakes and wetlands.

Streams and other surface water bodies may either gain water from ground water or lose water to ground water. However, streams commonly are a significant source of recharge to ground water. Further, it must be pointed out that the rocks in Nandi hills are predominantly made of sandstone. Leakage through the underlying rocks in sandstones is less compared to the basalt rocks. As pointed out by experts, nearly 30% of the surface runoff water seeps into the ground. However, in case of Nandi, this is not the case as many of the pores are covered with the soil from the mining activities prevalent in and around the Nandi hills. The dirt obstructs the percolation of surface run off water of rivers and streams.

iv. Forest Fires

As per the news reports, recently on March 8, 2018, several areas of the Nandi Hill ecosystem have caught fire.[16] The incident was not the first time, but it was for the second time in succession. The Forest Department who are in-charge of the area are of the opinion that the hunting traps were instituted near the fire sites. The other reasons are also because of the attempts for land grabbing and hunting of wildlife. These are the major causes for fire in the Nandi Hill area. Even in the past, multiple attempts have been made by various persons involve in the sand and stone quarrying mafia to usurp the land illegally. Rather, the attempt continues unabated. The attempts to blaze the area to clear the land for cultivation and for other activities are quite evident.

[16] Fire at Nandi Hills again, http://www.newindianexpress.com/cities/bengaluru/2018/mar/08/fire-at-nandi-hills-again-1783791.html

The Government of Karnataka announced to initiate action to develop the twenty heritage [17]sites in Karnataka under which, Nandi Hill is one of the major destinations. Forest fires, it was suspected, in the recent days, have not been due to natural reasons and the reason for this being that the farmers have the practise of burning the dry grass to facilitate the growth of green grass which serves as fodder to the cattle for grazing. Burning of grass which is two or three years old is helpful, but not the frequent fires, as it lead to killing of other shrubs in the surrounding areas[18].

v. Land Grabbing

The issue of land grabbing in the area is not unheard of, as it is vulnerable to be developed for economic activities. The land grabbing and squatters from the area, in order to make gains, squat on these lands and get it converted and develop it for other purposes, for which the government or the relevant authorities have to keep a watch.

Nandi hill has been declared as green belt which means that no residential areas can come up here and no commercial activities can take place. Officials of Forest Department mentioned that, these lands are also part of the green belt and every year they are targeted and the trees are being set on fire. Of late, many restaurants and resorts have come up here. This is a classic manoeuvring to usurp the forest land from the hands of the Government. Though, the land near the Nandi Hill is meant to be green belt, the airport, which is in the close proximity, is the leading cause for all the imminent issues. It was in the year 2008, a report from the Government was published that around 70 acres of land[19] has been encroached in and around the outskirts of Bangalore. Due to increasing land value and rates, it has attracted the attention of developers and land sharks, who, not only, will try to squat on the property, but make attempts to grab it for their benefit. Land grabbing is a means to achieve an end, i.e., to develop the area to facilitate economic growth. Development of Devanahalli – Dodaballapur region to make it an Information Technology Region will not only develop the realty but also push the economic growth. The development of resorts and

[17] Villagers burning dry grass cause for Nandi Hills fire, http://www.newindianexpress.com/cities/bengaluru/2018/feb/25/villagers-burning-dry-grass-cause-for-nandi-hills-fire-1778578.html

[18] Prof. Balakrishne Gowda, Professor, University of Agricultural Sciences, Bengaluru.

[19] Realtors grab government land in Chikaballapur, http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/Realtors-grab-government-land-in-Chickballapur/article15369875.ece

apartments will only push the growing population to these areas damaging the sensitive ecology.

The other positive of having the connectivity through Nandi Hill being that the area is on the way to Hyderabad, which is another economic hub and a metro city is close to Bangalore, which will provide connectivity. Though, Nandi Hill provides for clean air with pleasant environment free from pollution, is facing increase in traffic. The area is also proposed to come up with IT and SEZs and due to easy availability of land provides a good prospect for the developers. Furthermore, the investors have already started investing expecting returns sooner or later. Without following proper land conversion procedure, several buildings have already come up even before the lands getting converted. The Nandi hill area is witnessing rapid development and many more of such infrastructure projects are expected to come up in the near future.

vi. Sand Mining And Quarrying

Convoys of trucks pass by the road day, transporting tonnes of sand to different parts of the state, and perhaps to others too. On paper, sand mining is banned even on private patta land in Chickballapur district. In the road heading from Kuduti to Nandi Hills, the land has been plundered to such deaths that in some places the surface water has come up. There are some labourers who insist it's for construction work to level the road. But there is no sign of any construction- just an excavator to scoop out the sand and trucks to take it away. All this makes for an environmental disaster.

Nandi Hill is naturally blessed with bounty of natural resources. The rivers originating from Nandi Hills like Arkavathy and Palar have their river beds. The presence of rocks in these areas and due to its natural weathering, sand is produced. The mining of sand in these areas pose serious vulnerabilities to the river. The natural river sand is mined from the river beds and such mining has severe environmental consequences.[20] The mining of minor minerals requires permission from the Government and its impact on the government is tremendous which are as follows[21];

[20] District Level Environment Impact Assessment, Ministry of Environment, Forest and Climate Changehttp://www.environmentclearance.nic.in/writereaddata/District/surveyreport/201220177RUL54KFDistrictSurveyReportnewckp.pdf
[21] Ibid

a. Sand extraction reduces percolation of rain water to ground leading to plummeting of ground water level.
b. Roots of the tree will be deprived of water.
c. Water flowing into the river will not be filtered.
d. Erosion of nearby land due to excess sand lifting.
e. Disturbance in the area destroys the flora and fauna in surrounding areas.
f. Impact on the roads due to overloading of sand trucks.
g. Diminishing of Natural Rivers or river beds, not available for future generations.

Utilization of such resources are in the long run will damage the environment to a very great extent beyond recovery. Apart from the construction activities, natural channel of river Arkavathy is getting damaged. It has been also cited that due to rampant and indiscriminate sand mining the river flow has been affected along with the tributaries. Increasing infrastructure activities and shortage of natural sand for the fulfilment of construction activities, Arkavathy river bed provides for abundant amount of natural sand along its river bed. Although there is no quarrying in the hills, the surrounding areas are not new to it, which tends to be detrimental to the future of the ecology of the region. The ecosystem tends to be threatened by the noise from the blasting in the region. These sounds vibrations tend to disturb certain species of the region. Therefore there should not be a simple objective standard laid down which prescribes the boundaries after which blasting is allowed. Illegal quarrying seems to be a commonly encountered situation and hence there is a need to have a thorough look at the working realities from time to time. There should be sensitivity as to the issue of the particular ecology of the region, which can be arrived at by consulting experts assigned in the region.

vii. Airport and the issues around it

The Bengaluru International Airport is a hub of activities and the density of air traffic has been on the increase over time. Measures are being taken in expanding the same the vehicular traffic has multiplied several times over. This has resulted in phenomenal increase in air pollution. Expert consultations have revealed that if unchecked, this would be a serious health hazard and the symptoms of the adverse

effects of the same are already being experienced in the entire area and its neighbourhood. The Lok Adalat of the Karnataka High Court had expressed its serious resentment over the health and hygiene problems, resulting from this activity and commanded all the concerned to take the necessary corrective actions and formulate appropriate precautionary measures for future application. These institutions appear to have had little impact on the administration or those who are engaged the activities associated with the airport.

It is also further revealed in our consultations with the expert on airport and management that care and diligence are taken to ensure that the required specific measures for airport maintenance, management and operations, comply with the guidelines laid for the purposes and the Air Funnel area, that includes the surrounding land and airspace concerning take-off and landing, are maintained as per specifications. However, it was found that no clear plan exists or evidence of any effective measures taken in dealing with huge construction and deve3loping activities occurring in their vicinity. These have resulted in the encroachments, waste dumping and degradation of landscape in the surrounding area that has almost irreversible adverse impact on the Nandi Ecosystem threatening its integrity and survival. This requires urgent corrective measures for the present and better planning for the future to reclaim the lost ground of the Nandi Hills.

D. SCIENTIFIC AND OTHER EXPERT SOLUTIONS

Impact on sand mining

Sand Mining is an activity referring to the process of the actual removal of sand from the foreshore including rivers, streams and lakes. Sand is mined from beaches and inland dunes and dredged from ocean beds and river beds. A related process is the mining of mineral sands, such as mineral deposits like diamond, gold and silver. These minerals typically occur combined with ordinary sand. The sand is dug up, the valuable minerals are separated in water by using their different density, and the remaining ordinary sand is re-deposited. In-stream sand mining activities will have an impact upon the river's water quality. Impacts include increased short-term turbidity at the mining site due to resuspension of sediment, sedimentation due to stockpiling and dumping of excess mining materials and organic particulate matter, and oil spills or leakage from excavation machinery and transportation vehicles. Increased riverbed and bank erosion increase suspended solids in the water at the excavation site and downstream. Suspended solids may adversely affect water users and aquatic ecosystems. The impact is particularly significant if water users downstream of the site are abstracting water for domestic use. Suspended solids can significantly increase water treatment costs.[22]

For example, we have the Illegal sand mining is posing the biggest threat to the last of the wild and breeding gharials left. Found in maximum strength in National Chambal Sanctuary running across three states- UP, MP and Rajasthan, gharials are losing out to human interference. Mining of sand banks is destructive for gharial population as sand banks are essential for nesting and basking: Gharials lay their eggs under sand beds, but illegal sand mining destroys their nests. The complaint submitted to NGT reads, 'Sand is extracted for construction works. Local inhabitants are cultivating river banks immediately adjacent to the river and this is causing considerable disturbance to the natural habitat of ghariyals. Villagers residing along the river are flattening ravines present in the sanctuary for farming.' The 425 km stretch of the Chambal River was declared a protected area in 1979. The river originates from Kota in Rajasthan, runs through sandy ravines and ends at Bhare in Etawah, where it

[22] J. Tarus Sharon, Lagat Grace, Mitei Cheruiyot and Choge Phoebe, Analysis of Nitrates and Phosphates in Drinking Water Samples Collected from Tea Growing Community, Nandi Hills, Kenya 3-4(Chemical Science International Journal, 2017)

merges with the Yamuna. UP has 150 km of the river sanctuary running along Bah (Agra) and Etawah.[23]

The Arkavati is an important mountain river in Karnataka, India, originating at Nandi Hills of Chikkaballapura district. It is a tributary of the Kaveri, which it joins at 34 km south of Kanakapura, Ramanagara District called Sangama in Kannada, after flowing through Ramanagara and Kanakapura. The river drains into the Chikkarayappanahalli Lake near Kanivenarayanapura. It joins Cauvery river as a tributary near Mekedatu. The river is used by the Bangalore Water Supply and Sewerage Board to provide 135 million litres of drinking water per day to the city of Bengaluru, or about 20% of all the city's water. As it is filtered in the nearby mountain aquifer, the water is fresh and crystal clear. Sand Mining is an activity referring to the process of the actual removal of sand from the foreshore including rivers, streams and lakes. Sand is mined from beaches and inland dunes and dredged from ocean beds and river beds. A related process is the mining of mineral sands such as mineral deposits. These minerals typically occur combined with ordinary sand. The sand is dug up, the valuable minerals are separated in water by using their different density, and the remaining ordinary sand is re-deposited. Excessive in-stream sand-and-gravel mining causes the degradation of rivers. In-stream mining lowers the stream bottom, which may lead to bank erosion. Depletion of sand in the streambed and along coastal areas causes the deepening of rivers and estuaries, and the enlargement of river mouths and coastal inlets. It may also lead to saline-water intrusion from the nearby sea. The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system. It is also a threat to bridges, river banks and nearby structures. Sand mining also affects the adjoining groundwater system and the uses that local people make of the river. The government has the authority to make any regulation and policies. For the government to know what is needed to be formulated it can only be done with the help of a set of qualified scientists and several other experts in the fields of study, who can either be employed by the government or on a novational basis to look into some specific areas and thereby prescribe periodic reports to the authorities on repeated time such as ones in a week or month about the condition of the ecosystem and the pollution level ,which

[23] Manoj K Jha, Sand mining and its impact, (sept.2,2010), available at https://iasscore.in/national-issues/sand-mining-and-its-impact (last accessed on August 26-08-2018)

will further lead to the to formulate policies on needed issues and not waste the resources on the areas which are of least concern.

Impact of quarrying

The quarrying activities has caused significant damage to the surrounding areas as the finer dust particle that emerges from the quarrying activity gets deposited in the biodiversity rich areas. This will hinder the growth and development of the diversity.[24]

Impact on Air quality – Dust produced from the quarrying activities cause a major source of pollution, although the severity will depend on factors like microclimate conditions, concentration of dust particles in the ambient air, size of the dust particles and the related issues.

Noise Pollution – Quarrying involves several activities that generate significant amounts of noise. The excavation of minerals will involve considerable noise, particularly the blasting methods involved in the extraction.

Damage to Biodiversity – The major issue with regard to the negative impacts of the quarrying and sand mining is the damage inflicted to the biodiversity. The activities cause destruction of habitats and species they support.

There other issues related to various subjects are not specifically dealt with, since the data analysis requires technical expertise.

[24] Hsin-Yi, The impact of quarrying. http://www.sustainablefloors.co.uk/the-impact-of-quarrying.html

E. LEGAL AND POLICY ANALYSIS

a) *IN RE* GREEN BELTS

In India, there is no exclusive green belt regulation/policy. The Environment Protection Act, 1986 lays down guidelines for the protection of greenery. However, under the purview of other regulations such as Environmental Guidelines for Industries, Environment Management Plan, National Forest Policy, Forest Conservation Act, etc., certain percentage of land designated for green belts is recommended for different categories of industrial projects. Expansion of agricultural, urban and industrial activities are causing additional burden on natural resources. Industrial development is causing severe health hazards due the exceeded level of pollution. Green belt not only restrict environmental pollution but it helps to maintain the ecological balance of the region.

The Supreme Court has held that land falling within the green belt area cannot be put to auction by development authorities since serious public interests are involved in it. The court also nullified an auction made by the Delhi Development Authority (DDA) in 1985. The DDA auctioned a part of the land falling within the green belt in the Kalkaji area in South Delhi. A division bench ruled "on the date of the auction the plot being in the green belt, could not and should not have been put to auction.' Justice R C Lahoti directed the civic body to return the money deposited by Ravindra Mohan Aggarwal. Aggarwal had bid for the land with nine per cent interest since 1985. At the same time, public interest litigation was filed in the high court challenging the auction. The petitioner complained that the plot was situated in the green belt and, therefore, could neither have been treated as a developed plot nor put to auction for any purpose other than its use as a green belt.

The Karnataka High Court[25] had held that for maintaining ecological equilibrium and pollution free atmosphere of the villages, KIADB is to leave land of 1 km as a buffer zone from the outer periphery of the village in order to maintain a green area towards preservation of land for grazing of cattle, agricultural operations and for development of social forestry. This measure would preserve the ecology

[25] Karnataka Industrial Areas Development Board v. Sri C. Kenchappa & Ors., (2006) 6 SCC 371

without hindering the much needed industrial growth, thus striking a balance between the industrial development and ecological preservation. The Court had also directed that whenever there was an acquisition of land for industrial, commercial or non-agricultural purposes, except for the residential purposes, the authorities must leave 1 km. area from the village limits as a free zone or green area to maintain ecological equilibrium. The concept of green belt in Karnataka is always linked with the concept of land revenue.[26]

As per the **Karnataka Land Revenue Act**, **1964, Sec. 95 (2A)(iv)[27] and (xiii)**[28] The Deputy Commission cannot give permission to regularize the diversion of agricultural land for residential or commercial purposes if it falls within **green belt** areas. Reference is also made in the Statement of objects and Reasons[29] as follows;

"…

Such rapid urbanisation, unless adequately supported by requisite infrastructural facilities, may pose a great environmental hazard. Similarly, these urban areas run a great risk of becoming a "Concrete Jungle", unless their growth is properly regulated with suitable provision for adequately ***stretches of Green Belts****. Most modern cities today are laying great store by such provisions for Green Belts. With a view to ensuring that the urban population in Karnataka is adequately served by infrastructural facilities and does not unnecessarily run the risk of environmental hazards, it is considered essential to have carefully laid out Green Belts around such Cities/Towns.* ***The first step to protect such a green belt is to regulate conversion of the agricultural land in such track to non-agricultural use.*** *It is, therefore, proposed to amend the provisions of Section 95 of Karnataka Land Revenue Act, 1964, providing for the* ***prohibition of conversion of agricultural land to non-agricultural uses within the Green Belts around Cities/Towns****, as may be notified from time to time. Hence the Bill."*

[26] 1991 amendment to Karnataka Land Revenue Act with retrposepctive application from 1965 : Section 2A(xiii) — When someone uses agricultural land for some other purpose: Deputy commissioner may regularise any conversion done without his permission, except where such land is green belt area declared under Karnataka Land Revenue Act.
[27] Section 2A(iv) - is a forest land;
[28] Section 2A(xiii) - or unauthorised development or construction made in agricultural zone of approved Master Plan or green belt area declared under Karnataka Land Revenue Act, 1964; and.
[29] Amending Act 23 of 1984

The Supreme Court, in addition to, dealing at length with the principles of sustainable development, polluter pays, precautionary principle, public trust doctrine, also emphasized on the requirement of carrying on an impact assessment and obtaining necessary clearance from the State Pollution Control Board and the Department of Ecology and Environment before execution of an industrial activity.

b) LAWS REGARDING FORESTS

Ecologically Sensitive Zone

A brief note on the T.N. Godavarman Guidelines

In case of *T.N Godavarman* v. *Union of India*[30], what had started as a petition to cease illegal felling of timber in the Nilgiri Hills was soon transformed with cognisance of the court into recognising the ecological sensitivity of the region, given its rich biodiversity, it was essential to conserve and protect this region. From *T.N Godavarman* case three essential standpoints can be derived which is necessary, for protection of Nandi Hills.

- First, to establish that it is a protected forest to avail protection under the provisions of Forest Conservation Act 1980, the dictionary meaning of what is defined as forest should be applied to the definition of forest. Irrespective of ownership rights, all forests are included within this meaning must be accorded protection.
- Secondly herein, court has recognised that deforestation as key cause of ecological imbalance, thus prioritising a system to prevent deforestation.
- Thirdly, the duty to ultimately define what is ecologically sensitive area, and limiting human access to the same, to prevent any human activity that can endanger the ecological balance of the area. This can be easily determined by the vulnerability of native species to the area to any form of human interaction or activity.

Biological Diversity Act, 2002[31]

The scope of act can be used to define the biodiverse sensitive areas under this region and protect the same.

[30] 1997 2 SCC 267
[31] **T**HE BIOLOGICAL DIVERSITY ACT, 2002, No. 18 OF 2003

- Section 37 of the Act states that the Biodiversity Heritage sites to be established. The state government under this provision has the power to notify a particular area as a Biodiversity Heritage site. The Biodiversity Board of the state should take cognisance of erosion of forest cover, undertake bio-survey to determine current levels of damage done to the ecosystem in order to formulate a system of measures to conserve the region and prevent any further *overuse, abuse of resources or neglect* of the ecosystem.
- The Act under 36(4)(ii) provides for the governments to undertake and develop the national strategy plans for the conservation of the biological diversity. The State Board along with the National Biodiversity Authority can make impact assessment to see what is the impact of each development project in and around the region on the ecology, so as to prevent any adverse consequences. After such assessment it should be the duty of government to shut down any activity that has significant adverse impact on ecology in the long run, and for other projects if they have little or some level of impact they are to operate mandatorily in a sustainable manner, without affecting the environment, from environmental friendly waste management systems to sustainable use of pre-existing resources, and actively conserving resources.
- The role of State Government to act as a regulator, when it comes to monitoring pre-existing projects, any project that is neglecting the regulation standards of the government must be shut down immediately.

RESERVED FOREST

The Karnataka Forest Manual[32] prescribes the **Procedure in respect of the** constitution of a Reserved Forests under Chapter I, clause 1 as follows;

The procedure in respect of constitution of a Reserved Forest comprises of three stages:- Firstly, selection and preliminary demarcation of the proposed area by suitable cairns and the preparation of a Plan and draft notification of boundaries by the Divisional Forest Officer;

Secondly, inspection, perambulation, correction of map and settlement by the Forest Settlement Officer; and

[32] http://aranya.gov.in/downloads/KFD_Manual_1976.pdf

Thirdly, the preparation of the register of claims by the Forest Settlement Officer, the issue of the corrected map and final notification duly verified and signed by the Forest Settlement Officer and the Divisional Forest Officer and the final demarcation by the Divisional Forest Officer.

Clause 3 of the Manual prescribes for the Area to be included in the Forest;

Where the forest is too valuable to be set apart for village use and where occupied lands are scattered about in the midst of valuable forests, as frequently happens in the Malnad, it would be preferable to include all the available area in the proposed Reserved Forest, leaving it to the Forest Settlement Officer to allow such rights and privileges in or over such forest as the villagers may be entitled to in accordance with Sections 13 and 14 of the Forest Act.

Clause 4 of the Manual prescribes for the Areas to be excluded from Reservation

The following areas should be excluded from reservation when possible:-

(a) Occupied lands, when the exclusion can be made without disfiguring the shape of the forest;

(b) cultivable lands under tanks and irrigation charnels

Clause 11 of the Manual prescribes for the Preliminary demarcation;

The boundary line as shown in the map should be laid down on the ground and cleared to a width of 2 metres in such a manner that it can be easily identified by the Forest Settlement Officer and raiyats concerned. It should be further defined by small cairns set up at all angles and at other salient points in such a manner that one may be visible from the other.

Clause 12 of the Manual prescribes for the Draft Notification

The Divisional Forest Officer will submit the draft notification to the Chief Conservator of Forests through the Divisional Commissioner and the Conservator of Forests, together with all the connected papers, maps and descriptive account of the block. The latter will forward it to the Chief Conservator of Forests recording his own opinion thereon. If the Chief Conservator of Forests agrees to the proposals made, he will forward them to the Government. If the Chief Conservator of Forests disagrees with the Divisional Forest

Officer, the former's opinion will prevail, and the Divisional Forest Officer will either drop the question or carry out such modifications as he may order. If there is a divergence of opinion between the Chief Conservator of Forests and the Divisional Commissioner, the papers will be submitted for the orders of the Government by the Chief Conservator of Forests.

POWER OF THE GOVERNMENT

Under **Sec.39 of the Karnataka Forests Act, 1973**, the State government has the power to protect certain forest *for special purposes.* It is recommended that keeping in mind the fragile biodiversity of Nandi Hills, its ecological, historical and cultural significance, the State government by notification make provisions under Sec.39[33]

(1) (a) To prohibit the clearing of forest in the Nandi Hills foothills, the burning of trees, the cutting or sawing of trees, and the quarrying of stones in the surrounding area.
(b) Make provisions for afforestation of the foothills and the Nandi Hill and hilltop.
(2) Afforestation would also help to carry out the protection of land from soil erosion under Sec. 39 (2) (b). Increased afforestation would also fulfil the objective of (2) (h) (i), preservation of public health.

The reduction of forest cover has also led to several native animal species declining in number. Vultures which used to abound Nandi Hills are now longer there.

[33] 39. Protection of forests for special purposes.—(1) The State Government may, by notification,— (a) regulate or prohibit in any forest,— (i) the breaking up or clearing of any land; (ii) the pasturing of cattle; (iii) the firing or clearing of vegetation; (iv) the girdling, tapping or burning of any tree or the stripping of bark or leaves from any tree; (v) the lopping or pollarding of trees; (vi) the cutting, sawing, conversion or removal of trees and timber; or (vii) the quarrying of stones or the burning of lime or charcoal or the collection or removal of any forest produce or its subjection to any manufacturing process; (b) regulate in any forest the regeneration of forests and their protection from fire; (c) regulate the exercise of customary and prescriptive rights in such forest or forests. (2) When such regulation or prohibition appears necessary, the State Government may, by notification, provide,— (a) for the conservation of trees and forests; (b) for the preservation of and improvement of soil or the reclamation of saline or water logged land, the prevention of land slips or the formation of ravines and torrents or the protection of land against erosion, or the deposit thereon of sand, stones or gravel; (c) for the improvement of grazing; (d) for the maintenance of water supply in springs, rivers and tanks; (e) for the maintenance, increase and distribution of the supply of fodder, leaf manure, timber or fuel; (f) for the maintenance of reservoirs, or irrigation works and hydro-electric works; (g) for protection against storms, wind, rolling stones, floods and drought; (h) for the protection of roads, bridges, railways and other lines of communication; and (i) for the preservation of public health. (3) The State Government may, for any purpose referred to in sub-sections (1) and (2), construct at its own expense, in any forest, such work as it thinks fit.

Deforestation causes ecological imbalance and leads to environmental deterioration. Deforestation had been taking place on a large scale in the country and it had caused widespread concern.

WILDLIFE (PROTECTION) ACT, 1972

The Wildlife (Protection) Act, 1972 can also be pressed into its implementation for the better conservation and protection of the area. The Act was passed under Article 252 of the Constitution at the request of eleven states and it is intended to provide a comprehensive national legal framework for Wildlife protection. A two pronged strategy for conservation is adopted being specifying the endangered species irrespective of the location of its existence and the protection of all species in specified areas.

c) GROUND WATER CONSERVATION

Section 2(a) of **KARNATAKA GROUND WATER (REGULATION AND CONTROL OF DEVELOPMENT AND MANAGEMENT) ACT, 2011,** defines 'artificial recharge'. Section 2(n) defines rainwater harvesting. Section 2(r) defines saturation zones. Section 11(3) provides for the construction of 'artificial recharge structures'. This indicates that the Act does provide for a basic understanding of the scientific principles behind groundwater rejuvenation.

Section 10 provides for the power to notify certain areas to regulate and control the development and management of groundwater. The Karnataka Groundwater Authority, established under Section 3, has to consult 'expert bodies, who must opine that extraction of groundwater must be regulated in a certain area to serve public interest. The Authority can then advise the State Government to declare such area to be a 'notified area', as defined under Section 2(l). The State Government, may, upon such advice, declare the area to be 'notified area' via notification in the Official Gazette. Under Section 10(5), the same procedure can be followed for de-notification.

Any potential user of groundwater in a notified area must apply for a permit to the authority under Section 11(1). The Authority, before granting a permit, must be satisfied that it is not against public interest to do so, as under Section 11(2). This grant of permit will be subject to certain conditions under Section 11(3), like mandatory provision of

artificial recharge structures of appropriate size to be constructed by the applicant within a period as specified by the authority.

Under **Section 13**, any person or organization who engages in drilling activities must register their machinery with the authority. This condition applies even in non-notified areas. Under **Section 17**, the authority has been given a wide range of powers, including search and seizure of powers. Under **Section 32**, offences are defined in the nature of violations of stipulations provided for by the Act, and conditions laid down by the authorities. Punishments for offences like extracting groundwater without permit in notified areas are in the nature of fine and imprisonment. **Section 34** extends the commission of offences to corporate entities, and state that these entities too, can be punished accordingly.

d) TOURISM AND ECOSYSTEM

Managing Tourism in Nandi Hills Without Disturbing The Ecosystem[34]

An extensive scheme of management can be created under the framework of the **Karnataka Tourism Trade (Facilitation and Regulation) Act, 2015**, to regulate tourism activities so as to not let it affect the ecosystem in any way whatsoever.

Firstly to set up guidelines to define a competent tour guide, criteria should extend to awareness of the region, be aware of sensitivity of the ecology of the region, and be able to distinguish different requirements of each species and things that affect time.

- Prescribed authority under section 16 should grant license to tourist guide only upon meeting such criteria.
- The duties under section 21 and 22 must be followed stringently, when it comes to maintaining cleanliness of the region. For instance strict segregation and disposal of waste must be followed, and biodegradable waste can be used as compost to fertilize the soil of the region and aid in the growth of the native flora.

[34] Karnataka Act No. 21 OF 2015

- Special rules to be framed to regulate the activities of tourists. For instance, from regulating hours of visit, wherein in early hours of morning such as dawn time, when most of species are active, only experts such as scientist and avian watchers should be allowed, as they know ways to not disturb any of the fauna and do their task without disturbance. Late morning to early evening hours should be ideal hour to let in slots of tourists, but after dusk limited entry should be allowed. Rules should also be framed to penalize any tourist for littering the place or creating nuisance, pay fines if necessary to compensate for the same.
- The Government of Karnataka had drafted the policy for development of Cable Car at Four locations in Karnataka[35]. The four locations are
    - Chamundi Hills;
    - Nandi hills;
    - Kemmangundi;
    - Madhugiri Fort.

  The same has not been implemented since then or is moving in a snail pace.

e) FOREST FIRES

Disaster Management[36]-

This speaks about forest fire and its impact, its global and Indian scenario and on managing forest fire. Under management of forest fire, it mainly focuses on afforestation, efficient use of waste land, reclamation of waste lands, management of natural forests, increasing productivity of existing ecosystems, efficient utilization of woods, etc. It also throws insight on its latest forestry management practices and ushering a new culture among the rural masses which includes awareness, mobilization of the people, building confidence, multi-disciplinary applied research and providing analytical studies.

[35] Development of Cable cars at 4 locations in Karnataka.
http://www.karnatakatourism.org/policy/cable_car_at_4_locations.pdf
[36]Dr. Satendra Dr. Ashutosh Dev Kaushik, FOREST FIRE DISASTER MANAGEMENT, National Institute of Disaster Management Ministry of Home Affairs Government of India ,
http://nidm.gov.in/pdf/pubs/forest%20fire.pdf

National Action Plan on Forest Fire[37]

Most of the features are similar to the Forest Fire Disaster Management, except the extra feature on zonation and mapping of fire risk and methods of controlling the fire spread. It lays down various steps for an effective response by concentrating on the zones which are at risk for forest fire. This also covers post fire management which includes assessment of loss incurred, proper investigation of the causes, restoration of fire affected areas and equipping the firefighters, i.e the squad should be provided with basic equipment including leaf litter blowers and protective clothing.

Karnataka Forest Rules, 1969

Chapter VI (Protection of forests from fire)[38] - Under this it mainly focuses on prohibition and precautions to be taken regarding inflammable materials and kindling of fire within 15km of the forest boundary.

f) LAND GRABBING

The Government of Karnataka in the year 2011 came up with a law called the **Karnataka Land Grabbing Prohibition Act, 2011**

The Preamble to the Act states as follows;

"An Act to provide for measures to curb organised attempts to grab lands whether belonging to the Government, wakf or the Hindu Religious Institutions and Charitable Endowments, local authorities or other statutory or non-statutory bodies owned or controlled or managed by the Government. And whereas such land grabbers are forming bogus cooperative housing societies or setting up fictitious claims and indulging in large scale, unprecedented and fraudulent sale of such lands through unscrupulous real estate dealers or otherwise in favour of certain sections of the people resulting in large accumulation of unaccounted wealth and quick money to land grabbers and thereby adversely affecting public

[37] NATIONAL ACTION PLAN ON FOREST FIRE, FOREST PROTECTION DIVISION MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE GOVERNMENT OF INDIAhttps://www.forests.tn.gov.in/app/webroot/img/NAPFF-Final%20Draft%2023.04.2018.pdf

[38] http://aranya.gov.in/downloads/KF_Rules_1969.pdf

order; And whereas, having regard to the resources and influence of the persons by whom, the large scale, on which and the manner in which, the unlawful activity of land grabbing was, has been, is being organised and carried on in violation of law, as land grabbers in the State of Karnataka, it is necessary and expedient to curb immediately such unlawful activity of land grabbing."

Section 2 (f) of the Act defines "land grabbing'' as every activity of grabbing of any land, without any lawful entitlement and with a view to illegally taking possession of such land, or enter into or create illegal tenancies or lease and licences agreements construct unauthorised structures thereon for sale or hire, or give such lands to any person on rental or lease and license basis for construction, or use and occupation, of unauthorised structures; and the term "to grab land'' shall be construed accordingly.

F. CONCLUSIONS AND PROPOSED SECTOR WISE SOLUTIONS

The issues aforementioned prevailing in the Nandi vicinity seeks for immediate attention to be addressed with appropriate solutions. In the current system there is a lot of importance placed on forest conservation and preservation. The solutions for each of the issues have been provided a *Short term solution and a Long term solutions***;**

i. WITH REGARD TO TOURISM;

The way forward aims at highlighting proposals which would help, attain sustainable development of Nandi ecosystem. The following objectives are sought to be addressed;

- To understand the ecological and historical significance of the Nandi Hills.
- To protect the eco-system of Nandi Hills.
- To sort out garbage, security and tourism management issues.
- To provide solid-waste management solutions and to provide a proper planning to segregate the garbage.
- To strike a balance between the tourism and the environment without disturbing both.
- To take steps to prohibit rampant commercial activities in and around the Nandi Hill.
- To track Government initiatives and initiatives by NGOs for the protection of the Nandi Hill.
- To draw people's attention to the Hills and work towards protecting, preserving and promotion of it.

The recent developments being worrisome as there are several changes that are taking place. He stated that the restoration of ecological and social importance of the Nandi Hill has to be preserved. The significance of a monument has to be protected by having some legal backing. The monument has social, cultural and customary background, which has to be protected by law and its agencies. Nandi Hill is a potential area of natural diversity along with that, it has sand beds potential for

mining, place of origination for almost 7 rivers and this connects the Western Ghats with the eastern biodiversity. The pigmentation of flowers in Nandi Hills, as it has a beautiful colour because of the weather. Growth of different flowers and to curb the pollution, eco-friendly vehicles have to be introduced. The tourism department shall make a circuit in Nandi Hills only for the tourists. Nandi Hills has been deteriorating due to soil erosion, water retention and ecological dilapidation and as everyone knows about the sanctity of Nandi Hills.

We still have water marks on the hills and with 600-700mm rainfall every year the rain water has to be utilized. It is very important to build a cluster around the area and to build a cycle like that created by the nature. A balanced view for tourism and ecology has to be taken as the issue is with regard to acquisition and alienation.

RECOMMENDATIONS

a. Short term solutions

- The duties under section 21 and 22 of the **Karnataka Tourism Trade (Facilitation and Regulation) Act, 2015,** shall be followed stringently, when it comes to maintaining cleanliness of the region. For instance strict segregation and disposal of waste must be followed, and biodegradable waste can be used as compost to fertilize the soil of the region and aid in the growth of the native flora.
- Special rules to be framed to regulate the activities of tourists. For instance, from regulating hours of visit, wherein in early hours of morning such as dawn time, when most of species are active, only experts such as scientist and avian watchers should be allowed, as they know ways to not disturb any of the fauna and do their task without disturbance. Late morning to early evening hours should be ideal hour to let in slots of tourists, but after dusk limited entry should be allowed
- The State Government should provide for parking space in the foothills of the Nandi, so that the issue of parking will not spill over to the top of the hills.
- To install dustbins and garbage disposal bags in the select points of Nandi Hills.
- The introduction of electric vehicles to ferry the tourists from the foot hills, close to where the vehicles are parked, to the top and back must be considered and the

same should be implemented in a phased manner. This will reduce the number of visitors and will keep a check on the pollution atop hills.

- Safety aspect of the visitors must be considered and should be kept in mind and must close those spots which remains unfenced and uncovered.
- Setting up a checkpoint at several points in the hill area to keep a check on the activities happening in and around. Also to check cars and vehicles entering the Nandi Hill vicinity.
- To ban liquor and other intoxicating items on the Nandi Hills.

b. <u>Long term solutions</u>

- Cable Car or Ropeways

Due to large number visitors to the Nandi Hills, the pristine and clean environment gets polluted and leading to habitat loss of several exotic species of birds and animals. The other side of the problem being that the reduction in number of tourists will affect the Tourism industry. In order to strike a balance between the number of tourists and the protection of exotic species, Ropeway, as a mechanism can be established. Introduction of ropeways will go a long way in contribution to the protection and conservation of the sensitive ecology in Nandi Hills[39]. Establishing ropeways will facilitate the movement of goods and people from bottom to the top and the other way round. Technological advancement of ropeways

  - The Government should consider bringing in the ropeways from the foothills to the top. This reduces human intervention in natural habitats of the animals and also provides for an adventurous experience to the tourists visiting the spot.
  - Ropeway installation will provide a long term solution to the existing problem. Though, there will be disturbance of different sort while the

[39] The information and suggestions have been gathered after meeting Prof. Krishnarao Jaisim, Architect and Former Chairman of Indian Institute of Architects, at his residence in Suvidha Village, off Kanakapura Road, Bengaluru on 29.08.2018.

ropeways are being setup, but in the long run, it will prove as an effective and alternative means of transport to reach the hilltop.

- The utility and feasibility - physical and financial, study of Ropeway infrastructure has to be conducted by the Government of Karnataka for the same to be adopted and replicated in Nandi.
- The adoption of silent drilling for the erection of pillars may be adopted and the necessary supportive infrastructure on top of the hill has to be enhanced to support the ropeway system.
- Creation of viewpoints at different junctions both from the point of tourism and development of greenery around the hills will support the biodiversity in the hills and enhances the value for tourism.
- The implementation of the ropeways may be done through the assistance of private investors, wherein the private investor will also support for the infrastructure growth and the same may be operated on the Build Operate Transfer (BOT) model, for a longer period of time.
- The system followed in the Palani Rope Cable car system may be replicated in the Nandi Hill region.

- Installation of waste segregation and management systems on top of the hills.
- Waste management system to be handed over to one particular authority like the Forest Department to have its own wing for waste collection from the hill area and to hand it over to the local authorities. This way they can keep a check on the happenings around the hill and to avoid other major issues like the land grabbing and hunting traps.
- **Aerial Ropeways Manual**

  The Environment Impact Guidance Manual-Aerial Ropeways[40] 1 was an initiative that was brought after the need for sector specific manuals and guidelines was felt. It was also felt that such manuals on each sector would standardise the quality of appraisal and in reducing inconsistencies between SEACs and the SEIAAs in granting ECs for similar projects in different states. As per the guidelines given in this manual, the following points are to be observed:

[40] http://envfor.nic.in/sites/default/files/arial%20ropeway_May-10.pdf

- Out of the 3 types of ropeways, the aerial tramways (reversible mono-cable or bi-cable) and aerial lifts (non-reversible but multiple car) can be used in Nandi Hills.
- Falling under Category A, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden.
- The description of the environmental data in relation to aerial ropeway development with regard to – land, air, noise, water, biological, socio-economic and health environment.
- The mitigation measures as mentioned in Chapter 5 of the Manual and other measures that see fit to Nandi Hill must be duly applied.

ii. WITH REGARD TO GOVERNANCE

The State Government should come up with an institutional mechanism to resolve the difference and fill the gaps in the issue of governance by taking up the issue in the State legislature and by passing a special enactment or a regulation for the protection and conservation of the Nandi Hill area. The subject of governance requires to be looked at from the long term perspective and hence, the solutions are mostly restricted to the long term;

Long term Solutions;

- To create an authority called "Nandi Ecological Area Management Authority" on the lines of the authority established under the Hampi World Heritage Area Management Authority Act, 2002. Though the Act cannot be replicated to Nandi Hill, for the reason that the Nandi Hill area is small and the same does not require a special enactment. Further, an appropriate and effective action for the protection of heritage property within the Nandi area is to be implemented.
- Consolidation of land boundary being the essential requisite for such a protection. Hence, the special status classifying it as heritage monument becomes necessary.
- Passing a special resolution, clearly detailing out the roles assigned and the functions to be performed by the horticulture and forest departments to ensure harmony in their working.
- The State Government may consider handing over the affairs of the management of the Nandi Hills to one particular department – A Single Autonomous Independent body. Handing over the same to the Forest Department could be an alternative, which already have requisite powers to take necessary steps to protect and conserve.

In the alternative, such an arrangement has not worked effectively in the past. The Lake Development Authority and the Minor Irrigation Department managing lakes and water bodies are illustrative of less than adequate and less

than satisfactory arrangements. Hence, there arises a need to think of an autonomous body which shall be called as;

"THE NANDI ECO-SYSTEM CONSERVATION AND DEVELOPMENT AUTHORITY"

Details of the proposed authority will be dealt with in the Recommendations at the end of this Report.

iii. WITH REGARD TO RIVER CONSERVATION AND GROUNDWATER DEPLETION;

The district of Chikkaballapur, primarily being an agrarian district, requires lot of water for the farming activities. The issue of groundwater depletion and the river conservation has to be taken on war-footing, as the depleting natural resources like ground water and rivers are alarming. The quality of ground water, which plays a pivotal role in the irrigation and domestic purpose, depends on formation in which the groundwater is encountered. It has been found out that the groundwater for the area is found at an average depth of 700 to 800 Feet range and in some areas it goes further down to 1000 feet. The requirement of water for agricultural activities being inevitable, farmers prefer to dig bore wells and more than 25% of groundwater in Chikaballapur district is having higher concentration of fluoride, nitrate and total hardness being worrisome. The need of the hour is to come up with plans for rejuvenation of the ground water table and the plan for river conservation. It is essential to rebuild Nandi Hills as the water levels have gone down drastically, due to which digging bore wells will not suffice. In order to rejuvenate the groundwater resources in Nandi hills, it is necessary to artificially recharge them. There are two ways to recharge the ground water. In direct method, water moves from the land surface to the aquifer by means of infiltration. Direct recharge methods can be grouped under three categories:

- When the aquifer is shallow, water spreading may be applied by flooding over areas or conveying water to basins and ditches;
- When an aquifer is situated at moderate depth from ground level, the aquifer can be recharged through flooding of pits and shafts;

In case of high overburden thickness or confining aquifer conditions, recharge can be affected by injecting the water directly into the aquifer using boreholes/tube wells.

RECOMMENDATIONS

The objective is to regulate the usage of water and to regulate the borewell pumping for irrigation and other related activities and also to maintain the sustainability and the conservation of the water resources and by maintaining the quality of water for public health and environment protection.

Long term solutions

- Implementation of various provisions of the **Karnataka Ground Water (Regulation And Control Of Development And Management) Act, 2011**, in *sensu stricto.*
- The implementation of the Model Bill for the Conservation, Protection and Regulation of Groundwater, 2016.[41]
- Demarcating the water channel route to clearly pave way for the river to flow and take its natural route.
- Artificial recharging of the channels and groundwater.
- Holding awareness drive to ensure people's participation, wherein information is shared and passed on as to the next generation. It is also essential to bring in community mobilization to bring forth cohesion amongst the members of the villages near the Nandi Hill area.
- The prohibition on digging new bore wells for certain number of months in a year will improve the situation to some extent.
- *Watershed development*[42] in the nearby areas will go a long way in rejuvenation of the ground water level. The implementation of water shed in and around the village areas will lead to judicious utilization of resources available in the area. The area which receives abundant rainfall is not able to sustain itself when it comes to ground water. Facilitating for the water to get deposited in the ground

[41] DRAFT MODEL BILL FOR THE CONSERVATION, PROTECTION AND REGULATION OF GROUNDWATER,11
http://www.planningcommission.nic.in/aboutus/committee/wrkgrp12/wr/wg_model_bill.pdf

[42] What is Watershed Development? http://www.karnataka.gov.in/watershed/Pages/What-is-Watershed-Development-.aspx

by adopting this mechanism will contribute to the increase in ground water level and also the river flow.

- *Rainwater harvesting pits*[43] - Even after receiving abundant rainfall, ground water shortage is imminent and the area suffers from lack of water, as most of the rain water gets wasted in the run off. By digging the land deep, and making the soil loose for water to percolate in selected areas by involving the local community people in the area is also one way of rejuvenation of the groundwater.
- Indirect methods of artificial recharge include the installation of groundwater pumping facilities or infiltration galleries near hydraulically connected surface water bodies (such as streams or lakes) to lower ground water levels and induce infiltration from surface water bodies. The effectiveness of induced recharge method depends upon the number and proximity of surface water bodies, the hydraulic conductivity of the aquifer, the area and permeability of the streambed or lake bottom, and the hydraulic gradient created by pumping. Indirect methods generally provide less control over the quantity and quality of the water than do the direct methods. When indirect method is practiced, the water recovered consists of a small fraction of groundwater and a large part of river or lake water.
- In hilly areas like the Nandi hills, infiltration of rain water is best accomplished by employing an integrated series of techniques, which, for example, can include damming the gullies of minor streams, constructing subsurface dikes and/or percolation tanks along their tributaries, contour bunding and trenching on slopes, placing farm ponds in the foot hills, and wherever possible, installing check dams-cum- minor irrigation dams on the main stream courses. Terracing and afforestation of hillsides, which help to retain runoff and increase infiltration, may also form part of an integrated basin-scale water resources development plan. Such techniques have been effectively implemented in different parts of India. For example, In Maharashtra, studies were carried out on seven percolation tanks in the Sina and Main River basins. When the tank bottom was

[43] Local water conservation methods: Viable alternative to rejuvenate depleted groundwater aquifers, https://counterview.org/2016/06/10/local-water-conservation-methods-viable-alternative-to-rejuvenate-depleted-groundwater-aquifers/

maintained by removing accumulated sediment and debris prior to the annual monsoon, the average recharge volume of these tanks was 50 % of the capacity of the tank. Similarly, in Tamil Nadu and Kerala, studies were carried out by CGWB on nine percolation tanks in the semi-arid regions of the Noyyal, Ponani and Vattamalai River basins. Rates of percolation were as high as 163 mm /day at the beginning of the rainy season, but diminished thereafter mainly due to the accumulation of silt in the bottom of the tanks. Periodic desilting, therefore, was determined to be an essential element in the maintenance of these tanks.

- The problems associated with artificial recharging include aspects such as recovery efficiency, cost effectiveness, contamination risks due to injection of recharge water of poor quality, clogging of aquifers, upstream- downstream impact, inequity in water distribution and a lack of knowledge about the long term implications of the recharge process. However, proper harnessing of surface water through artificial recharging and judicious husbanding of recharged water assume greater significance in the present state of ground water resources development and management in India. Therefore, the economic, managerial and institutional aspects of artificial recharge projects need to be studied further.
- Ground water resource management must be made more localized. The Expert Group on Ground Water Management and Ownership of the Indian National Planning Commission suggested a shift in focus from state control to community management by user groups because of difficulties of implementing a permit-based system. It recommended that user groups be responsible for planning the use of groundwater within groundwater management units. Based on the goal of sustainable-yield management, withdrawal should not exceed long-term recharge. The Central Ground Water Board and the State Ground Water Board would be responsible for scientific monitoring of groundwater levels and for estimating a sustainable level of groundwater use. In case water levels fell below the replenishable level, the Central government could declare an area as "environmentally threatened" and, in consultation with stakeholders, a strategy for addressing this problem would be developed. Thus, the legal framework in India must adopt a decentralized approach to solving the problem involving ground water management.

Any intervention cannot be sustained with outside support alone. Therefore, the communities in which initiatives are undertaken are imparted with vital technical knowledge on managing the introduced interventions, so that they could sustain the operations on their own.'

- ***Rain Gardens & Afforestation***

Hill stations will have to bank on harvested surface water for their needs in the future. But the loss of tree cover by massive deforestation would mean less natural retention of water in the soil and more flooding as the rain comes in torrents. Such a flow of water cannot be harvested.

This is why dedicated afforestation and creation of rain gardens is a good idea. A rain garden is a sunken landscape that uses native plants, local soil, and mulch to remove pollutants from water, and allows it to percolate into the ground. It's easy to create, looks good all year-round and has a positive impact on the environment.

iv. WITH REGARD TO FOREST FIRES;

Grass fires and dried scrubs are the major source for the forest fire to expand. The forest fires are both due to natural and manmade reasons. The control and extinguishment of the forest fires have to be the main objective. The Forest Department should come up with regulations to prevent such mishaps from occurring. The spread of forest fire depends on the landscape features like thee gradient and other aspects[44]. Forest fire requires the intense management of the department due to its adverse effects on the biodiversity causing threat to the flora and fauna. The terrain of the hill is extreme. Rights and activities within the forest have to be restricted. The challenges are many and should consider boundary consolidation, prohibition of alienation of land, reduction in vehicular movement, increasing forest fire cases due to increase in population. Due to high biotic pressure, strict guidelines have to be imposed. Due to lack of scientific input and requirement of eco sensitive zonation there is arbitrary eco sensitive approach which impacting the Nandi Hills.

RECOMMENDATIONS

Long term solutions

- The Forest department must engage the services of fire watchers in the summer months.
- Preparation of Fire Management plan for the Nandi Hills.
- Weed management in the forest should be made compulsory, as the weeds are found to be the leading cause for the forest fires.
- Increasing the green cover by planting more trees which can sustain even with little water.
- **Technological Innovations –**

[44] Chapter 8, Forest Fires and Weed Management, Forest fires and its management, Administration of National Parks and Wildlife Sanctuaries in Karnataka
https://www.cag.gov.in/sites/default/files/audit_report_files/Chapter_8_Forest_Fires_and_Weed_Management_of_Karnataka_Report_No_6_of_2017_on_National_Parks.pdf

- Remote sensing and GIS technology could be effectively used in fire risk zonation.
- Thermal imaging cameras in drones help in capturing images even in the dense flames by transferring thermal energy into visible light.
- Early Warning Systems: Strengthening collaboration with partner organizations involved in generating warnings about forest fires and manufacturers of those devices.
- Requisite training for Officials to use technology and handle those devices.

- **Community Involvement**

    - Nudging people to participate in the forest conservation and circumventing forest fires.
    - Providing community people with economic and Non- economic incentives.
    - Creating awareness among these community people- Educating them about safety tips and tackling the situations during Forest Fires.

- **Institutional Mechanisms**
    - Separate wing of Forest Fire management under Department of Ecology and Environment in Karnataka.
    - Hierarchy of officials to be appointed in charge of Forest fire Management in the state.
    - Preparedness among officials: Officials must react and respond expeditiously during forest fires.
    - It is the responsibility of the officials under this wing to have checks and balances on the overt or negligent acts of the community people or tourists that result in the forest fires.

v. WITH REGARD TO LAND GRABBING;

Issue of land grabbing in the Nandi Hill area is not uncommon and is becoming a norm to encroach upon the government lands. The Government has to take necessary steps in order to prevent such illegal activities like encroachments and grabbing. The removal of illegal encroachments on public land especially in protects areas like Nandi Hills is a tough task and the same can happed when the government enlists the services of all its government officers particularly the Department of Forests and Revenue, since they are the authorities for the scrutiny.

Long term solutions

- Administrative measures against the encroachment must be set up for Nandi Hills which could monitor the illegal encroachments happening in the protected areas.
- In case of encroachment in the protected zone, the Task Force after verifying the same through the land records can file a case in the Special Courts constituted under the Karnataka Land Grabbing Prohibition Act, 2011. The Karnataka Land Grabbing Prohibition Act, 2011 was enacted by the Government with a view to curb the land grabbing and encroachment practices occurring in the state of Karnataka. Sections 4 and 5 of the Act prescribe the penalty for land grabbing and its related activities as imprisonment from 1 to 3 years and fine upto Rs. 25,000. It is obvious that the prescribed limits to the penalty including the fine and imprisonment are really low and minimal. This would rarely deter any land grabber from committing the offence and encroaching into the protected area. Therefore, the government of Karnataka must introduce separate Rules and Regulations covering the region of Nandi Hills which must fix a much higher fine and imprisonment for the offence.
- To avoid the conflict of laws, the same Rules or Regulations would be introduced under the existing State Act and the cases if any, would still come under the ambit of the Special Courts constituted under the aforementioned Act.

- For example, the imprisonment could be increased as being from 15 to 20 years and non-bailable in nature with the fine levied being proportionate to the value of the land grabbed or encroached. Stringent penalties such as non-bailable arrest coupled with hefty fine could play a key role in preventing land grabbing and encroachment menace in the protected area of Nandi Hills.
- The Government of Karnataka must earmark a portion of the annual State Budget to cover the expenses required by the concerned departments and officials for the functioning of the aforementioned Task Force and the protection and conservation of Nandi Hills.
- The Government should also consider imposing prohibitions on any future developments of the residential layouts in the area. That apart, the area should also be cleared from any kind major economic activities.
- The land records which are already available on the website[45] must be kept track of to assess the changes which are taking place in the nearby areas.
- The government must set up a panel and conduct a survey to know the exact area of land which is grabbed by the land sharks and a direction in this regard has to be issued to vacate the land.
- The Government should passionately pursue the matters for prosecuting the offenders and to ensure that the essential resources belonging to the government do not fall to the kitty of few individuals.
- The Government must notify the area and demarcate the boundaries, similar to what is done to a reserve forest, for the sake of protecting it from further deterioration.
- Handover the functioning of the area to one department and not to multiple departments which will reduce the confusions and increase efficiency. The same can also be done by conferring special powers to that particular department in case found necessary.

[45] Revenue Maps Online, https://landrecords.karnataka.gov.in/service3/

vi. WITH REGARD TO SAND MINING AND QUARRYING

There are some practical difficulties in incorporating this which have been identified after having studied the pertinent statutes;

- The Forest (Conservation) Act, 1980;
- Mines and Minerals (Development and Regulation) Act, 1957;
- Mineral Conservation and Development Rules, 1988;
- Forest (Conservation) Rules, 2003; and,
- Karnataka Minor Miners Concession Rules, 1994.

Currently there are many regulations falling under the various enactments by the legislature. This calls upon the powers under various statues to regulate the mining activity. This could lead to confusions as per the applicable law and hence, there should be a consolidated record of the laws. Such a compilation should be made available in places where public gathers. This would spread awareness in the area and provides scope for public check on the permitted manner of mining activity allowed in the region.

Long term Solutions

- In relation to this, distances and permissibility of various quarrying activities and their extent to be regulated. The minimum distance and pre requisite conditions to be fulfilled to do quarrying have to be maintained as the bare minimum safeguard.
- Therefore, it is recommended that there be a mechanism in place by virtue of which these officials with grievances can file a complaint anonymously without scope for discovering their identity. This would correct the implementation and provide a free hand at hearing the issues faced in the region.
- Before providing the license, an enquiry as to the needs and extent of quarrying or mining is essential and should be made prerequisite. There should be a check at least once in three months, on the compliance to this and the limited usage of the land. A report should be collected by the concerned

experts as to the effects post the grant for license to mine. If there are externalities and negative effects then the terms of the lease should be altered. A report of the effects on water, the population, their health, etc. should be taken into account.

- Punishments for violations should be seriously taken up. The writ of mandamus should be entertained by readily in the matter. Since this is a grave matter, there should be scope for permanent disability of acquiring the license in the case of a default. An official who fails to step in and act effectively in the case at hand should be allowed to be blacklisted once the matter is heard and there appears to be a large public interest at stake. Encroaching government property and that of the locals seems to be a regular problem. Such usurpers should also be black listed in that case.
- An important aspect is that, the mining and quarrying around Nandi Hill region should be prohibited, unless an absolute necessity is reflected and the alternatives are not feasible. The authority should be able to minimize or reduce such activities in the 20 Km radius at least. It should also be prohibited in the distance of 10 km from any greenbelt area.
- The activities should also be regulated as per the season. Certain exclusive species visit the region on during certain periods and it is essential that at the peak of such migration period, there is no such hazardous activity. It gives the area around it a break from the regular activities, allows the migrant species to thrive and at the same time allows for the revival of the natural course of environmental recovery at that period.
- The mining regions and the map of the network should be displayed at the various public sites so as to spread awareness and also bring to the easy notice of the public in case of any illegal or prohibited functioning. There is a need for transparency in the system. Since the region has hills and is also booming, there is an attempt to flatten the land as well as exploit the resources around it which has caught the attention of many. The government needs to declare to the local population which are the permissible ways of mining so that they are not deceived into giving their land for such activities by manipulation or by working for them. It is a method of local control.

The damage inflicted needs to be assessed and if there is any, there should be a ban on the activities in the first place. Sufficient time should be given to rejuvenate the resources and efforts towards its reclamation should be made.

vii. WITH REGARD TO AIRPORT AND ISSUES AROUND

From the foregoing analysis concerning the airport and the development in the surrounding areas, its impact on air quality and biodiversity is quite evident.

- A far more serious effort be paid by the airport authorities in-charge of the operations there to effectively manage the noise levels to the ambient levels as prescribed by the Environment Protection Act, 1986; and,
- The loss of biodiversity and the habitat destruction in the area on account of unplanned and unscientific developmental activities need clear regulations.

These require a far more integrated and cohesive working of the planning departments, the local bodies, the Bangalore Development Authority (BDA), the Bangalore International Airport Area Planning Authority (BIAAPA) for imposing necessary curbs and providing for clear safeguard measures beyond the "Funnel Area".

Conclusion

In conclusion our research team would like to record our appreciation for the opportunity to study the issues concerning the Nandi ecosystem and examine the possible policy and legal interventions to help and save a unique and fragile ecosystem. The foregoing has been an earnest attempt on the part of the research team in understanding the host of problems and to offer solutions that are doable both in long and short term. As one could see the research effort has gone beyond the realm of policy and law but has made an attempt in juxtaposing the problems and solutions that art, science and commerce, anchored to policy and law. It is the sincere belief and hope of the research team that the recommendations made are within the realm of "the POSSIBLE", that accommodates for a clear role and responsibility to the local community. But this can happen only if there is both political and administrative will.

It has, indeed, been a fascinating journey. What we discovered through our research is the home truth that conservation and sustainable development of Nandi Hills is enabled through actioning of the suggestions. We believe that this would bring back the old charm of Bengaluru "the Garden City" of India.

We would consider, giving effect to the recommendation of our team by all the concerned would be an ample reward for us and a fitting tribute to Kempegowda and the erstwhile rulers of the Princely State of Mysore.

RECOMMENDATIONS AND THE WAY FORWARD

Culling out from the short term and long term solutions highlighted earlier under various issues, the following recommendations are brought to the forefront;

1. ***Promote sustainable tourism;***
    a. ***by regulating activities***
    b. ***providing better infrastructure to cater to tourist needs (cable car or ropeways),***
    c. ***better public transport facilities (bus facility from foothills to the summit) leading to lesser private vehicles;***
    d. ***Improved waste management and disposal system to be adopted, and***
    e. ***Deployment of adequate police personnel to keep a check on the activities in Nandi vicinity.***
2. ***Rejuvenation of water bodies;***
    a. ***Strict implementation of Karnataka Groundwater (Regulation and Control of Development and Management) Act, 2011;***
    b. ***Adopting technology for the collection and conservation of rain water leading to ground water recharge;***
    c. ***Building artificial lakes and ponds in the Nandi vicinity which facilitates the collection of run-off water;***
    d. ***Increase in green cover by means of afforestation;***
    e. ***Facilitate meaningful participation of the stakeholders to create awareness;***
3. ***Preventive measures – In re Forest fires;***
    a. ***Implementation of Fire management Plan with adequate trained personnel;***
    b. ***Monitoring measures aimed at prevention of forest fires leading to loss of biodiversity;***
    c. ***Fostering improved community participation and creating awareness;***
    d. ***Putting to use technology for early warning, identifying offenders and better management in case of a mishap.***

4. ***Tackling the issue of land grabbing;***
    a. ***Consolidation of land boundaries in the Nandi hill area;***
    b. ***Strict implementation and speedy prosecution of offenders under the Karnataka Land Grabbing (Prohibition) Act, 2014;***
    c. ***Updation of land records;***
    d. ***Proper checks and balances on developmental activities.***
5. ***Conservation of sand and other resources***
    a. ***Restricting and limiting the permissions and licenses;***
    b. ***Imposing stricter penalties for violations;***
    c. ***Creating "Prohibited areas" and imposing regulations during breeding season.***
6. ***Measures for the Fly Zones;***
    a. ***Airport authorities to monitor environmental pollutions (Air, light and noise);***
    b. ***Consultative mechanism to be adopted while implementing the plans.***

The aforementioned recommendations are a highlight of the solutions proposed for different issues prevailing in the Nandi Hill area. Following the said recommendations, there is a need to create an autonomous body with requisite powers to manage, regulate and prosecute for better conservation and sustainability of the Nandi hill ecosystem. It is proposed that a single, independent and autonomous body by name ***"NANDI ECO-SYSTEM CONSERVATION AND DEVELOPMENT AUTHORITY (NECDA)"*** *be established with the following features;*

- It is an authority that will have an annual budgetary allocation, made by the state government, exclusively for the purpose of upkeep, maintenance, management, development and conservation of the ecosystem.
- It will comprise of the Chief Secretary (as the Chairman) and Members drawn from
    - Department of Home, Revenue, Forests, Environment, Water resources, Tourism, Kannada and Culture, etc. (Not more than 8);
    - Academic research institutions (Not more than 5);
    - Urban & Rural Development institutions, including Panchayat Raj (not more than 3);

- Corporates and Voluntary groups (Not more than 2).

The aforementioned authority will be acting as the Steering body, taking decisions in line with the objectives, to be implemented by the concerned departments of the government. The oversight of implementation shall be by the heads of each department, reporting to the Steering body. It shall engage in a number of promotional activities highlighting the value, significance and importance and utility of the eco-system. For this purpose, it shall engage the local community and the educational institutions. In raising the resources for the NECDA, the state government shall insist on a stipulated percentage of the amount reserved for CSR by the corporate entities to be kept at the disposal of the former. NECDA shall also be enabled through a special legislation to have the powers of approval of developmental activities, in consonance with the objectives; regulating and restricting all activities within the ecosystem; collecting and utilization of fee and levies under different heads and ploughing back the same for achieving the goals of the eco-system. If the government is interested in evolving a legal framework, creation of institutional mechanism and its working, the Commons Cell in the Law School would be interested in assisting the state by undertaking such a responsibility.

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