Thesis Abstracts

Master of Planning (Environmental Planning and Management)

IV Semester

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Department of Planning
School of Planning and Architecture, Vijayawada

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List of Thesis Titles - Master of Planning (Environmental Planning and Management)

Title of Thesis:

Role of Agricultural Residue in Development of Rural Economy – A Case of Sirsa District, Haryana

Amrita Khandelwal, Master of Planning (Environmental Planning and Management) - IV Semester
Reg. No. 2150300022

India being an agriculture-dominant country produces more than 500 million tons of agricultural residues annually. Residues such as corn stalks, corn cobs, wheat straw, wheat pod, cotton husk, paddy husk, paddy straw, paddy stalks, banana residue, barley stalks, coconut shell, cotton husk, cotton stalks, cow gram stalks, maize cobs, maize stalks, sugarcane baggase etc are the by-product, traditionally considered as “trash”. It is “co-product” of grain production where both the grain and the residue have significant economic value and the best example of recycling and reusing. Agricultural residue is having various applications such as livestock feed, compost making, energy source, bio-fuel and bio-oil production, building materials (bricks, plastering), biochemical, biopharmaceuticals, bio-fertilizers, bio-plastics, leather and paper making, sugar byproducts, metal finishing, packaging etc. However, a large portion of unused agricultural residues are burnt in the fields primarily to clear the left-over straw and stubbles after the harvest. Burning of crop residues causes environmental pollution, is hazardous to human health, produces greenhouse gases causing global warming and results in loss of plant nutrients like N, P, K and S. The problem is more severe in the irrigated agriculture, particularly in the mechanized rice-wheat system of the northwest India. Therefore, appropriate management of crop residues assumes a great significance.

Haryana is an agrarian economy with the second highest agricultural residue production of 2696.7 KT/Year amongst all the 28 states (MNRE, 2009). In Haryana state, Sirsa district lies on the first position under crop production. The research is limited to the analysis of Sirsa district predominant crop production, predominant residue production, revenue generation by the optimal residue utilization for all the four tehsils(Sirsa, Rania, Dabwali, Ellenabad). Aim of the research is to develop an optimal supply chain framework for agricultural residue utilization to enhance the rural economy of Sirsa district. First, the predominant crop production trends with respect to generation of crop residue have analysed. Second, crop residue has assessed as an ingredient for use and current application that can be locally relevant. Third, generation of residue related with crop production and prospects of appropriate utilization. Last, optimal spatial chain of crop wise residue utilization from the source to the consumer point has been proposed. The data required for the study is major types of crops, crop production, types of residue production from each crop, current residue utilization by the farmers and Industries and case studies of industries. Collection of the data will be done by primary sources (Surveys, interviews, focused group discussions) and secondary sources (Department of Agriculture (DOA), District Industrial Centre (DIC), Department of Economics and Statistics (DES), Centre for Science & Environment (CSE), HARSAC(Haryana Space Applications Centre etc). Data will be analyzed by crop wise residue production analysis , present supply chain analysis of agricultural residue crop-wise, surplus residue analysis and cost benefit analysis.

The outcome of the research is an optimal residue supply chain framework from source to consumer point to enhance the rural economy. The information generated in this study is expected to be useful for district administrator, farmers, industrialists, agricultural universities, working groups on bioconversions etc. which in turn would positively influence the overall agriculture economic development.

Title of Thesis:

Energy Efficient Villages: Framework Towards Achieving Carbon Neutrality- A case of Baniban Gram Panchayat, Howrah District, West Bengal

Anupriya Banerjee, Master of Planning (Environmental Planning and Management) - IV Semester
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Green House Gases are the major contributors of global warming and pollution. The world as one entity is trying to fight the impacts of Green House Gases and also trying to reduce and control its emissions. The emission depends on energy consumption, landuse change, agriculture and waste. Among these, energy sector contributes 76% of total Green House Gases (94% CO2) emission in the world. India being the 4th largest carbon emitter and 3rd largest consumer of energy in the world, the current energy consumption has increased by 8% which is double with respect to last 3 decades and the energy demand is projected to increase 5 times by 2050. These statistics give us a scope to focus on energy efficiency and carbon neuralization of the nations.

The major portion of Indian population lives in villages (i.e. 69%) as of 2011 and is deprived of its basic energy needs. The energy needs of villages are mostly fulfilled by different traditional sources, which are of low efficiency regime. An emphasis on energy demand fulfilment of the villages through alternate sustainable sources and other traditional sources will make the villages self-sufficient as well as reduce the carbon emissions.

The aim of this study is to develop a model for energy efficient villages in India with low carbon interventions taking a pilot case of an already adopted village under the Sansad Adarsh Gram Yojna (SAGY)- Baniban Gram Panchayat, Howrah District-West Bengal. The parameters of the study include domestic, agricultural, transportation and occupational energy use. The study targets on the energy consumption trends and patterns of the Panchayat by various forecasting techniques and calculate the emission caused by it. It will also analyze the alternate energy sources in the region to cater to the energy demand. By interviewing and surveying villagers it was possible to understand the social and economic factors that influenced consumption and how rural communities fulfil their energy needs.

These findings allowed us to take into consideration the socio-economic aspects of these communities and these considerations were used to form the recommendations for energy system improvement. The outcome of the study will be an Energy Management Plan for Baniban Gram Panchayat, which will help us to develop a model framework for energy efficiency in rural India and reduce CO2 emission for low carbon development.

Title of Thesis:

Ecosystem Services of Biodiversity Regions in Urban Context- Case Study of 'Yamuna Biodiversity Park' and 'Northern Delhi Ridge', Delhi.

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Ecosystem services are benefits to people from nature. Among others, the benefits of eco-sensitive areas include provision of food, natural purification of water, carbon sequestration, soil stabilization, recreation, cultural values. The contribution of natural ecologically rich areas as benefits or services are often un-quantified and un-measured. The value of such benefits is gradually becoming more apparent as human populations grow and the demand for natural resources increases. However due to exploitative nature of urbanization, anthropogenic factors, lack of valuation and knowledge about these ecosystem services, policy makers often ignore their importance and diminish their value. This has serious consequences.

The aim of the thesis is to evaluate the performance, role and significance of Ecosystem Services in two case areas having varied levels of regulation. Varied levels of regulation indicates two starkly different ecosystem with respect to their origin and character. Yamuna Biodiversity Park was selected as it presents a successful model of how a degraded land was converted to a biodiversity park with rich biodiversity and environment value and the Northern Delhi Ridge-an already existing biodiversity area having heritage and environment value. In the former case area it has helped to improve the urban environment quality whereas the latter faces degradation and extinction of various environmental elements. The study undertakes a comparative assessment of both the study areas to determine the status of biodiversity and ecosystem services.

The research primarily objectifies at identifying the Ecosystem services being provided by biodiversity regions in an urban backdrop and their transition during the time span of 2007-2017. For this comparative study two case areas were selected which would represent two different kind of biodiversity region in an urban area. First, a biodiversity region which has been converted or regenerated from a barren or degraded ecosystem and Secondly, a naturally existing biodiversity region which bears the environmental characteristics of that geographical area.

The methodology involved documenting and mapping the spatial changes in the study areas in terms of land use and water and green cover, finding the ecosystem services provided by each of the study areas in the past and present and capturing the perception of the users of the various ecosystem services. The parameters for assessing the ecosystem services were environmental baseline characteristics, existing scenario, flora and fauna, quality of environment and number of ecosystem services present. Both primary and secondary data was used and the samples were representative of different age, education, income, gender and distance from the biodiversity region. Primary data was collected from interviews with the scientist in-charge of the study areas and questionnaires surveys were conducted to capture the perception of the users. Secondary data was collected from various Govt. Departments namely Delhi Development Authority (DDA),

Centre for Management of Degraded Ecosystems (CEMDE), Forest Department, etc. The Sampling strategy applied was based on the age, gender and income. It was distributed in such a manner such that it has a homogenous representation of male, female, people from various age groups and income groups. For the questionnaire survey a sampling size of 100 was taken and for tourist survey it was 5% of the daily footfall. For the prioritization and ranking a sample size of 100 was chosen for the citizens and 20 for the environmental experts. Ranking and Prioritization of the Ecosystem Services is an important prerogative for assessment of the same. This was done according to the citizens as well as environmental experts. Willingness to pay (WTP) survey was conducted to ascertain the probable charge which can be introduced as an entry fee. Tourist survey was conducted to find out the tourist perception and feedback. It also attempted to determine if additional services can be provided and what would be the willingness to pay for those services by the users. The study ramified the validation of the positive and negative changes of the ES to establish the case for conservation and mitigation measures and identify the gaps in mitigation and conservation measures so that the loopholes can be targeted through strategic interventions- Physical (site level) and Policy level. This involved elaborate interviews and discussions with the authorities.

The outcome of the thesis has been in the form of strategies, interventions (physical and biological) and management approaches which balances the need of the various stakeholders and the need to rejuvenate or conserve the Ecosystem Services. Particular emphasis was laid on the services of Air Quality Improvement and Storm water Management, which were the most prioritized services as per visitors and experts. Estimation was done of the value of carbon sequestration and oxygen generation. Assessment of water recharge and drainage capacity was valued. Each area was comprehended in terms of the potential of the ecosystem services that can be tapped through conservation and the threat that needs to be addressed. The thesis showed ways to come up with irrefutable justifications on how valuation of ecosystem services should be an important prerogative for planning and can be an effective tool for measuring the health of the various ecosystems.

Title of Thesis:

The Influence Of Land Use On Urban Heat Island: Hyderabad.

Neela Manasa, Master of Planning (Environmental Planning and Management) - IV Semester
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Urbanization of cities reflecting high concentration of people and infrastructure development has rapidly transformed the urban environment. Changes in the usage of land and associated activities of man has modified city's climate leading to a shift from comfort zone, to experiencing heat stresses and thereby leading to the formation of urban heat island.

This effect of Urban heat island is subjected to be prominent in developing tropical cities of south Asia because, solar radiation intensities and the ambient air temperatures are customarily high. Elevated temperatures from the heat island, particularly during summer time affect the local environment and quality of life through- increased energy consumption, increased emissions of air pollutants, distress in human health and comfort. Therefore, identification of heat environment in the densely built urban areas reflect the need for planning in enhancing the city's climate ensuring better living environment.

Extensive literature learning has been done in the related field, where the approach towards the study has been chosen from the journals 'The application of urban climatic mapping to the urban planning' & 'Assessment of Urban Heat Island based on the relationship between Land Surface Temperature and Land use/ Land cover'.

Consequently, the research emphasizes on the urban thermal environment from the view point of anthropogenic changes at local level. To date, in India the understanding of climate change at local level is influenced by microclimatic modelling, and minimal intervention has been made to mainstream climatic analysis into the urban planning process.

In connection, identification of heat environment using the technique of urban climate mapping has been performed in the city of Hyderabad. The city being one of the largest agglomerations of India, had accounted for a rapid urbanization with loss in green and blue spaces since 1980's. Further, a greater change had been noticed during later 1990's in the sector of agriculture leading to a complete compact city.

The study took its initial step through identifying the parameters which influence urban heat island at macro level. The parameters include - Population density, Normalised difference built up index, Normalised difference Water index, Normalised difference vegetation index, Topography, Land surface temperature, Ambient air temperature, Wind dynamics and Relative humidity.

Primary tools used for analysing the study include Geographical information system (GIS) and remote sensing data. The satellite data take from Landsat 8 of United States Geological Survey (USGS) and BHUVAN was used in mapping the identified parameters to obtain a macro view of the city. Calibrations were done before using the obtained satellite data.

Urban climate mapping, a comprehensive summation of the parameters has been prepared for the city separately for day time and evening time. The resultant map obtained for the city characterize the urban heat islands which were classified into very high thermal load, high thermal load, medium thermal load and low thermal load. The classification provides us the quantitative and visual evaluation of the urban environment with climatic concerns.

Later, a grid based analysis was carried out to examine the land use influence on Urban heat island. In connection, superimposing urban climate map with land use has been done to identify land use specific thermally loaded areas. 10% of the residential, 10% of industrial, 7% of commercial and 6% of mixed-use, land uses claim for very high thermal stresses during the evening time.

Though the study can further be extended in analysing the thermally loaded areas at microlevel, due to time constrains broad recommendations in terms of improvements in surface cover and urban structure were suggested to enhance these areas of the city.

Keywords: *Urban Heat Island(UHI), Remote Sensing, Geographical Information(GIS), Urban Climate Mapping, Land Surface Temperature (LST)*

Title of Thesis:

Assessing The Potential Of Wastewater In Urban Area; Case Study Patna City

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Water is one of the most valuable resources on our planet, yet it is under constant threat due to climate change and resulting drought, explosive population growth, and waste water generation. One of the most promising efforts to stem the global water crisis is industrial, domestic and municipal water reclamation and reuse at the various level of region, city neighborhood and household level. The Water Reuse Association defines reused, recycled, or reclaimed water as "water that is used more than once before it passes back into the natural water cycle." (Meg Calkins 2011) Water scarcity and water pollution are crucial issues in many cities, towns and villages in today's world. Currently, there is a growing awareness of the impact of sewage contamination on rivers and lakes. One of the ways to reduce the impact of water scarcity and pollution is to increase water and wastewater reuse. In the context of trends in urban development, wastewater use and treatment deserves greater emphasis.

In most of the Indian cities only human activity particularly the domestic sector creates vast quantities of wastewater through inefficient and poor management of water and wastewater. The wastewater (mix of domestic wastewater, rain water and industry effluent) is discharged into rivers and land either treated or untreated resulting in contamination of river water. Some contaminated water is used for irrigation and domestic use in cities which are located on same river bank cities which is also located on same river bank (Van der Hoek et.al, 2002). According to central pollution control board, Delhi, (Bulletin volume-1 2015), the estimated sewage generation in the country was 61754 MLD as against the developed sewage treatment capacity of 22963 MLD. Because of the hiatus in sewage treatment capacity, about 38791 MLD of untreated sewage (62% of the total sewage) is discharged directly into nearby water bodies. As per CPHEEO estimates about 70-80% of total water supplied for domestic use gets generated as wastewater. The wastage of water poses sustainability challenges, depletes energy reserves and undermines human water security and ecosystem.

In this study emphasis is laid on less the consumption of fresh water in the urban area and thereby try to reduce the waste water generation in the city. The case study area of Patna city had a total of 1.68 million population in 2011 and main water source is groundwater. People also extract ground water through bore wells. Domestic Water supply cover 81 % of total population and 152 MLD Wastewater is generated by these 81 % of population. According to Central Public Health and Environmental Engineering Organization (CPHEEO), that amount is 52 % of wastewater production of total sewage water within the city. As we know that the population increase in city leads to water demand/ consumption. Currently, four Sewage Treatment Plants (STP) are in different area of Patna city but these STPs are only able to treat 37 % whole wastewater of the city and the rest 63 % of the wastewater is directly discharged into Ganga through 9 different nalas. That leads to water bodies' pollution and contamination of groundwater.

The benefit of domestic wastewater collection and disposal system is to ensure that sewage or excreta and sullage discharged from communities is properly collected, transported, and treated to the required degree and use waste water as an alternative resource to fulfill the water demand by the different urban activities. Further the excess treated waste water disposed to ensure without causing any health or environmental

problems this help in conserving of the fresh water for next generation and protect the water sources from the water pollution.

The unit of analysis would be “ward” for the waste water generation and treatment in Patna city, Data has been collected from the various departments of the city and also conducted primary survey for the urban activities where wastewater can be used.

So, the main focus area of this research is assuming the potential of wastewater in urban area at various level including sewage and drainage water to reuse wastewater at household level and community level, find out another alternative treatment process and last, find the urban activities where we can use treated wastewater. For example, treated domestic wastewater that would be suitable for urban lawn watering and recreational amenities, construction sector, etc. In this context, the experience shows that is possible to: 1. Neighborhood planning and water conservation - An Approach to Environmental Management by Abdul Razak M., 1989. 2. Decentralize Wastewater Treatment for Small Communities by Subramanian K., 2004.

The outcome of the thesis is to develop approaches for reusing wastewater both domestic water and drainage, minimizing its generation at community and neighborhood level. Through effective planning for water conservation protection and reuse the reuse of treated wastewater within the water supply system in urban area in different sectors in city for non-domestic purposes is studied which will help to reduce the consumption of water and better use of wastewater.

The thesis finally aims at securing our water sources from water pollution and protect the aquatic ecosystems for nature balance, reduce water scarcity in urban areas which will have positive impact on the quality of urban life and provide sufficient water for the future generations.

Title of Thesis:

Examining the Effect of the Physical Characteristics of the Urban Green & Blue Spaces in Heat Mitigation: A Case Study of Pune

Alisha Choudhury, Master of Planning (Environmental Planning and Management) - IV Semester
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Urban areas generally are found to exhibit surface and atmospheric temperatures slightly more than the surrounding rural areas. This phenomenon is known as the urban heat island (UHI) effect and the difference in the temperature is known as the urban heat island intensity (UHII).

The climate of Pune has changed during the past 3 decades, mainly due to the increased rate of urbanization and expansion of the industrial belts and built up areas. In a study conducted by the Ministry of New and Renewable Energy during the year 2012-13 it was found that the city of Pune exhibited the maximum UHII i.e. 10^{o}C, among many other important cities of India viz., New Delhi, Bhopal, Kolkata, Mumbai, Pune, Vishakhapatnam, Vijayawada and Chennai. In the year 2016 the city of Pune was found to have a population density of 8,182 persons per sq. km (www.worldpopulationreviews.com) which is much less than that of Kolkata which has a population density of 80,972 persons per sq. km but a UHII of only 4^{o}C.

The blue and green spaces are considered as one of the most important passive strategies to reduce the UHII. Through my study I want to find out how effective are the urban green and blue spaces in the city of Pune in reducing the UHII. The main objective of the study would be to evaluate the cooling intensity created by the blue and green spaces and to estimate the distance up to which the cooling effect is encountered. Further, the study also aims to understand the pattern of cooling island created by the selected green and blue spaces. The parameters of the study will be landuse land cover, normalized difference vegetation index (NDVI), land surface temperature (LST), physical characteristics of green and blue spaces such as land shape index (LSI), size and perimeter-area ratio (PAR), which has been finalized after referring a number of research papers on the subject. LST will be calculated from the LANDSAT data with the help of GIS tools and techniques. Apart from the LANDSAT data numerous other data has been collected through the secondary survey, which would be useful to evaluate the selected green and blue spaces in terms of the selected parameters and variables.

The expected outcome of this study will be in the form of strategies, which would be in conjunction with the present planning guidelines. These strategies may be helpful in the process of expansion of Pune or similar cities with similar situations or may be developed into a software. This study will also help in further understanding of the cities.

Title of Thesis:

Impact Of Polluting Industries On Surrounding Residential Areas: A Case Of Vishakapatnam Port Area

Surya Madhav, Master of Planning (Environmental Planning and Management) - IV Semester
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Since the enactment of the economic liberalization policies in 1991, India has experienced a rapid growth in industries. This increased number of industries has attracted huge amounts of population in close proximity to them, resulting in the residential expansions at a faster rate. These industries, from their emissions have a negative impact on these residential settlements leading to issues of public health and related aspects. The greenhouse gas emissions are often major concerns in these areas. According to the planning commission of India, the greenhouse gas emissions from the industrial sector alone have amounted to 405.86 million tons of CO2, 0.21 million ton of NO2, and 0.15 tons of CH4, which together is equivalent to 412.55 million tons of CO2.Besides spatial dynamics, land use changes and property markets are other aspects that are also influenced to different degrees where assessments of those is not drawn much focus in the field.

This research explores an industrial area in the city of Visakhapatnam, analyzing their impacts due to the emissions and air pollution on the surrounding public health and spatial changes. The emission levels of these industries are collected from their respective Environmental Impact Assessment reports and with the help of the tools; the affected micro zones are identified. The air quality levels obtained from the pollution control board are analyzed and areas of impact area identified using the kriging tool in Arc GIS, which are then overlapped with the industrial emissions micro zones, delineating the areas of high vulnerability, with respect to their ward boundaries.

Data variables for the study such as socio economic factors, land use changes, encroachments, housing typologies, tenure status, job opportunities in the area, workers classification etc. have been collected from respective departments and primary surveys to help strengthen the analysis. Study area has been divided into zones depending on their proximity to industries. Accordingly interview-based surveys and the questionnaire based surveys have been conducted to study the socio-economic and health conditions of the residents in the settlement. 130 samples were selected and various surveys were conducted, spread across different proximity zones in the commercial and residential areas along with administration, education and health institutions. The obtained data is statistically analyzed to shortlist the relative and non-relative variables. These variables were studied in relation with the air pollution levels in several zones of the study area. Using the spearman's rank order correlation technique, the relation of the pollution levels to the population growth, public health and spatial change were quantified individually along with the relation between the population growth and the encroachments.

Once the selected variables were analyzed, inferences were drawn to narrow down various factors influencing these settlements thus establishing the relations and reasons for various issues. This quantified relation helps to narrow down the concentration to specific issues and their causes, helping to shortlist the necessary interventions that can be made. With regulated development as the goal, a policy level framework is developed to help reduce and mitigate the impacts of the industries on these settlements and promote a healthy environment for the people.

Title of Thesis:

Water Footprint Assessment. A Case Of Rural Areas Of Bhiwani District, Haryana

Tulika, Master of Planning (Environmental Planning and Management) - IV Semester
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With over one billion people, India currently has the world's second largest population. The estimate of the amount of people living in India in the year 2050 is 1.6 billion. In addition, the total GDP per capita in India is also growing rapidly. These will lead to a large growth in the total food demand in the near future. Since most of the utilizable water resource in India is used for crop production followed by domestic use and industrial use, the implied increase in food demand is bound to increase the pressure on the renewable water resources. The water resources of states like Haryana, Rajasthan, Punjab, Uttar Pradesh and Tamil Nadu are closest to be exhausted in case of food self-sufficiency and water sustenance. In this context, it is necessary to find new frameworks for integrated water resources management to help maintain a balance between human resource use and ecosystem protection. New paradigms and approaches like Water Footprint have been emerging in scientific communities to promote efficient, equitable and sustainable water uses, and these paradigms are believed to break new ground for water resources planning and management.

The water footprint is defined as the volume of water needed for the production of the goods and services consumed by the "people". It assesses the both direct and indirect (virtual/embedded) water consumption. This concept has been developed in analogy to the concept of the ecological footprint. The water footprint has three components: green, blue and grey. Together, these components provide a comprehensive picture of water use by delineating the source of water consumed, either as rainfall/soil moisture (blue) or surface/groundwater (green), and the volume of fresh water required for assimilation of pollutants (grey).

The study focuses on the assessment of Water Footprint (WF) of the rural people of Bhiwani district in Haryana State of India, in relation to their activities in livelihood generation (Agriculture) and communal use (Domestic). The aim of the thesis is "**To estimate the differential levels of agriculture and domestic Water Footprint of blocks (Sub-District level) and develop appropriate rural development strategies in view of available water resources".** Bhiwani District of Haryana is predominantly a rural agrarian district consisting of ten blocks, out of which four blocks fall into the safe category of groundwater (GW) development and six are over exploited. The criteria for selecting the district are GW development status, rural population (81%) and cropped area (84%). The analysis has been at be a Block Level and comparative of WF calculations of Agriculture and domestic sectors in each block followed by assessment of water availability through surface water (SF) availability (drainage capacity analysis) and GW potential analysis (recharge analysis). A sustainability assessment has been carried out by comparing the aggregate WF with the available water resources and the region would then be determined as water deficit or water abundant. Finally, Strategies for green rural development by management of water resources (Groundwater & Surface water) and for reduction of water footprint in both agriculture and domestic sectors has been be carried out.

The thesis is a demonstration of how Water Footprint approach can be used to reduce water consumption by increasing production per hectare and making use of Water by the people more sustainable.

Title of Thesis:

Impact Of Deforestation On Forest Dependent Communities In East Godavari.

Lohita, Master of Planning (Environmental Planning and Management) - IV Semester
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In India's current forest and tree cover is estimated to be 78.29 million ha, constituting 23.81% of the geographical area of the country. As per the India State of the Forest Report (ISFR) 2011, forest cover has declined by 367 sq. km compared to the forest cover in the preceding ISFR in 2009. The National Forest Commission report 2006 indicated that around 41 per cent of total forest in the country is already degraded, 70 percent of the forests have no natural regeneration, and 55 percent of the forests are prone to fire. In the forested landscapes of India, the livelihoods of the people, especially the indigenous communities, living close to the forest and within the forests are inextricably linked to the forest ecosystem. People depend on the forest for a variety of forest products for food, fodder, agriculture, housing, and an array of marketable minor forest produces which can potentially degrade forest if harvested unsustainably.

In my study area of East Godavari District has 5 Revenue Divisions, 60 Mandals with 1409 villages and 16 urban towns. Out of the 5 Revenue Division, Rampachodavaram Division with 7 Mandals exclusively covers the predominantly forest area. Forest degradation in Rampachodavaram is generally thought to have negative consequences on rural livelihoods but there is an overview of its effects in the region because the importance of forests to rural livelihoods has never been adequately quantified. Based on surveys conducted in rural households it is found that indigenous trees (deciduous tree) in forests have a lesser fiscal value, for the tribal population than that of plantations. The communities living adjacent to the forests under study are neither asset-rich nor self-sufficient enough to solely rely on the forests.

Since forest hardly has helped the tribal communities in the area, with a significant amount of income generation, most of the forest lands are being cleared for commercial plantations, which promises a higher income to forest dependent communities in a short span of time. As a result forest area is constantly decreasing while plantation area is seen on increase. This in due course will have serious ramifications on the environment and on forest dependent communities as well.

From land-use and land cover change (LUCC) maps derived from satellite images, deforestation in forests in varying periods from 2011 to 2015, were compared. It was observed that deforestation rates were higher in protected areas than in community forests. This is also substantiated with an increase in illegal plantation areas. The present work looks to study this aspect and evolve well-paying sustainable livelihood strategies for forest dependent communities so that they do not indulge in deforestation.

Title of Thesis:

Impact of Surrounding Activities on Protected Area: An Ecosystem Approach. Case study of Okhla Bird Sanctuary, New Delhi.

Garima, Master of Planning (Environmental Planning and Management) - IV Semester
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Bird sanctuaries are nature facilities that advocate the conservation of various species of birds and their natural habitats while promoting rehabilitation and survival. The case area of study is Okhla Bird Sanctuary, which is an Important Bird Area (IBA) in India where thousands of migratory wintering water birds come every year. It comes under the Protected Area Network of Uttar Pradesh Government, and was declared as Bird Sanctuary on 8th May 1990 under the Wildlife (Protection) Act 1972 of India. The dominant feature of Okhla Bird Sanctuary is a large lake formed after the creation of a barrage on the river Yamuna in 1986.It has a total area 400 hectares out of which open water is around 273 hectares (68.23%). Okhla Bird Sanctuary supports more than 320 bird species, including migratory bird species.

Rapid urbanization and industrialization in New Delhi and Noida and discharge of untreated wastewater into the river Yamuna (upstream of Okhla Bird sanctuary) have resulted into deteriorated water quality of river Yamuna at Okhla Barrage that has ultimately put an adverse impact on the floral and faunal diversity of Okhla Bird Sanctuary. An uncontrolled increase in built up density on the periphery of the sanctuary has reduced the feeding, foraging, resting, and breeding ground for birds. Noise pollution due to heavy traffic movement on DND road and Kalindi kunj road, existence of crematorium within the bird sanctuary, waste to energy plant functioning within 2 km radius of bird sanctuary etc are responsible for the deteriorating air quality of the Bird sanctuary environment. All these issues may be attributed as reasons for the declining bird count over the years in Okhla Bird Sanctuary from 320 to 132 bird species presently.

This study aims at managing the protected area of Okhla Bird sanctuary through ecosystem approach by scrutinizing the impacts of surrounding activities on the protected area. The objectives of the study include spatio-temporal analysis of the existing situation of Protected Area and its surrounding areas, analyzing the impacts on Protected area with respect to air, water and flora and fauna species, determining the ecosystem services provided by the Okhla Bird Sanctuary and finally suggesting strategies for harmonious existence of Protected area environment and its spatial settings through ecosystem approach. In direction to achieve these objectives the analysis consists of impact assessment with respect to air quality, water quality and noise levels, spatial transformation, bird species assessment and species risk assessment.

This thesis deals with study of degradation of Protected area due to activities in surrounding areas, assessing the environmental impacts on Protected area and application of Ecosystem Approach in Protected area. Hence, the outcome of this study is to carefully plan for an eco-sensitive development of Protected Area by preparing strategical measures based on Ecosystem Approach in order to make the ecosystem of Okhla bird sanctuary resilient to the impact of the upcoming future development.

Title of Thesis:

Building Resilience to Agro-Climatic Change by Climate-Smart Agriculture. Case area: Krishna District, Andhra Pradesh.

V Srinivas, Master of Planning (Environmental Planning and Management) - IV Semester
Reg. No. 2150300032

Climate change, associated with increase in temperature, variation in rain fall and extreme weather events like floods, droughts, cyclones etc., is one of the major global challenges faced by all the countries especially developing nations. Agriculture is one of the sector which is worst hit by the climate change, as it negatively affects both crop and livestock production systems, adding to pressure on the global food security. As per the World Bank report on India titled 'Climate change & Food Security 2014', by 2050 the productivity levels are expected to be lower than the regular yields due to climate change i.e. changes in temperatures, crop water requirements, water availability and quality. As crop yield decline and food security problems emerge, so does the urgency of addressing these challenges arise.

The case area of my thesis is Krishna district in Andhra Pradesh where the agricultural sector will be hit seriously due to this prevailing climate change as predicted by World Bank in their report titled –"Impact of Climate Change on India, 2014". It is mentioned that mean temperature of this region will be raised by 2-4 degrees and erratic increase of rainfall by 4-8% by 2050 which may indirectly lead to a plunge by 20% of the annual income of the farmers in this region. Hence these statistics highlight the importance of carrying out a research to address this issue of climate change and its impact on agriculture sector in Krishna district.

My thesis titled "'Building Resilience to Agro-Climatic Change by Climate Smart Agriculture" tries to establish a relationship between agro-climatic change and agro-vulnerability to climate change. As a part of the study the first objective tries to depict the climate change at the district level and my second objective focuses on the assessment of the present agricultural performance of the district at Mandal level which brings out the current agricultural scenario of the district with respect to climate change. The third objective focuses on the assessment of composite vulnerability of agro-systems to climate change which details out in to socio-economic, agricultural & drought vulnerability analysis at Mandal level.

The thesis then attempts to categorize the mandals in to high, medium and low levels of vulnerability. The study culminates by defining climate smartness in reference to agricultural sector at the regional context and propose recommendations based on issues & potentials identified through best suitable smart approaches at regional level contributing to the agricultural sustainability.

Title of Thesis:

Adaptation to Heat Wave at A Neighborhood Level - A Case of Bhubaneswar

Siddik Khan, Master of Planning (Environmental Planning and Management) - IV Semester
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The world is facing a new form of natural disaster since last few decades, i.e. Heat Wave. Where it claims life, which is as significant to other disasters. The only difference is heat wave act as a silent killer by claiming life at a regular interval during a heat wave period. Now this is a global phenomenon affecting both developed and developing countries and the coastal states of Odisha and Andhra Pradesh are the worst affected ones in India. Due to climate change, adaptation is a key and essential strategy to counter the immediate effects along with long term mitigation measures and one of the adaptive strategies has been to issue heat wave warning and undertake awareness campaign to bring behavioral changes in people to counter the health impacts.

Bhubaneswar is one of the planned city we have in India. But during heat wave period the city faces economic as well as social challenges in functioning effectively. The meteorological center, Bhubaneswar aware the public/ daily laborers to avoid exposure to sun. The educational institutes are the more suffered due to this. Because they keep on extending the summer vacation period, so that the children should not be exposed to extreme heat.

At present, only 2 cities in India, i.e. Ahmedabad and Bhubaneswar have prepared the Heat wave action plan. These plans are acting effectively to minimize the number of casualties and provide the framework for taking effective measures and developing infrastructure to tackle the heat wave period. So, this study will focus on adaptation to heat wave at neighborhood or community level particularly with the use of green corridors or the urban vegetation for a comparatively cooler pocket within the city. The urban neighborhoods are more vulnerable in this context where the dependence on artificial cooling is increasing. It is necessary to work out the existing mechanism of heat response during a heat wave period. The sources or appliances which we use to tackle the heat exhaustion are ultimately ending with increasing the outdoor temperature. It also reflects in our energy demand during such extreme events which may lead to power outages in future. The modern building designs and the materials are prone to more heat release. Still there are comparatively cooler places in cities where urban parks, forest, water bodies, etc. are significant in number. So, the research will establish the response or importance of urban green with its built environment.

The research has developed the scenario where an urban area can go in reverse to achieve a cool island effect. It found through various analysis in this study that the dense vegetation with in the neighborhood can help reducing the temperature to a certain extent. The variation in vegetation density with the width of road also regulates the temperature with in the neighborhood. A proactive decision making system is of utmost necessity for conducting the related studies for making community or city more resilient. This can be done by policy interventions and bringing change in the byelaws, where the city and its citizens can act together to make the place livable through natural means, not by the artificial ones.

Title of Thesis:

Impact Of Ecotourism On Local Community, A Case Study Of Panna National Park

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In the past decades, “eco-tourism” has been growing in popularity throughout the World due to its purported devotion to sustainable, non-invasive alternatives to existing tourism types. Though the term existed but the notion of ecotourism came in the literature during 90’s (Romeril, 1985). However, many suggest that ecotourism is simply a marketing ploy (Weaver, 1998), and is actually draining on poor communities and ecosystems (displacement of indigenous population, land use, development of infrastructure, etc). In recent years, academics and management bodies have strongly advocated ecotourism as a tool to achieve socio-economic development vis-a-vis environmental conservation in the developing countries, such as India (Kristina Barkauskiene, Vytautas Snieska, 2013). But in such context question arises that what are the direct environmental, social, and economic effects of the growing ecotourism industry? Is ecotourism a step in the right direction, or does it fail to live up to its eco-friendly claims and what are the perception of local community on ecotourism and to what extent the local communities are engaged in ecotourism activities?

Relationship between ecotourism planning and its contribution towards sustainable community development in the protected areas (PAs) like National Park of developing countries such as Panna National Park is not often studied. In this context, this study aims to critically explore the local environmental issues, environmental & social impacts and dynamics of ecotourism planning and its relationship with and contribution towards sustainable community development in the Protected Areas of Panna National Park. Currently the park is managed by the Forest Department of the state and the community involvement in tourism activity is quite low.

The research includes multiple data collection approaches such as structured interviews survey with the households and tourist (duration of their stay, mode of transport used etc.), semi-structured interview with the key informants their (income level, job security etc.) and informal discussion with stakeholders about prevailing problem. Planning for the ecotourism destinations will be based on the existing land use, carrying capacity of the Park and biodiversity index.

The study describes the perceived benefits and costs of ecotourism largely depend on the (a) level of community participation in ecotourism activities and decision-making process (b) capacity to influence decisions (b) capacity to collaborate with stakeholders (c) availability of resources, skills, knowledge and education (d) proximity to the major trail and networking. Based on the research findings, this study suggests planning and policy recommendations to (a) empower the poor and marginalized section of community (b) enhance local economy (c) protect local resources (d) and promote sustainable community development in the settlements around the Panna National Park by encouraging buffer area tourism, proposing various tourism activities in identifies tourism village, changing of ecotourism zone and adopting sustainable practices.