Chapter 2: Review of Literature

Aptly regarded as the kidneys of the landscape and a biodiversity hotspot, ‘Wetland’ is one of the precious natural resources that exist on the earth surface. The flourishing of Indus civilization in ancient times effectively traces and highlights the value of wetlands. Tracing the lineage, almost all the towns and cities were established near or along the ponds, lakes, rivers, etc. In present times, there has been a gradual change in perception and attitude towards the way people view wetlands, in retrospect, people were unaware of the value of wetlands and perceived it as a breeding ground for mosquitoes for the elimination of which the Government of United States had provided financial funds under US swamp land Acts of 1855. The process of destruction of wetlands can be divided in three phases, i.e., due to colonial settlements (1600-1800), agricultural developments (1800-1900), and technical innovations and developments. In the first phase, permanent colonial American settlements can be held accountable for the destruction of wetlands. Secondly, agricultural developments such as the construction of dams, development of drainage systems, and governmental policies related to various developments in agriculture and irrigation schemes were mainly responsible for wetland losses (Dahl & Allord, 1982). Thirdly, authors have discussed the directly proportionate relationship between changes in culture and values with the decrease in numbers and areas of wetlands.

On the other hand, wetlands provide a variety of ecological, socio-economic, entertainment, cultural, religious and livelihood advantages and benefits. These services can be distinctly divided into several groups such as provisioning services like food, wood, flowers, etc., regulating services like supply of water, treatment of wastes, in addition to which it also provides various cultural and amenity services such as recreational, artistic, provision of historical information, etc. and services for essential life-support and livelihood such as provision of habitat for flora and fauna (Indian Space Research Organisation, 2011a). Some of the primary significance of wetlands are discussed below:

- Wetlands occupy an advantageous position if seen through a historical and religious point of view. For example, because of the existence of the Dong Han
Dynasty in 223 AD, Xixi Yangtz is considered a famous wetland delta in China. In addition to this, Tang dynasty also flourished alongside the Xixi Yangtz wetland in 618 AD. Due to the development of temples in the past, this wetland acquired a spiritual and religious significance (Verschuuren, 2014). Similarly, the historical significance of Ropar wetland is marked due to the signature of treaties between Maharana Ranjit Singh and Lord William Bentick as an indication of the political dynamics of Punjab. Damage of archaeological sites within and around wetlands and loss of organic artefacts are associated with the degradation of wetland areas (Nicholas, 1992). Wetlands in Punjab also have their own specific religious importance such as Kanjli wetland due to its association with Shri Guru Nanak Dev Ji. Apart from its religious significance, wetlands have greater economic significance as evident in the case of Naganon district of Assam where the livelihood of a bulk of people depend on wetlands for fishing, agriculture, sericulture, and for the rearing of ducks, goats, and cattle (Sarma & Saikia, 2010). Among other significations, wetlands are bestowed with higher importance in terms of tourism and provision for livelihood. In rural areas, it also serves as a ground for bathing of cattle in the summer season.

- Due to its capacity to store rainwater, it can be considered as a site for rainwater harvesting. The water that gets stored in wetlands is further used for the supply of water for various irrigational, industrial, and domestic use. For example, most of the water supplied in Mumbai are supplied through wetlands like Tansa lake, Tulsi lake, Vihar lake, etc. (Sinha, 2013). For irrigational purposes, wetlands play a primary role as the supplier of water such as, in the case of, Sirhind canal, Firozpur feeder, and Rajasthan feeder from the Ropar and Harike wetlands of Punjab. Wetlands also act as a water purification system. As most of the wetlands are found near the rivers or streams, they play a dual role in terms of mitigation of floods by diverting the extra flow of rivers into wetland areas and also maintains the flow of rivers by adding water to the river during dry seasons. (Tiwana et al., 2008). The role of wetlands shifts on the basis of its distribution and location, for example, in coastal regions, the mangroves creates a protective shield against the speedy waves of cyclones. Among various other
advantages, wetlands also act as a carbon sink where the dependency of absorption of carbon is directly related to the amount of vegetation in that particular wetland.

- Wetlands also serve as a habitat for different species and forms of biota, along with supporting various threatened and vulnerable species. Due to seasonal migration, wetlands have also attained the stature of international importance.

2.1 Services related to Wetlands: The functions attributed to wetlands can be divided into four main categories such as regulation activities which includes ecological processes for a supportive healthy environment, secondly, as a carrier of supporting activities that aim to provide a space for human settlement and for agricultural purposes, and thirdly in relation to its production functions including provision for food, water, raw materials like clay and wood, and lastly, its function as a provider of information through research, education, various aesthetic and spiritual values related to wetlands (Groot, 1992; Turner et al, 2000; Schuyt, 2005; Millennium Ecosystem Assessment, 2005). Wetlands play a vital role to shield against floods especially in upstream countries like the USA where construction of wetlands has reduced the damage of about $17 million each year, along with the mainstream of River Charles. For mapping of coastal wetlands, Sundarban delta uses ERS-1 SAR black and white data images of 1992 and 1993 that is able to penetrate cloud covers, conversely, IRS-1B LISS data is also used for evaluation of ERS-1 SAR data. (Dwivedi et al, 1999). Coastal wetlands help in the maintenance of the world’s freshwater storage by preventing the intrusion of saline water into fresh water (Stuip et al., 2002). The management policies and the feasibility of such policies in real life was the main area of focus of the study undertaken by Cools et al. (2013). Due to inadequate measurement of the services and products catered by the wetlands, insufficient knowledge, and high complexity of the wetland ecosystem, ramifies to mismanagement of wetlands particularly under the river basin management plan. To burden on it, the outcome of the research project is not appropriately implemented by the policymakers. According to a study, analytical analysis is necessary for a proper management plan, which can be divided into quantitative analysis (involves models, statistics, etc.), qualitative analysis (mainly involves local stakeholder and is focused on the depth
knowledge of every aspect) and lastly to study the role of external variables (such as population, climate change etc.). The authors of the above study focused on issues such as to investigate the primary issue responsible for the constant decrease of areas under wetland covers, irrespective of its ecological significance, and analysis of the social gaps that exists between the local communities and the governmental policies as one of the main factors for the degradation of wetland ecosystem (Gopal, 1982; Gopal, 1991). Therefore, there is an urgent need to make people aware of the importance of wetlands and instil such ideas among other basic ideas that are cultivated since birth, the conservation and management of which is essentially necessary for us. The resulting monetary outputs from wetlands, in turn, contributes to its management by the action of benefits (Franco & Luiselli, 2014).

2.1.1 Socio-economic significance: Stuip et al. (2002) take into account case studies of different wetland ecosystems of developing countries to analyze their contribution in terms of socio-economic benefits, which can be divided into use value and non-use value (Ramachandra et al., 2005; Ramachandra et al., 2011). On the basis of their functions and benefits, use value can be divided into direct use values such as food, transportation, agriculture, and non-direct use value like protecting from floods, groundwater recharging. Protection of biodiversity, ecological maintenance, cultural and heritage are described under the non-use value of wetlands. Values of wetlands differ from stakeholders to stakeholders, for instance, if one stakeholder perceives it as a form of developmental process, the other might perceive it as a form of livelihood providing food and environmental security. Debroy & Jauaraman (2012) focused mainly on the role of Pichavaram mangroves on the livelihood of fisher-folk in Tamil Nadu. In terms of economic return, mangroves including its product and services were estimated to be 2,00,000 $ to 9,00,000 $ per ha/year. But sadly, different anthropogenic activities in coastal areas affect fisher-folk by damaging the coral reefs, mangroves, wetlands, swamps, etc. In order to study the economic capability of wetland areas, it is utterly vital to estimate the importance and value of wetland areas and its contribution to humankind. The economic valuation of wetlands is controlled by several factors such as its location, size, types, and biophysical properties such as recharge of groundwater and treatment of water. A close relationship exists between wetlands, their ecosystem
services and the prospective economic valuation of ecosystem services (Whiteoak & Binney, 2012). Verschuren (2014) has revealed the social implication of wetlands in the context of their religious and spiritual importance. For example, in the religious context, Manasarovar Lake in Himalayan region of Tibetan Autonomous province is being worshipped by the people of India, Nepal, and Tibet as it is believed that bathing and drinking of its water cleanses and relieves a person from all his sins.

Lambert (2003) stated that the valuation of natural products is necessary for the management and conservation of wetlands. Nonga et al. (2010) stated that the study of the surrounding environment, land use practices of peoples and a possible threat to wetlands are equally necessary to know the socio-economic importance of wetlands. People that live around the wetland areas are dependent mainly on agriculture activities for the sustenance of their livelihood. Due to its scenic beauty, the spiritual and religious significance of wetlands attracts a number of tourists, tourist camps and hotel companies which open a range of employment opportunities for local inhabitants. In addition to this, wetlands are used for a number of other purposes such as grazing of animals, water supplies for drinking and domestic use, medicinal use, wildlife purpose, fire woods etc. But wetland areas are negatively affected due to overexploitation of wetland areas by dumping waste materials, overuse of water for irrigation purposes and rapid construction of settlements. Demnati et al. (2012) stated that three activities like agricultural production, livestock and salt pan production are highly dependent economically on wetlands in the arid region. About 80 percent of the population in the arid region is economically dependent on agricultural production, such as feeding of livestock and for the purpose of grazing, except in dry seasons. During the dry months, salt pan production is the main source of income in arid areas whose economic contribution is higher than both agriculture and livestock production. Authors have stated that up to 2003, governmental agencies had a monopoly over salt pans in Chott Merouane of Algeria. But in present times, its involvement has declined to 25 percent and the remaining 75 percent are held by private companies that overuse and exploit these salt pans and are responsible for the degradation of wetland areas.

According to Lamsal et al. (2015a), the rural communities are more dependent on wetlands for various purposes as compared to urban residents, as the poor
communities in developing world are more reliant on wetlands for their livelihood as compared to the communities of the developed world. The biological and environmental ecosystems are very essential in the case of sustainable livelihood as these ecosystems affect the numbers, species, and quality of flora and fauna. But on the other hand, higher growth of population and its allied activities affects the productivity of wetlands. Authors also specified that higher priority to food security and reduction of poverty also affects the conservation and management of wetlands, because people fail to understand its value; which alarms for a need for greater participation of local communities rather than higher authorities, as the former understand the situation much better than the latter. Odine et al. (2011) have analyzed that wetlands are a warehouse of a number of products like medicinal plants, handcrafted materials, provision for water and food, etc. People residing in the surrounding as well as in the faraway areas are dependent over wetlands for their day to day requirements and needs, but are exploited by local people due to lack of sufficient knowledge, mismanagement, and poor planning by the government. Farber et al. (2002) stressed the meaning of valuation as simply an expression of an object or for a particular action. They elaborated the meaning of valuation and categorized into two: intrinsic and instrumental value. The intrinsic values are defined as those in which the valuation of any object can be decided according to its level to integrate with the ecosystem rather than solely for human satisfaction. On the other hand, instrumental value mainly deals and gives its preference to the satisfaction of human beings, and is anthropocentric in nature. The increasing difference between the utility and return of products in the natural ecosystem is becoming the main source of conflict. There are different benefits that are derived from the products and services provided by wetlands in terms of its valuation such as travel cost, replacement cost, factor income, avoided cost etc. Bockstael et al. (1995) & Brander et al. (2013) also shed light on the economic valuation of ecosystem products and services which are necessary for the stability or sustainable use of natural products. Carlsson et al. (2003) focused mainly on the designing of wetlands area that affects the provision of services and the number of benefits that are derived from them. For instance, the design of pavements and walking tracks, plantation of trees and level and depth of water affects the frequency of visitation of
both birds and people. The primary concern of the authors lies in the reduction of the amount of nitrogen in the wetland areas in a sustainable and cost-effective way. In this article, authors have observed that the valuation of products not only depended on the magnitudes but also on the fragility of the products.

2.2 Threats to wetlands: Destruction of wetlands in India puts a negative impact on the livelihood of 74 percent human populations in rural areas who are directly or indirectly dependent on wetlands for food, irrigation, drinking water, transportation, etc. Ladhar (2002) revealed that residents of wetlands are worried about shrinking of wetlands which will pose a great threat to their livelihood dependence on fish farming and wetland crops such as Nelumbium and Trapa. It affects the ecological system of wetlands with the continued cultivation of mono-crops. Sustenance of livelihood is responsible for the conversion of wetlands into dry lands as people are unaware of wetland crops and its economic importance. Present day practice of using modern techniques of agriculture can also be held accountable for the disappearance of wetlands due to lack of passage of water to the wetlands. Ramachandra (2001) & Ramachandra et al. (2015) stated that about half of wetlands in Bangalore city of Karnataka state has been lost due to unplanned urbanization, coupled with the spatial expansion of cities at the cost of wetland areas. Several factors like population explosion, industrial activities have negatively affected the environment of wetlands due to increasing pollution from both point and non-point sources. Rana et al. (2009) focus on how the growth of population and its developmental activities are responsible for the relative decline in the numbers of trees and shrubs in wetland areas of the tropical region in Bangladesh, leading to loss of animal habitat and extinction of species and number of animals. Thus, the ecological and biological characteristics are interlinked with the socio-economic functions of the wetland. Out of the several economic profits and benefits provided by wetlands, sand mining and woods plucking are one of the many which act as a source of income for the local communities. Tulu & Desta (2015) laid emphasis on the negative impact of human activities on wetlands. The authors in the article, explains how the nature of human exploitation has changed from the subsistence to commercial. The government policies associated with the development of industrial and agriculture are mainly responsible for the degradation or
loss of wetland areas, for instance, conversion of wetland water into canal for irrigation purposes. For the conservation and management of wetlands, the focus has to be laid on ‘down to top’ policies, which demands an initiation of local level planning at the basic step. Antos et al. (2007) shed light on the negative impact of urban expansion over the wetland areas which leads to degradation or encroachment of wetlands in three ways; encroachment for urban expansion increased flow activities and increased numbers of human activities such as recreation, infrastructure building etc. In urban spaces, many visit the wetland areas for recreation, pure entertainment purpose, relaxation or to re-link with nature, the ramifications of which can be both positive and negative. The negative form of recreational activities has been responsible for habitat loss, and in a positive way, can raise the level of awareness and values of wetlands. Faulkner (2004) mainly focusses on urban expansion and the status of forest wetlands in U.S.A in which he notices a gap between the population growth and land development has been widening greatly with an increase in the level and progress of urbanization. Major researches in India has been on the ecological and limnological aspects of wetlands and have marginally focused on the socio-economic implications of wetlands that affect the management strategies related to wetlands in India.

The area under wetlands is decreasing day by day due to the continuous expansion of urban areas both within and in the surrounding areas. Similarly, infrastructure developmental activities such as encroachment of the wetlands areas for the construction of a multi-storey complex have been accountable for the disappearance of Ambuja wetland in West Bengal (Mukherji & Nayak, 2015).

2.2.1 Decreasing Area: According to Prasad, 16 percent of people in India are dependent on wetlands that cover only 2.42 percent area vide the total area in India. Prasad et al. (2002) divided the loss of wetlands areas based on their intensity into acute loss and chronic loss. In acute loss wetlands, areas are filled up with soil and chronic areas are characterized by gradual removal of forest areas due to soil erosion and sedimentation of wetlands. The amount of open water drastically decreases in wetlands from the post-monsoon period to the pre-monsoon period. In the case of a river, the amount of open water in a reservoir decreases at a higher rate in comparison to Ox-bow Lake, sandy and marshy lakes (Indian Space Research Organisation,
Remote sensing plays a significant role in the monitoring of wetlands in terms of their land use pattern, drainage, and physiography (Verma et al., 1998; Kumar & Pandey, 2003). By using remote sensing data, several scholars have studied the land use, land cover and area under wetlands in different periods of time. Kotoky et al. (2012) makes a land use/land cover study of Dhansiri river channel with the help of remote sensing data and topographical sheets, the result of which shows the decline of forest and crops from 1975 to 2008 and areas under settlements have increased from 1975 to 2008 due to urbanization and the explosive growth of population. Prabaharan et al. (2010) with the help of remote sensing data analyses land use and land cover changes in the coastal areas of Tamil Nadu, in which he used toposheets as a base layer and made a land use map with the help of IRS and Landsat data. Results have found that severe form of urbanization and population explosion have led to a decrease in the areas under grass and shrubs from 1998 to 2008. In the same line, a study undertaken by Verma et al. (1998) shows that the Ropar wetland of Punjab is highly affected by human interference due to the high fertility of the soil that is used for paddy cultivation. Thermal changes in the temperature of the water are also responsible for rampant water pollution in Ropar wetlands as hot waters from Ropar thermal plant is discharged into the Lake for coolant process. On the basis of its physiographic characteristic, wetlands are mostly found in depression places which leads to, in many developing countries, the use wetland as a dumping ground for both solid and liquid wastes (Zedler & Kercher, 2005). The fish scale can be used for mapping of pollution in wetlands with respect to fish fauna. Buda Nallah and Kala Sanghain are sources of polluted water in Harike wetland that affect both the quantity and quality of water resources (Braich & Jangu, 2013).

2.2.2 Impact on Bio-diversity: Wetlands being a habitation place for different forms of biota, the decrease in the quality and quantity of wetlands equally affects the biodiversity. Habitat plays an important role in terms of breeding and in the maintenance of biodiversity, but several anthropogenic activities such as deforestation, urbanization, mining, and firing of grass for agriculture space destroy the habitat at the Kallar Kahar Lake in Punjab. Destruction of habitats impacts the biodiversity both in terms of breeding and in their numbers (Rias et al., 2010).
2.2.3 Degradation by Human Activities: Various studies that were conducted to analyze the impact of wetlands on its surrounding areas particularly focussing on drainage, have reached multiple conclusions. A study taken up by Zedler & Kercher (2005) concluded that the construction of drainage for irrigational purposes is responsible for the disappearance of wetlands on a global scale as well as at national, regional and local level. Similarly, Stuip et al. (2002) revealed that uses of wetlands for water supply for irrigational purposes are responsible for the degradation of 56-65 percent of wetlands in Europe, 27 percent in Asia and 6 percent in North America till 1985. In developing countries, several factors like deforestation, storage of water in dams, and displacement of people ramify into the loss of areas and functions which further affects the wetland ecosystem (Galbraith et al., 2005). Frequent use of fertile floodplains for agricultural purposes eventually leads to dire loss of wetlands. Similarly, the invention of recent technology for digging of canals and construction of the walls around major rivers are also responsible for the degradation of wetlands; for example, the conversion of Dutch peat land into agricultural fields in the 11th century was marked by dikes on its boundaries (Frequent use of highly fertile floodplains for agricultural purposes eventually leads to loss of wetlands. In the same way, the invention of technology for the digging of canals and construction of the walls around major rivers are also responsible for the degradation of wetlands (Verhoeven & Setter, 2010). According to Ellis et al. (2000), wetlands are mainly known as wildlife habitats and, for conservation and preservation of archaeological remains, is presently under serious threat due to the construction of artificial drainage system from wetlands. The insufficiency in policies related to wetlands leads to further degradation and depletion of wetlands in India. Under the rules for wetland conservation and management, 2010, wetlands with areas more than 500 hectares and below 2500 meters are selected for conservation and protection of wetlands; smaller wetlands with areas less than 500 hectares are excluded which leads to loss of a huge number of natural wetlands in the last decade, due to conversion of these wetlands into sites of dumping of wastages. Another systematic lack points to a concentrated focus on the wetland’s conservation and management rules on the protection of habitats of birds, prevention of pollution, and industrial set ups in the wetland territories. According to the studies on the water
crisis in wetland areas, the main source of water feeding in wetlands is due to the construction of dams over the rivers (Dandekar & Thakkar, 2011). A study taken up by Mironga (2005) to analyze the effects of farming practices on wetlands of Kisii district in Kenya, highlighted the lack of awareness among the farmers regarding the various negative impacts of farming practices in wetlands, due to their sole intention and interest to cultivate economic benefits out of wetlands. Ehrenfeld (2000) has evaluated the impact of urban growth on the size and number of wetlands, both within as well as in the surrounding areas. The nature of urban wetlands is different as compared to the non-urban wetlands in terms of its hydrology, habitat patches, species, and geomorphology. In urban areas, wetlands are used for several activities that not only puts an impact on its size and quantity, but also on the activities of the species associated with it, for instance, the quantity of water in a wetland would affect its species habitation and growth as habitat plays an important role in the evolution and the growth of several species. The gaps between the urban, suburban and rural wetlands have decreased due to several developmental activities.

2.3 Impacts of wetland: Wetlands play a vital role in restoration and as regulatory factor for the ecosystem. But, it impacts on human and biology of surroundings cannot be ignored. Rey et al. (2011) elaborated the condition of Florida’s environment where high mosquito populations have always been a part. The stable water areas are favourable for reproduction of mosquitos (Clements, 1992). Mosquito-transmitted diseases have played a major role in human history. The impact of high saltmarsh mosquito numbers on the health of locals and visitors cannot be ignored. In case of Florida, Coastal wetland management had done many efforts from 1920s for mosquito control in terms of dredging ditching and filling, and impounding without effecting the environment. By keeping in mind, the importance of wetlands as habitat of aquatic life, high use of pesticides use to control mosquito have been minimized. Even in early 1980s, the planning of wetland area in Florida goes side by side with mosquito control practices. In this way, it is important to make efforts to keep in mind local public health issues along with importance of wetlands so that management practices can be implemented to reduce the problems created by wetland areas. Wetlands are habitats of many types of flora and fauna. The water characteristics of wetlands determine the
types of species within it. There are many species which are found in wetlands water and may be different from local biology. A salt marshy areas adjacent to Mar Menor saline lagoon have many different species due to is hydrology. Rogel et. al. (2007), studied the soil salinity and characteristics of ground water from 1991 to 2004 by evaluation the values of nitrogen, organic carbon, phosphorus, ammonium and nitrates. The results of these values show that the due to increased flooding, the soil salinity has dropped during the study period. The soil characteristics have changed due to flooding by wetland/lagoon areas and with those environmental changes, *Phragmites australis* *Sarcocornia fruticosa,* and *Juncus maritimus* species have expanded in local areas of wetlands. This pattern of vegetation was completely different from the previous zonation of vegetation. The moisture and salinity in soil has increased due to wetland so the cover of *Limonium delicatulum* has decreased. Abundant vegetation cover adjacent to wetland led to deposition of organic debris due to colonization of this habitat by perennial species.

Except the changing pattern of biodiversity of the surroundings, wetlands also become the cause of intense flooding. Increased flood risks of surrounding areas promote human migration because flooding risks are associated with the location of wetlands nearby coastal areas. Increase in water level in deltaic landscape causes submergence of coastal areas. Twilley et al. (2016) identified the various causes of flooding in coastal areas and sinking of river deltas beneath seas-level is significant threat for social systems and natural landscapes. This type of sinking of river deltas and flooding in coastal wetlands is the combined effect of anthropogenic activities and changes in sediments supply to those areas. The study on Mississippi River Deltaic Plain (MRDP) provides various examples of the functions and feedbacks regarding river management and its impacts on human. Changes in salt marsh vegetation patterns along with reduced sediment input and increase in salinity also coincide with an increase in wind fetch in Terrebonne Bay. The authors argued that the balance of water relative to land of this delta provides much clearer understanding of increased flood risk from tropical cyclones rather than just estimates of areal land loss. These type of activities affect human settlements shifting also.
2.4 Modes of wetland conservation: The conservation of wetlands initially began in 1934, with the issuance of duck stamps by the United States of America. With the sale of these duck stamps, the Government of U.S. A. successfully purchased 2.1 million hectares of land solely for the purpose of wetlands (Mitsch & Gosselink, 1986). This effort for the conservation and management of wetlands spread across the globe and stimulated many countries to take a step towards its conservation. The initiation was taken up on 2nd February 1971, with a convention of wetland signed in Ramsar which came to be known as the Ramsar Convention of Wetlands. It is an intergovernmental treaty that provides a framework or platform for the conservation and management of wetlands with progressive national action and international cooperation. Unlike the earliest policymakers who solely focus on the aspect of drainage of wetland areas, the concept and nature of conservation and management of wetlands changed with time. The earliest attempt of the government for its conservation encouraged the conversion of wetland areas for agricultural purposes (Larson & Kusler, 1979). The slow metamorphosis was marked with the gradual shift in focus from the drainage of wetland areas to making a habitat for wildlife hunters in the first half of the twentieth century. In the present times, the theme and mode of conservation have shifted to the protection of wildlife and conservation of wetlands from various anthropogenic activities like intensive land use changes, pollution, infrastructural development, and hydrological alteration. Precise attention and focus towards the identification and ecological conservation of wetland areas were started almost after the second half of the twentieth century. Before this, wetland areas were treated as transitional habitats or areas of different stages from terrestrial to aquatic land (Mitsch & Gosselink, 1986; Pattern et al., 1990). The Ramsar Convention initiated the orientation towards the making of a wetland inventory. The first inventory of Indian wetlands was published in 1990 by the Ministry of Environment and Forests. An inventory of wetlands is essential for the evaluation of various wetland resources, their functions, values, diversity as well as the variations and the qualitative and quantitative influence of human activities over the wetland areas. Various institutions establish control over wetlands as wetlands functions as a warehouse for different kinds of goods and services which accounts for a clear demarcation for each product and services provided. Therefore, lack of
coordination between these departments will hinder in the management of wetlands, likewise, developmental plans of one institution may affect the management of other institutions; for instance, the plan for reclamation of land for agricultural purposes taken by the agricultural department may affect the management plans of the fishery department. In addition to this, there is a necessity for the maintenance of historical records in order to document the number of resources that are provided by wetlands. These historical records are then used by various departments for the proper management of wetland resources (Torell et al., 2001). The shifting of priorities are greater culprits responsible for the degradation of wetlands, for instance, concentrating solely on the benefits of industrial development would influence both the ecological structure as well as a local dependency of people. In order to overcome such problem, authors have introduced a group model building that comprised of local participants. In this model, only technical support is provided to each local participant for the accurate collection of data. The GMB is helpful for the success of any policy at a local level with complete awareness and knowledge about that particular problem. Systematic Dynamic is another system that deals in line with the management policies and which works in several steps according to its required needs (Chen et al., 2014). Rajasekar et al. (2007) analyse the management and measures taken for conservation of Keshopur wetland in Gurdaspur which was started by the forest department in 1998, 2003 and 2005 but failed due to political causes. Therefore, in 2006, wildlife division was created which focused on the bottom-up approach with the active participation of the local participants that led to the development of the Keshopur Chhamb Community Reserve in 2007. The main objective was aimed at the conservation and management of vulnerable ecosystem of wetlands. The Keshopur Chhamb Community Reserve was divided into five zones and each zone was controlled by the Panchayat. But this programme was not successfully executed due to lack of infrastructure facilities, communication barriers, financial problems etc. Therefore, the economic valuation of wetlands became necessary as self-generating of funds from wetlands served better from the management and conservation point of view. Rahman & Begum (2011) focused on the management of
wetlands through diversification of people dependency by generating new employment opportunities in the area. Therefore, the Government of Bangladesh initiated a community-based project MACH (Management of Aquatic Ecosystem through Community Husbandry) for management and conservation of wetlands under the diversification of livelihood opportunities. Poultry farming, fish nursery, livestock rearing are the example of some livelihood opportunities that lower the dependency level of people over the wetland areas. Ganjali et al. (2014) shed light on the values of the culture that play an important role in the development of any nation, in which the authors focused on the promotion of ecotourism mainly in the context of conservation and management of wetlands. In the view of which, the authors emphasized the study of strengths and weaknesses of wetland areas which are necessary for effective development and promotion of tourism. The development of tourism offers both opportunities as well as threats to the culture, beliefs and natural environment. Howarth & Farber (2002) emphasized on the economic values of the products and services provided by the ecosystem, such as market values, which are not covered under the institutional arrangement. The valuation of ecosystem products and services are essential for the successful execution of various management and conservational policies, which in turn develops a spirit of sustainable use and consumption of natural products.

**Figure 2.1: Heuristic Model of Economic Valuation**
In this figure, S shows the numbers of products provided by wetlands and P shows the price. The $P_0$ and $S_0$ show the level of human satisfied at $P_0$ price human beings are ready to purchase $S_0$ goods.

Hettiarachchi et al. (2014) focus on the significance of Ramsar institution that took an initiative for the management and conservation of wetlands at a global level. The idea of the whole article revolves around the sustainable use of urban wetlands; which becomes evident in 2012 when the Ramsar Convention exclusively focussed on the conservation and management of urban wetlands under resolution XI. Authors revealed three major drawbacks that affect the management and conservation policies such as the complex relationship between society and ecological process, political pressure and absence of environmental justice especially in the case of urban areas. The study taken up by Reed et al. (2014) focused on the issue of process and structure of management action plans which rendered sole collection of knowledge as futile, and demanded greater exchange of knowledge between both the consumer group that involves those who use these services such as the local communities and the policymakers who developed these management plans. The knowledge exchange process is also beneficial for the making of an interview schedule, as the number of experts and the practical knowledge about a specific object is helpful will help in refining a definitive question. In addition to this, knowledge exchange is also helpful in minimizing research expenditure. Management and Conservational policies related to wetlands are controlled by the Ministry of Forest, Environment and Climate Change (MoEF & CC). In addition to this, management strategies in India were adopted mainly after 1990, with the establishment of the National Wetland Conservation Programme (NWCP) in 1985. In 2006, the National Environment Policy was adopted by the Government of India that also discusses the lack of a formal system for the management of wetlands in India (Bassi et al., 2014).

2.5 Policy Framework of Indian Wetlands conservation: The research related to the making of wetland inventory started in 1960 by the Government of India. Post-independence, there was an initiation for the conservation and protection of wildlife, forest, estuaries, mangroves and other wilderness that came under the Indian Board for Wildlife, chaired by the Prime Minister of India. A Tiwari Committee was established
in 1980 for the protection of the environment and on the recommendation of the committee, the Department of Environment was established by the Government of India in November 1980. The Department of Environment had set up a wetland research group in the year 1980 which was chaired by Prof. C. K. Varshney and identified about 1193 wetlands that covered about 39,045 hectare areas. Out of this, only limited wetland sites such as Keoladeo Ghana National Park, Point Cali mere, Chilika Lake and Sundarbans delta are covered for the conservation and management purposes (Scott, 1989). In the year, 1985, Department of Environment was replaced with the Ministry of Environment and Forest that worked for the planning, promotion, and coordination between the department for management and conservation of protected areas.

According to WWF, ‘the first step of any conservation programmes is to understand what exists’. The first step towards the compilation of information about the wetland areas was initiated by the International Union for Conservation of Nature and Natural Resources (IUCN), International Waterfowl and Wetland Research Bureau (IWRB) in 1985 with the financial support of World Wide Fund for Nature (WWF). After this, a directory related to wetlands of India was prepared by the Ministry of Environment and Forests in 1990 based on a survey carried out in 1972 (Ministry of Environment and Forests (MoEF), 1990). The directory recorded 67420 wetlands in India that covered about 40,40,087 hectare areas. Out of these, 14,50,861 hectares lies under the 2167 natural wetlands and 25,89,266 hectare areas under 65,253 man-made wetlands (Ministry of Environment and Forests (MoEF), 1990; World Wild Fund for Nature, 1993). But, this served as an incomplete directory of wetlands, as it excluded many inland and coastal wetlands due to lack of data. In a year, 1993, the Directory of Indian Wetlands was reproduced by the WWF and Asian Wetland Bureau (AWB), in which new information related to wetland areas were added which previously didn’t exist in the Asian Wetland Directory. The limitation of such a directory was the inclusion of several wetlands with insufficient information in the Directory of Indian Wetlands. Besides this, it gives much preference to fauna and flora or waterfowl in the selection of wetlands. For detailed knowledge of Indian wetland areas, remote sensing data of LISS I/II data of the year 1992/1993 had been used for the first time by Space Application Centre
(SAC), Ahmedabad in 1992. The information about several wetland areas was added in the inventory which was located in inaccessible and remote areas, which didn’t give much space for field visits. The mapping of wetland areas had been mostly done on 1:250000 scale under the Nation-wide Wetland Mapping Project. Although, for some states like Punjab, Haryana, Himachal Pradesh, Sikkim, Tripura, Manipur, Nagaland, Assam, Arunachal Pradesh, Meghalaya, Goa, West Bengal mapping has been done on 1:50000 scale (Garg et al., 1998). The major shortcoming in this inventory is that it includes all the water bodies and water masses in the wetland category and makes a complete exclusion of rivers (Garg et al., 1998). In order to increase the accuracy of wetland inventory, a second scientific inventory of wetlands has been done by SAC in 2007 under the project of National Wetland Inventory and Assessment (NWIA) sponsored by the Ministry of Environment, Forest and Climate Change (Panigrahy et al., 2011).

2.5.1 Nodal agencies that deal with the management and conservation of wetland;

2.5.1.1 Ramsar Convention, 1971: The Ramsar Convention is an international treaty, which provides a framework for national action and international cooperation for the conservation and sustainable use of wetlands and its resources. The history of Ramsar convention can be traced back to 1960 when several countries and non-governmental organizations were worried about the degradation and loss of wetlands habitats and its consequent effects on migratory birds. The Ramsar Convention was signed in 1971 at the Iranian city of Ramsar and it came into force in 1975 (Ramsar, 1971). Its primary focus, in its initial phases, was on the conservation and protection of the habitat of birds and it later shifted to provide various benefits of wetlands to the lower sections of the society in line with sustainable development (International Water Management Institute, 2014). In 1982, the Government of India signed the Ramsar Convention on wetlands for the conservation of wetlands and biodiversity, at the global level and presently, 26 wetlands sites in India has been selected for Ramsar wetlands (Ramsar Convention Secretariat, 2010).
2.5.1.2 The Ministry of Environment, Forest and Climate Change (MoEF& CC): It is a nodal agency in the administrative structure of the Central Government, dedicated for effective planning, promotion, co-ordination and overseeing the implementation of India’s environmental and forestry policies and programmes. The main objectives of the MoEF & CC are conservation and survey of biodiversity and wildlife, prevention and control of water, soil and other pollutions, afforestation, protection of the environment and to ensure the welfare of animals. The ministry is responsible to formulate plans and various regulating strategies for the protection of wetlands in India. The degradation of wetlands which forms a major part of water resources has become the thrust interest of the ministry. Ministry has coalitions with the Central Pollution Control Board (CPCB), river management authorities and research institutions as well as universities to regulate water pollution (Ministry of Environment and Forests (MoEF), 2007).

- **Central Wetland Regulatory Authority (CWRA),** is an authoritative body of the Ministry of Environment and Forests. The main aim of this body is to look into the issues of wetlands and promote wetland protection, conservation, management, policies etc.

2.5.2 Wetland Management and Conservation in India: There has been no specific rule and policy as such for the conservation and management of wetlands. The Ministry of Environment, Forest and Climate Change sees to the proper management and conservation of wetlands in the country, which can be accounted for a major influence of a number of legalization acts like Indian Fishery Act 1857, Indian Forest Act 1927, Forest (Conservation) Act 1980, Water Act 1974, Wildlife Act 1972, Environmental Protection Act 1986, Air (Prevention and Control of Pollution) Act 1974, Coastal Regulation Act 1991, on the wetlands in India (Bassi et al., 2014; Ministry of Environment and Forests (MoEF), 2009). Besides this, the management and conservation of wetland areas are supported by several other policies like the National Forest Policy 1988, National Conservation Strategy and Policy Statement on Environment and Development 1992, National Environment Policy 2006 and National Biodiversity Action Plan 2008 (Ministry of Environment and Forests (MoEF), 2013). The
present study mainly concentrates on those policies/plans which were established or implemented after the foundation of the Ramsar Convention in 1971.

**2.5.2.1 Wildlife Protection Act, 1972:** This act is indirectly linked with the protection of flora and fauna (of wetlands), as it includes the Biodiversity Hotspots and National Parks and Wildlife Sanctuaries. This act was implemented with a major objective of protecting the wildlife of the country from smuggling, poaching and illegal trade (Ministry of Environment, Forest and Climate Change (MoEF & CC), 2016a). The management of wetland areas and marshes areas are covered under Act 44 of 1991. The Act was amended in 2002 and later re-amended in 2006 with some additions of other acts related to tiger conservation act etc. and a special steering committee was established. National Wildlife Action Plan was formulated in the year 1982 in the meeting of the Indian Board of Wildlife and was adopted in 1983. The conservation of biodiversity was its primary focus. Similarly, the year 1988 witnessed the formulation of the National Forest Policy to stress on conservation (Department of Environment, Forests and Wildlife, 1988). In the preferment of Wildlife Plans, in February 2016, presented a draft of the National Wildlife Action Plan (2002-2016) in the form of a new draft of the National Wildlife Action Plan (2017-2031) that had been formulated to ensure a systematic forward planning of the wildlife and forest resources (Ministry of Environment, Forest and Climate Change (MoEF & CC), 2016b). Section IV of the draft, fully concentrates on the wetlands, primarily dealing with its importance, problems, issues, and conservation of the wetlands of the nation. By highlighting the biological, ecological and economic significance of the wetlands, the draft speaks to adopt certain management plans like the climate change adaptation and disaster risk reduction. In addition to which, it suggests to engage some management authorities or training institutions to overcome the exceeding concern of wetlands.

The government ensures the conservation of the wetlands under the Wildlife Protection Act but fails to understand the real issue of lack of proper functioning at the ground level. It focuses on the protection of flora and fauna by labelling those areas as ‘protected’. The conservation of the wetland areas is solely under the Wildlife Act, but only if it supports the endangered species of flora and fauna and the habitats of endangered wildlife (Panini, 1998).
2.5.2.2 Environmental Protection Act (EPA), 1986: The first draft of this act was conceived after the participation of India in the United Nations Conference on Human Environment in Stockholm in 1972. The main objective behind the introduction of the Environmental Protection Act was to control the rapid decline of the environmental quality due to an increase in the amount of pollution, exceeding the number of chemicals in the food chain and thus, aggravating the risk of environmental threats at national as well as at the global level. Therefore, EPA deals with the protection and improvement of the environment by setting relative parameters in order to counter the effects of pollution (Ministry of Environment, Forest and Climate Change (MoEF & CC), 2016c). The various aspects of the Environmental Protection Act are defined as follows:

a) “environment” which includes water, air and land and the inter-relationships and interactions that exist among them, with humankind, other living creatures, plants, micro-organisms, and property;

b) “environmental pollutants” comprise of different solid, liquid or gaseous substances that are present in impermissible amounts which tends to be injurious to the natural environment;

c) “environmental pollution” which indicates the presence of environmental pollutants in the immediate environment;

d) “handling”, in relation to any substance, its mode of manufacture, processing, treatment, package, storage, transportation, use, collection, destruction, conversion, offering for sale, transfer, etc.;

e) “hazardous substances” are inclusive of any substance or preparation of which, owing to its chemical or physio-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment;

f) “Prescribed” refers to the prescription of rules under this act (MoEF).

Encompassing a range of pollution issues of land, water, and air, this act came into effect from 19th November 1986. As wetlands can be subcategorized under water pollution so it aims towards the protection of water from wetlands. This act is responsible for the formulation of rules so as to prevent environmental pollution and to ensure proper coordination among the state and central governmental bodies for
achieving its necessary target. The EPA standardizes the limit for the presence of any substance in air, land, and water. Violation of the standardization rules by any person, public or private firms will be strictly penalized, the management of the act is taken care by the Ministry of Environment and Forests (MoEF) which has also set up a National Committee on wetlands, mangroves and coral reefs that are further subdivided into Wetlands/ Lakes Committee, and Mangroves and Coral Reefs Committee.

2.5.2.3 National Wetland Conservation Programme (1985-86): It is the first conservational programme that is directly linked with the conservation and management of wetland areas. The status of conservation and management of wetland areas has been accessed from the coverage of wetland numbers and areas under the NWCP. In its initial stages, only 23 wetland sites were covered under the NWCP, of the Ministry of Environment and Forests, with not much change in the numbers up to the year 2003. The NWCP shows a remarkable expansion from the year 2003 to 2006 with the numbers of wetland sites increasing from 27 in 2003 to 94 in 2006 (Ministry of Environment and Forests (MoEF), 2007), with further revision of the programme on 12th June 2009. The coverage areas and numbers of wetlands had increased from 94 in 2006 to 115 in 2009 that required serious conservation and management actions (Ministry of Environment and Forests (MoEF), 2009) in about twenty-four states and two Union Territories of India. In the case of Punjab, three Ramsar wetland sites, i.e. Harike, Ropar and Kanjli, and two national wetlands, i.e. Nangal and Ranjit Sagar have been selected for the conservation and management purposes. Out of which, four wetland sites namely Harike, Ropar, Kanjli and Nangal are managed and conserved by the Punjab State Council for Science and Technology (PSCST) and the conservation and management scheme of Ranjit Sagar wetland is taken by Ranjit Sagar Dam Design Organization under the department of irrigation (Punjab State Council for Science and Technology, 2010, 2011).

The enlisted objectives of this programme are protected and prevent further degradation of wetlands from a number of activities like encroachment, siltation, catchment erosion, weed infestation and agricultural wastage that are discharged into the wetland areas (Garg, 2015). The primary aim of this programme includes the formulation of policies for the conservation and management of wetland areas, to select
the wetland areas according to their priority of conservation, to monitor the programme and formulation of wetland inventory. NWCP is coordinated both by the central and the state governments whose principal role is to issue guidelines, provide financial aids, and evaluate the entire project or wetland sites covered under this programme. Complete financial assistance is provided by the Government of India for the Management Action Plan (MAP) and research projects, which ranges for 3-5 years and is submitted by the state government to the central government. Small and medium-sized wetland areas with areas less than 100 hectares are not covered under the NWCP. Similarly, small and medium-sized wetlands are excluded from the list and description of the MAP and are financially deprived as governmental funds are based on the area and size of wetland (Ministry of Environment and Forests (MoEF), 2009). The list and description of MAP for wetlands is not available on the site of NWCP, in addition to which, financial support is given only for certain activities like survey and mapping, fencing of catchment areas, plantation, treatment of catchment areas, controlling of weed intensification, pollution control, livelihood support, infrastructure development, and awareness etc. The release and funding of financial sources are quite complicated as wetlands are protected areas which are managed by other departments. The main function of the central government lies in the provision of financial assistance and evaluation of various conservational and management action plans whereas, the state/union territories are responsible for proper implementation of these plans. In the case of Punjab, funds for 1113.34547 lakh rupees’ have been released up till 1st February 2017 under NWCP by the Government of India. The details of the funds in accordance to the wetland sites are discussed below table 2.1:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Wetland</th>
<th>Fund release till 1.02.2017 (in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Harike Wetland</td>
<td>493.06447</td>
</tr>
<tr>
<td>2.</td>
<td>Ropar Wetland</td>
<td>271.645</td>
</tr>
<tr>
<td>3.</td>
<td>Kanjli Wetland</td>
<td>167.541</td>
</tr>
<tr>
<td>4.</td>
<td>Nangal Wetland</td>
<td>181.095</td>
</tr>
</tbody>
</table>

Source: NWCP, 2017
NWCP covers only a limited share of wetland areas as the selection criteria for the conservation and management of wetlands are as same as that of the Ramsar selection criteria, which are discussed below:

1. Criteria 1. If it contains a rare or unique example of a natural or near-natural wetland type.
2. Criteria 2. If wetland areas support endangered or ecologically threatened species.
3. Criteria 3. If the wetland areas support a population of plants or animal species that maintain the biological diversity of the region.
4. Criteria 4. If the wetland areas support endangered species of plants/animals that are at a critical stage of their life cycle.
5. Criteria 5. If the wetland is able to support 20000 or more water birds.
6. Criteria 6. If it consistently supports 1% of the total population of any one species or its sub-species.
7. Criteria 7. If the wetland areas are able to support those species or population of fishes that are associated and contribute to the benefits of the wetland ecosystem and biodiversity at a global level.
8. Criteria 8. If the wetland areas provide an abundant space for fishes for their food, water resources, the path of migration, nursery etc.
9. Criteria 9. If the wetlands are able to cater to the possibilities of eco-tourism, recreational activities, research and educational facilities, water and food resources, cultural heritage and their conservation etc.

Drawbacks of NWCP:

1. Due to the sole selection of only Ramsar wetland sites under this programme threatens several small and medium-sized wetlands.
2. The whole process of fund release and approval of the government is questionable as it provides financial aids on the basis of the size and area occupancy of the wetland rather than the problem itself.
3. The provision of funds to the state governments becomes a complex affair if granted on the basis of protected or non-protected areas, for instance, if the
wetland area is estimated greater than the protected area, then funds will be released under the NWCP, or else it will be released under some other programme like the Integrated Development of Wildlife Habitats or under the Project Tiger and Project Elephant etc.

4. NWCP has mentioned that both the central and the state governments are accountable for the conservation and management of wetlands under this programme. But there is no clear demarcation and mentioning of the committee who will seek and look into the conservation and management activities, in particular.

5. There is a complete exclusion of the participation of local stakeholders and the non-governmental organizations under this programme. The participation of the local stakeholders should be indispensable to the process of decision making. The combination of both traditional and scientific technologies is necessary for obtaining long-term conservation plans (Ministry of Environment and Forests (MoEF), 2007).

6. Besides this, lack of interest of both the central government and the state government on proper implementation of conservation plans and the review of existing legal and institutional issues poses a major setback. (Panini, 1998; Ramachandran & Aithal, 2016).

In the year 2013, NWCP was merged into National Plan for Conservation of Aquatic Ecosystem. All the wetlands that are identified under the NWCP were now covered under the NPCA. The financial funding pattern for the conservation and management of wetlands was changed from 100 percent to 70:30 percent (90:10 for North-eastern and Himalayan states) in the year 2013-14 (Ministry of Environment, Forest and Climate Change (MoEF & CC), 2014; Simha, 2016).

2.5.2.4 National Lake Conservation Programme (2001): Lakes is one of the important elements of the ecosystem which provides a range of benefits in terms of various ecological services. But due to the high amount of pollution, siltation, encroachments, etc., these services and values are under severe threat. The conservation and management of water bodies depend not only on the nature and tendency of the problem but also on the level in which it affects in terms of physical,
chemical, hydrological and biological. NLCP was initiated in the year 2001, for the conservation and management of lakes primarily in the urban areas. Earlier, the lakes and water bodies were covered under the National Wetland Conservation Programme from the year 1983 to 1989, which was developed by the government for special lakes in order to protect them against the nature of activities in the urban and semi-urban areas which includes discharge of wastages in the lakes. The pre-survey that has been carried out for the protection of lakes, identified 62 lakes in total (Ministry of Environment and Forests (MoEF), 2008). They have been given a choice for amendment and revision of priority by the State Government within 5 years of time. In addition to it, the involvement of multiple agencies in the management of lakes is further accountable for the degradation and over-exploitation of lakes (Gopal et al., 2010). Further degradation occurs due to the carelessness in decisions of different management bodies such as a municipality, who permit for the disposal of solid and liquid wastes in the same water body from which domestic water is supplied; as in the case of Dal Lake in Srinagar and Upper Lake in Bhopal. As a reply to which, the National Lake Conservation Programme was adopted in the year 2001 that focussed on various activities like; de-siltation, removal of weeds, development of front lake areas, fencing of lake areas, checking of water qualities, control of pollution from point and non-point sources, sewage treatment plants and public awareness programme that has been covered under NLCP. The beginning stages marked a cent percent grant provision by the Government of India for the conservation of lakes in urban and semi-urban areas (Reddy & Char, 2006). The funding arrangement of NLCP has been changed in the year 2002, in which the share of the Central Government was reduced from 100 percent to 70 percent and the remaining 30 percent funding was done by the State Govt. The bodies of the lake conservation authority have been developed in several states with various names such as the Lake Development Authority in Karnataka in the year 2002, Lake Conservation Authority in Madhya Pradesh in 2004, Loktak Lake Development Authority in Manipur, Chilka Development Authority in Odisha, Lake and Waterways Development Authority in J & K. The Ministry of Environment, Forests and Climate Change has given directions to all states to constitute a City Level Monitoring Committees (CLMCs) for all rivers and lakes that is
to be chaired by the District Collector including the administrative head of the Urban Local Bodies (ULB), representatives of the implementing agencies, NGOs and other prominent social workers. In addition to this, there is an utmost need and necessity for the awareness and knowledge related to the conservation of water bodies from a management point of view. The Indian Institution of Technology, Roorkee started a course on “Conservation of Rivers and lakes: through Alternative Hydro Energy Centre” that is sponsored by the MoEF (Alternative Hydro Energy Centre, Indian Institute of Technology, Roorkee, 2010). There is no specific legal framework that deals directly with the management and conservation of lakes, wetlands and aquatic ecosystems which are covered under several Acts such as the Wildlife Act, 1972, the Forest Conservation Act, 1980 related with the biodiversity and natural resources and the Water Prevention & Control of Pollution Act, 1974 which concerns itself towards effective prohibition of dumping of wastages in the water. As a concern of fulfilling their duties, various state governments have developed their legal framework for the conservation, and management of lakes, wetlands, and rivers in their respective territories as ‘land’ and ‘water’ account as state subjects.

**Delimitations:**

Only perennial lakes have been covered under the NLCP, other types of wetlands, those are under non-perennial lakes, are conveniently ignored by the government. Lakes exceeding an area of 10 hectares and depth more than 3 meters is the only criteria for a wetland and lake to get selected for conservation, as an exception, lakes comprising of the area more than 3 hectares and having any social and religious importance to take into consideration for selection. There are several loopholes that are present in each regulatory plan designed for wetlands and these loopholes serve as an advantage and incur profits for the industrialists, as in the case of the Coastal Regulation Zone Notification.

**2.5.2.5 National Environment Policy, 2006:** The National Environment policy is an extension of the existing policies that looks into the issue of environmental protection, and formulates on the recommendation and in the view of earlier policies. The National Environmental Policy is developed to extend its coverage and fill in the existing gaps
in previous policies. “The Dominant theme of policy is that while conservation of environmental resources is necessary to secure livelihoods and well-being of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation than from degradation of the resource” (Ministry of Environment and Forests (MoEF), 2006). The objective of the National Environmental Policy is to focus on the conservation and intra-generational equity of environmental resources relevant to all sections of the society in line with their form of livelihoods. It carries out its objective by focussing on environmental conservation through multi-stakeholders such as participation of local communities, public agencies as well as for various research institutions. Along with the conservation of environment, some of the other objectives of the National Environmental Policy includes good governance and to promote optimum use of environmental resources, in addition to which, certain aspects like priority to the surrounding inhabitants, right to development, economic efficiency, equity, legal labiality, decentralization of power, integration of social and natural science for policy formulation, environmental standard and precautionary measure etc. has been discussed. In actual sense, such things are not applied at the ground level as evident in the case of Harike wetland, which despite being a Ramsar site there is no proper boundary demarcation, lack of plantations and revenue records of the lands acquired by the local people etc. as it is not feasible. This policy is focused on the empowerment (in terms of funds, actions, and capabilities) of local bodies such as panchayats or municipalities (Ministry of Environment and Forests (MoEF), 2006). The relation between the services and its impact on the wetland areas have been discussed in the National Environmental Policy, 2006. According to which, several wetlands are undergoing stress as it is being constantly exploited and is used for dumping of various solid and liquid wastes as it is perceived to have little economic value as compared to other water bodies. But in reality, the dependency of the surrounding inhabitants has increased the economic value of wetlands from the ground level. Sadly, despite being home for various biota, there is an effective failure in realizing the quantitative and qualitative view of wetlands. The policy highlights the need to set up a legally enforceable regulatory mechanism that will promote the conservation and management
of wetlands with the proper participation of local communities and relevant stakeholders. Therefore, on the basis of suggestions of National Environmental Policy, a legal structure named *Wetland Conservation and Management Rules, 2010* was developed by the Ministry of Environment and Forest.

### 2.5.2.6 Wetland Conservation and Management Rules, 2010:

The wetland conservation and management rules, 2010 was developed on the basis of recommendations given by the National Forest Policy, 2006. The National Forest Policy mentioned the need to set up a regulated authority that seeks towards the maintenance of ecological character, identification of new wetlands and primarily focus on the development of a national wetland inventory (Bassi et al., 2014; Ministry of Environment and Forests (MoEF), 2012; Ministry of Environment, Forest and Climate Change (MoEF & CC), 2016d; National River Conservation Directorate, 2017). The Central Wetland Regulatory Authority was constituted as per the provision under rule 5 of Wetland Conservation and Management Rules, 2010 and consists of a Secretary (MoEF), a representative of the Ministry of Tourism, Water Resources, Agriculture, Social Justice, Chairman (CPCB), Joint Secretary or Advisor (MoEF) and four experts from the field of ornithology, limnology, ecology and hydrology who are nominated by the central government for a tenure of three years, the nomination process of which is not entirely transparent which further shows the lack of confidence and seriousness in the part of the government in relation to the conservation and management of wetland areas (Dandekar & Thakkar, 2011; Bassi et al., 2014). The wetlands controlled under these rules include the Ramsar wetlands, UNESCO heritage sites (wetland), protected areas such as national park, wildlife sanctuary, reserved forests, and marine parks, complex ecosystem wetlands with an elevation of 2500 meters and an area of 5 square kilometres or above, wetlands below 2500 meters with an area of 5 square km or higher areas, and also incorporates any wetland that is identified or suggested by the Central Wetland Regulatory Authority (Wetland Conservation and Management Rules, 2010; Dandekar & Thakkar, 2011).

Reclamation of wetland areas, setting up of new industries, storage, dumping and handling of hazardous substances, permanent construction and untreated disposal of any liquid and solid wastes etc. are restricted under these rules. The Harike wetland is
the part of Sutlej River which has turned into a dumping site of the industrialized city of Ludhiana, the effluents from which has turned the water black with impurities, and has become a breeding place for different diseases which causes harm to the surrounding biodiversity and people. The activities such as extraction and use of water, disposal of treated effluents, unsustainable grazing, collection of biotic and abiotic resources, boating, dredging, agriculture, horticulture, repairing of existing structure and the facilities are prohibited and requires prior permission from the state government as it aims to preserve the ecological character of the wetland areas. Conversely, activities related to recreational, religious, livestock, etc. are allowed with respect to the essential rights of the communities over the wetland areas.

In order to identify new wetland areas, a brief document has been prepared by the state government within a year of the formulation of rules and details of wetland areas, in terms of their geographical location, size and entailing threats etc.; which will succeed with the investigation of the matter by the committee, the result of which would decide if that area be labelled as ‘protected' or not. Any dissatisfaction with the decision of the Central Wetland Authority can be then appealed to the National Green Tribunal within six months. The National Green Tribunal is not functional at this stage (Dandekar & Thakkar, 2011).

**Drawback or limitation of conservation and management rules, 2010:**

1. The major drawback is the sole focus of the wetland conservation and management rules on the conservation and management of wetlands by prohibiting and regulating certain activities, by blatantly ignoring the rights of people over the wetland areas. In other words, the dependency of people over the wetland areas for water security, livelihood, grazing etc. has been conveniently ignored and overlooked during the formulation of the rules. The worldwide conservation and management policies recognize the importance of protecting livelihood dependency and promotion of democratic system or structure for the management (Ashoka Trust for Research in Ecology and the Environment (ARTEE), 2010; Dandekar & Thakkar, 2011), the adoption of which is evident in the case of the Forest Department of India with its announcement of the Forest Rights Act, but the same is completely overlooked in
the case of the management and conservation rules, 2010 (Ashoka Trust for Research in Ecology and the Environment (ARTEE), 2010). The same is also mentioned in the draft in the year of 2008, 2009, and 2010 regarding the roles of wetland in connection with the dependence of livelihood of the rural communities and the consequent effects of the declining services of the wetland ecosystems. For example, more than 50000 people are dependent over Dal Lake in Jammu & Kashmir for the sustenance of their livelihood (Khan et al., 2014). About 90 percent population depends over mangroves wetlands in the East Godavari Delta, Andhra Pradesh, India (Dahdouh-Guebas et al., 2006). Thus, there is a dire need for both the state and central governments to understand the real meaning of conservation and manage the involvement of the local communities that are dependent over these wetland areas.

2. The draft formulated in the year 2008, mentioned different types of wetlands which need proper management and conservation; which categorized wetlands into three types: A type, B type, and C Type. Category A wetland includes Ramsar sites, World or National heritage areas, transboundary wetlands, wetlands that have more or equal to 1000 hectares in arid, 5000 hectares in semi-arid, 10000 hectares in humid and 100000 hectares in humid region and including those wetland areas that are a source of water for ‘A’ class cities. Category B wetland includes state heritage areas and also includes wetlands that are a source of water for B class cities and Category C wetland includes those wetlands that are selected under A and B categories or is the source of water for 100 residents or fulfilled the needs of local people. But in the final notification rules in 2010, only class A wetlands are given preference in terms of management and conservation. The selection of wetlands for management and protection activities was far better mentioned in the draft of the year 2008. In addition to which, socially and culturally significant wetlands are identified for conservation activities under the draft year 2008. But, the final notification rules of the year 2010 marks an exclusion of such rights for the protection of smaller wetlands (Dandekar & Thakkar, 2011; Ministry of Environment and Forests (MoEF), 2008).

3. In the draft of the year 2008 as well as in 2009, there has been mentioning of the initiation for the constitution of regulatory committees at different levels, i.e., district
level, state level, and central level so as to properly cater to the representation and participation of native people. But, in the final notification in the year 2010, no such space has been allotted to the district and state level committees (Ministry of Environment and Forests (MoEF), 2008; Ashoka Trust for Research in Ecology and the Environment (ATREE), 2010; Dandekar & Thakkar, 2011). The second section of the draft mentioned about the local bodies like the municipalities and panchayats, which were omitted in the rules in the year 2010. Unlike the draft, in the year 2008, the final notification of the management and conservation rules, 2010, doesn’t mention any form of public consultation. Public consultation is a process that seeks the opinions of the locally affected people and their concerns about the ecological and economic, that will be brought to the notice of the regulatory authority for further action (Ministry of Environment and Forests (MoEF), 2008). There is a need to have a management committee with at least 50 percent quota for the local and non-expert members that are routinely connected with the wetland areas (Dandekar & Thakkar, 2011). Even, in the 2016 draft (management and conservation rules, 2016), the participation of the local people has been completely ignored in the constitution of the state level committee.

4. The prohibited activities that are mentioned in the rule, 2010 have not successfully applied in the context of wetlands. For example, as per the rules, Ramsar sites have been selected for the management and conservation, but according to a field survey, disposal of liquid and solid wastages still continue in the wetland areas. In addition to which, ARTEE’s wetland conservation team mentioned that there is a need for a separate notification that only delineates on the prohibited activities for better conservation and greater profits.

5. The identification of new wetland areas is limited as per the rules 2010 as it primarily focusses on Ramsar sites, heritage sites, etc.; and the lack of proper space for local level government further aggravates the problem. ARTEE group of wetland research team proposed a need to add democratically elected members of various panchayat/assembly/parliament members in various committee (Ashoka Trust for Research in Ecology and the Environment (ATREE), 2010). The National Environmental Policy, 2006 was reviewed by both the experts as well as the
members of parliament and focuses on the participation of several local bodies such as the municipalities and panchayats, local communities and stakeholders that are directly or indirectly dependent over its resources (Ministry of Environment & Forests (MoEF), 2006).

6. The whole foundation of management and conservation rules falls apart due to overlapping; as wetland areas that fall under the National Parks and Wildlife Sanctuaries shall be regulated by the provision of Wildlife Act, 1972 which mainly focuses on the conservation of fauna or flora species. The protected or notified forest areas is managed under the Forest Act and Environmental Protection Act and other areas that are covered in these shall be regulated under the Environmental Protection Act which further questions the whole setup of allotting a wetland area under a different act. According to ARTEE, there is a need to develop or constitute a separate wetland act that strives towards complete analysis of all possible issues and aspects of wetland areas.

2.5.2.7 National Plan for Conservation of Aquatic Ecosystem (NPCA), 2013: The National Plan for Conservation of Aquatic System is developed to fulfil the needs of a separate body for the conservation and management of lakes and wetlands that are different from the aspects of rivers conservation. There are two different programmes for the conservation and management of wetlands and lakes that have been already developed by the government, i.e. National Lake Conservation Programme (NLCP) and National Wetland Conservation Programme (NWCP). These two programs separately seek towards the conservation and management of the same. For instance, NLCP focuses on the conservation and management of lakes in the urban and semi-urban areas, whereas NWCP focuses on the wetland areas mainly the Ramsar or large-sized wetland sites. In the year 2013, with the aim for integration and to promote a multi-disciplinary approach, the Union Cabinet of India merged two different forms into a single plan that came to be known as NPCA. The approaches of management and conservation plans have changed from a sectorial level to the mainstreaming aquatic ecosystem (Ministry of Environment, Forest and Climate Change (MoEF & CC), 2016e).
The main objectives of NPCA include the development of policies guidelines; advancement of eco-restoration efforts with the help of integrated management, development of a national inventory for the aquatic ecosystem, participation, and support of local stakeholders for various management purpose etc. Both the central and the state level committee has been established under the NPCA. Formulation of policies and financial aids related to conservation come under the central level committee whereas the implementation of conservation and management plans comes under the duties of the state level committee.

**Delimitation of NPCA:**

The coastal and mangroves wetland areas are excluded from the NPCA, and the number of wetlands and lakes identified is the same as covered under the NLCP and NWCP. There has been no noticeable change in the selection criteria for wetlands and lakes. The NPCA talks about the setup of a State Wetland Authority, but in the case of Punjab, there has been no specific wetland authority to address its issues. There has been no evidence of the participation of local people and integrated approaches in the case of NPCA.

**2.5.2.8 Wetland Management and Conservation Rules, 2016 (Draft):** The Ministry of Environment, Forest and Climate Change proposed a new draft of Wetland (Conservation and Management) Rules, 2016 that shows the ineffectiveness of Management and Conservation Rules, 2010 (Nagaranjan, 2016; India Environment Portal, 2016). The pending petitions against the Wetland Management and Conservation Rules, 2010 at the National Green Tribunal are also responsible for the announcement of new draft rules i.e. Wetland (Conservation and Management) Rules, 2016 as dated 31 March 2016. Several organizations such as Bombay Natural History Society, WWF India, Legal Initiative for Forests and Environment, International Rivers, INTACH, Yamuna Jiye Abhiyan and South Asian Network on Dams Rivers and people have sent their representatives and submitted objections regarding the new Rules. Ritwick Dutta, an environmental lawyer and member of the Legal Initiative for Forests and Environment said, "It makes very little sense to grant states, which have so far not been adhering to the Rules that are
already in place, all the power to notify wetlands” (Nagaranjan, 2016). The new draft rules have some advantages as well as shortcomings as discussed below:

- The proposal of draft 2016, regarding the setup of a State Level Wetland Authority in the place of Central Wetland Regulatory Authority that dealt with the concerns related to wetland conservation, regulation, and management. The participation of the local bodies, NGO, communities has been ignored in this case. All the power related to enforcement of the rules, acts, regulations, and implementation has been given to the State Wetland Authority.

- The draft did not mention the timespan required for the identification and selection of wetlands. As mentioned in the earlier notification, the state government shall prepare within a year of the commencement of rules (Nagarajan, 2016; India Environment Portal, 2016).

- The coastal areas that were overlooked in the rules 2010, has been mentioned in the draft of the year 2016 for the management and conservation activities.

- The reclamation of wetlands and conversion of wetland areas to non-wetlands are mentioned only under the prohibited category. Other activities such as setting up of industries, disposal of solid and liquid wastages and permanent construction that are prohibited in the earlier notification of Rules, 2010 have been deleted in the new draft rules, 2016 (General Knowledge Today Blog, 2016). Only those activities are mentioned which contribute to the maintenance of ecological integrity.

- The new draft rule, 2016 doesn’t mention about the correspondent authority that is entitled to give prior permission for the approval of these kind of activities in the wetland areas. The list of activities that needs prior permission from the state government is mentioned in the earlier rules, 2010.

- The new rules have omitted certain wetland areas that were covered in the earlier rules, for example, the UNESCO heritage world site and high altitude wetland areas have been overlooked and certainly omitted.

- The right to appeal against the rules, that have given in earlier rules, are also omitted in the new draft.
2.5.2.9 Wetlands (Conservation and Management) Rules, 2017: Wetlands (Conservation and Management) Rules, 2017 was introduced by the MOEF & CC on 26 September 2017, which worked under the Environment Protection Act, 1986. This act replaces the Central Wetland Authority with the State or Union Territory Level Authority. At the national level, a working committee has been established. The committee has the power of recommendation and advises the government for suitable policies and programs for the management and conservation of areas by promoting ‘wise use of wetland’ and ‘zone of influence’. ‘Wise use of wetland’ delineates the conservation of wetland ecosystem, with sustainable development and ‘zone of influence’ focuses on the list of activities operating in the catchment zone of wetland areas. The notified list covers the central, state, union territories and Ramsar listed wetlands. This rule shall not be applied over the wetland areas that are covered under any other act like the Wildlife Protection Act 1972, India Forest Act 1927, Forest (Conservation) Act 1980 and Coastal Regulation Zone Notification 2011 as it creates confusion regarding the coverage of wetland areas under this rule, because many Ramsar sites are covered under the Wildlife Protection Act 1972 and so on. According to this, the list of wetlands will be prepared within three months and notification within six months. According to the Conservation and Management Rules 2017, the demarcation of wetland boundary and zone of influence is necessary with the notification of Wetlands within a year.

2.5.2.10 National Water Mission (NWM): National Water Mission is one of the subdivisions of the National Action Plan for Climate Change (NAPCC). The basic objective of National Water Mission is “conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management”. The open accessibility of water resource data and impact of climate change over the water resources in public field, conservation, and management of water through stakeholders’ participation, concentrating on the overexploited or the most vulnerable areas, has three major goals (out of fives) under the NWM. The NWM wetland mainly focuses on the conservation of water bodies excluding the wetland areas with the active participation of state, local bodies, and stakeholders. It also gives an idea as to how the public scheme is used for
the conservation of water bodies; for instance, the participation of a local stakeholder under the Mahatma Gandhi National Rural Employment Guarantee Act (MANREGA) scheme for the conservation and management of water.

The identification and inventory of wetland areas with ‘unique features’ are covered and aimed as the first goal of NWM i.e. accessibility of all data in the public domain. The third goal of the National Water Mission includes the conservation and management of wetland areas and “focused attention on vulnerable areas including over-exploited areas”. According to NAPCC, formulation and implementation of a regulatory system to ensure wise use of wetland areas at the national, the state and district level, environmental impact assessment of development project over the wetland areas and the relation between the afforestation and wetland areas are the major or highlighted areas. But, there are no recommended strategies under the NWM (National Water Mission, 2011). Water is one of the most important elements of wetland areas, but it seems that the conservation and management of wetland areas are not properly understood by the Ministry of Water Resources. NWM mentions the fact that the management and conservation of wetland areas are controlled by the Ministry of Environment and Forest in their existing schemes or programs (National Water Mission, 2011). Water is an essential part of the wetland ecosystem that affects all other wetland ecosystems. But, sadly, wetlands have no space in the National Water Policy of India which is mainly concerned about the provision and issues on the availability of water to all human beings rather the proper management of water bodies includes wetland areas (Ministry of Water Resources (MoWR), 2002, Ministry of Water Resources (MoWR), 2012).

2.5.2.11 Eco-sensitive zone: The Eco-sensitive zones are defined as transitional zones from areas of highly protected areas to non-protected areas. The National Board for Wildlife takes decisions about the declaration of eco-sensitive zones around the National Park and Wildlife Sanctuaries. The decision or discussion on the eco-sensitive zones is discussed in the 21st meeting of National Board for Wildlife under the theme of Wildlife Conservation Strategy 2002. It was decided that “lands falling within the 10km of boundaries of National Parks and Wildlife Sanctuaries should be notified as eco-fragile zones under the section 3 (V) of the Environmental (Protection) Act and
Rule Sub (VIII) & (X) of the Environmental (Protection) Rules”. A letter was moved by the Additional Director General of Forests on 6th February 2002 to all the chief wardens of the state and the union territories. The same states have raised a concern regarding the impact on eco-sensitive areas due to various developmental activities. So, the proposal about the formation of an eco-sensitive has been re-examined in the second meeting of the Indian Board for Wildlife that was held on 17th March 2005 and decided that the “delineation of eco-sensitive zones would have to be site specific and relate to regulation, rather than prohibition, of specific activities”. The decision was circulated among all state governments for compliance vide letter dated 27th March 2005, to which they waited for a reply in vain.

Then, a writ petition no. 460/2004 was filed by the Goa Foundation in the Hon’ble Supreme Court with the concern of eco-sensitive zones. On 4th December 2006, the Hon’ble Supreme Court decided that the period of 4 weeks should be given to all the states and union territories to send a proposal to the Ministry of Environmental and Forests. But, the proposal was moved by only six states namely Haryana, Gujarat, Mizoram, Meghalaya, Assam and Goa, and the remaining states didn’t forward the proposal. In this context, a writ has been filed by the Shri Anand Arya and Anr Vs. Union of India about the non-declaration of the eco-sensitive zone around the protected areas in Uttar Pradesh and the Hon’ble Supreme Court gave them the decision and approval for the construction of a park near the Okhla Bird Sanctuary.

As a result of which, MoEF had set up a committee under the chairmanship of Shri Pronab Sen for identifying the parameters for an ecologically sensitive zone. The extension of ecosystem varies from area to area on the basis of the requirement for that specific area. The inventory for different land use pattern is necessary around or within 10 kms of the protected areas in order to avoid the negative impact on protected species and habitat areas. Therefore, a committee has been formed, comprising of the wildlife warden of the concerned area, an official from the respective states/union territories, an official from the revenue department of the area concerned. The suggestions of which could be the following:
In reference to protected areas, as to how much areas have been declared under the eco-sensitive zones.

The relative needs of the areas that also acts as a shock absorber.

To propose the finest techniques for the management of eco-sensitive zones.

To recommend broad-based thematic activities to be included in the Master Plan of the region.

The final notification for the creation of an eco-sensitive zone around the protected areas such as National Parks, Wildlife Sanctuaries has been issued on 9th February 2011, by Shri Prakriti Srivastava (deputy inspector general (WL)), to all states/union territories with necessary guidelines that are to be followed.

Activities that are allowed in the eco-sensitive zones may be of three types, i.e., prohibited, regulated and permitted. The list of activities is discussed in the following table:

**Table 2.2: List of activities permitted, regulated and prohibited under the Eco-sensitive zones**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Activity</th>
<th>Prohibited</th>
<th>Regulated</th>
<th>Permitted</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Commercial Mining</td>
<td>Y</td>
<td></td>
<td></td>
<td>Regulation will not prohibit the digging of the earth for construction or repair of houses and for the manufacture of country tiles or bricks for housing for personal consumption</td>
</tr>
<tr>
<td>2.</td>
<td>Felling of tree</td>
<td></td>
<td>Y</td>
<td></td>
<td>With permission from the appropriate authority</td>
</tr>
<tr>
<td>3.</td>
<td>Setting of sawmills</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Setting of industries causing pollution (water, air, soil and noise etc.)</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establishment of hotels and resorts</td>
<td>Y</td>
<td>As per the approved master plan, which takes care of habitats allowing no restriction on movement of wild animals</td>
<td></td>
<td></td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>6.</td>
<td>Commercial use of firewood</td>
<td>Y</td>
<td>For hotels and other business-related establishment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Drastic change in agricultural systems</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8.</td>
<td>Commercial use of natural water resources including ground water harvesting</td>
<td>Y</td>
<td>As per approved master plan, which takes care of habitats allowing no restriction on movement of wild animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Establishment of major hydroelectric projects</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Erection of electrical cables</td>
<td>Y</td>
<td>Promote underground cabling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Ongoing agriculture and horticulture practices by local communities</td>
<td>Y</td>
<td>However, excessive expansion of some of these activities should be regulated as per the master plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Rainwater harvesting</td>
<td>Y</td>
<td>Should be actively promoted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Fencing of premises of hotels and lodges</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Organic farming</td>
<td>Y</td>
<td>Should be actively promoted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Use of polythene bags by shopkeepers</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Use of renewable energy sources</td>
<td>Y</td>
<td>Should be actively promoted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Activity Description</td>
<td>Code</td>
<td>Notes</td>
<td></td>
<td></td>
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<td>------</td>
<td>---------------------------------------------------------------------------------------</td>
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<tr>
<td>17.</td>
<td>Widening of roads</td>
<td>Y</td>
<td>This should be done with the proper environmental impact assessment (EIA) and mitigation measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Movement of vehicular traffic at night</td>
<td>Y</td>
<td>For commercial purpose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Introduction of exotic species</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Use or production of any hazardous substances</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Understanding activities related to tourism like over-flying the National Park area by any aircraft, hot-air balloons</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Protection of hill slopes and river banks</td>
<td>Y</td>
<td>As per the master plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Discharge of effluents and solid waste in natural water bodies or terrestrial areas</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Air and vehicular pollution</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Sign boards and hoardings</td>
<td>Y</td>
<td>As per the master plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Adoption of green technology for all activities</td>
<td>Y</td>
<td>Should be actively promoted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ministry of Environment and Forests, 2011

a) The precise description and mark of physical boundaries delineating actual geographical conditions over the toposheets are to identify a potentially
qualifying eco-sensitive zone and identify the name and geographical coordination of the village that falls within the buffer zone.

b) An inventory of the existing legal status of rights, entitlements, privileges, and obligations of the local communities.

c) The detailed description of the endemic species, habitats, species, and richness in terms of their biodiversity importance. In addition to this, details regarding the cultural and aesthetic values and land-use pattern may be necessary.

d) The resources that are significant in an eco-sensitive zone from an economic and livelihood point of view.

e) An inventory of activities that are regulated, prohibited and permitted in an eco-sensitive zone.

f) A list of the protected areas for a declaration of an eco-sensitive zone.

The list of prohibited activities is well defined under the Eco-sensitive zone, which depends on the committee as to how they implement these rules and regulations. The inefficiency of the State and Union Territories is reflected in their lack of interest in the case of demarcation or sending off a proposal in regard with the creation of eco-sensitive zones around National Parks and Wildlife Sanctuaries. Though the letter for the demarcation of eco-sensitive zones was initiated in the year 2002, it was finalized in the year 2011. The final notification for eco-sensitive zones was successfully issued owing to the active participation of the public and the Public Interest Litigation in the Hon’ble Supreme Court of India. But there are still some states that have not submitted their proposal to the MoEF until the year 2011, which shows the state’s irresponsibility towards the serious issues of water, soil, and wildlife.

2.6 Local participation and their role in the management of wetlands: The significance of local participation has been accessed from its popularity, as maximum of the programs, policies and the plans are focused on the active participation of local stakeholders in the management and conservation of the wetland areas. The close relationship between the wetland areas and people, necessitates the participation of the local inhabitants for the conservation of surrounding areas as they are closely aware of the situations, problems, and way of management from several years (Badola et al., 2012). For example, the Keoladeo National park was initially managed by the
local people in the 18th century, as their livelihoods closely linked with the areas. The rights of the local people were withdrawn after the conversion of the area as a National Park in the year 1980 (Vijayan, 1991). Even when livestock is the main source for the livelihood of surrounding villages, people’s dependency of wetland areas dropped to only 5 percent after the declaration of areas as a National Park area (Azeez et al., 1992). The impact of the banning of livestock grazing has more impact on the lower income group than the middle and the higher income group. The banning of grazing of livestock is responsible for rapid growth of grasses that is responsible for fires in the sanctuary areas. Therefore, after knowing the role or importance of local people in the management of areas, permission for the limited livestock has been given for a limited season (Azeez et al., 1992).