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*President*  
**Prof. B. S. Murty**



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**PART II**

**SECTION OF  
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*President: Prof. B. K. Tiwari*

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# **99<sup>th</sup> Indian Science Congress**

**January 3-7, 2012, Bhubaneswar**

**I**

## **ABSTRACTS OF PRESIDENTIAL ADDRESS**

**Prof. B.K.Tiwari**

**PRESIDENTIAL ADDRESS**

**Institutional Arrangements for Preservation and Management of  
Community Forests of North-East India**

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**Abstract:** Most community forests in hill regions of north eastern India have been managed by the traditional local institutions for centuries and majority of these institutional mechanisms remain functional even today. Prevalence of high percentage of forest cover in the region outside government control provides ample evidence that traditional institutions are more or less effectively managing the community forests in the region. The study was conducted through a survey of secondary literature and field works using standard social science research methods in Mawkyndeng, Raliang, Mulum, Mawkhophet, Pyndeng, Mawlieh, Domjyrti, Jenggitchakgre, Sasatgre, Lengte, Rawpuichhip, Lawngtlai, Keitum, Mopungchuket, Longkhum, Monsenyimti, Longwa, Mon, Wakching, Enhulumi, Tetsumi and Lumami, villages inhabited by Khasi, Garo, Jaintia, Ao, Chakaseng, Konyak, Sumi, Lushai and Mizo, tribes of three hill states of the region viz., Meghalaya, Mizoram and Nagaland. Based on extensive survey the institutions involved in preservation and management of forests have been classified into three major types: traditional, quasi-traditional and modern. Traditional institutions with elaborate hierarchal structure are found mainly in the state of Meghalaya, quasi-traditional institutions, a blend of traditional administrative set up and modern institutions, are gaining ground in the state of Nagaland while modern institutions have almost replaced the traditional system of forest governance in the state of Mizoram. At least eleven types of community forests viz., group of village forest (*Law Raid*), village forest (*Law Shnong*), restricted forest, sacred forest, clan forest, cemetery forest, regeneration forest, bamboo forest, recreation forest, village reserved forest and medicinal plantation were recorded in the study villages of three states. The study concludes that the tribal people through experiential learning have developed an elaborate, functional and generally democratic system of forest governance that has contributed immensely towards preservation and management of forests and associated natural ecosystems in the hill regions of north eastern India. An analysis of the system suggests that several management lessons can be

learnt from the structural arrangement and functioning of these ever evolving and dynamic institutions.

**Key words:** Sustainable, natural resources, community, institution?

## **1. Introduction**

For generations, humans have relied on forests not only for their livelihoods, but also as an integral element in their cultural, spiritual and social systems. Whereas, nationalization of forests led to massive deforestation primarily for converting the forest land to other land uses.<sup>1</sup> In developing countries like Nepal, community forest management has emerged as the dominant approach, due to management failures of central governments<sup>2</sup>. Here the community forests have been established as a successful programme to improve the forest condition and livelihood of the people.<sup>3-5</sup> Similarly, the implementation of Joint Forest Management and decentralization of forest policies has been proven to be successful for conservation and management of community forests.

In northeast India, most of the forests are controlled by the communities. According to FSI (2009)<sup>6</sup>, the communities controlled about 88.16%, 93.5% and 31.35% in Meghalaya, Nagaland and Mizoram respectively.

In hill regions of northeast India community forests are conserved by the local people which in most cases is based on principal that provide space of extraction of goods for bonafide needs and also ensures continued existence of the forest resources for future.<sup>7</sup> There is a great variability in the management practices and these practices have evolved under different biophysical and cultural environments.<sup>8</sup> There is a general lack of scientific research on the forest management practices of traditional and tribal societies though few researches have been carried out on sacred groves, home gardens and agroforests.<sup>9-10</sup> Local people across several states of northeast India have taken initiative to protect and manage their forest resource. They have set up their own rules and regulations specific to the socio-political, economic environment of their villages, and their own institutions in which elements of their tradition is clearly reflected. Under customary law, these forests are classified into different types depending on their intended use. The pattern of ownership of community forest is also very complex and diverse.<sup>11-12</sup>

The study aimed to document the structure and functioning of local institutions

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involved in forest management in the state of Meghalaya, Mizoram and Nagaland. The study also aimed to analyse the typology of community forests in the region.

## 2. Materials and methods

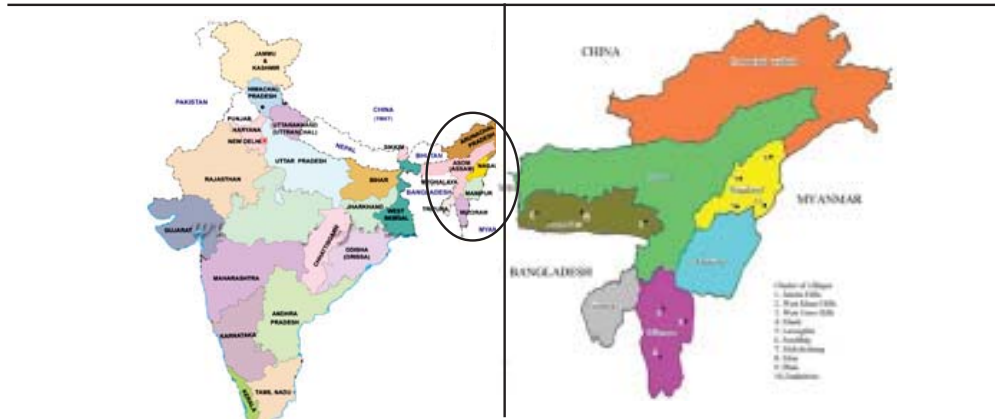
### 2.1. Study area

The Indian states of Meghalaya, Mizoram and Nagaland and part of north east India known for high ethnic and biological diversity, and is part of Indo-Burma hotspots<sup>13</sup>. The region is undulating and mountainous with average height varying from 1,000 m to 2,000 m above mean sea level. Maximum temperature is 30 °C in summer and minimum temperature is 5 °C in winter. The climate of the region is directly influenced by the South West monsoon and North Eastern winter winds. The region experiences tropical monsoonic climate that varies from Western to Eastern part of the plateau. The case study was conducted in ten clusters of villages in Meghalaya, Mizoram and Nagaland covering nine tribes, viz., *Khasi, Garo, Jaintia, Lushai, Mizo, Konyak, Ao, Chakesang and Sumi* (Table 1). In Meghalaya, nine villages were surveyed (namely, Mawkyndeng, Raliang Mulum, Mawkohphet, Pyndeng, Mawlieh, Domjyrti, Jenggitchakgre and Sasatgre). Similarly in Nagaland nine villages were selected viz., Mopungchuket, Longkhum, Monsenyimti, Longwa, Mon, Wakching, Enhulumi, Tetsumi and Lumami were surveyed. While in Mizoram, four villages viz., Lengte and Rawpuichhip, Lawngtlai and Keitum were selected for present study.

Table 1- Tribes and villages surveyed for primary data collection

State	Cluster	Tribe	District	Villages
Meghalaya	1	<i>Jaintia</i>	Jaintia Hills	Mawkyndeng, Raliang and Mulum
	2	<i>Khasi</i>	West Khasi Hills	Mawkohphet, Pyndeng, Mawlieh and Domjyrti
	3	<i>Garo</i>	West Garo Hills	Jenggitchakgre and Sasatgre
Mizoram	4	<i>Lushai</i>	Mamit	Lengte and Rawpuichhip
	5	<i>Mizo (Lai)</i>	Lawngtlai	Lawngtlai
	6	<i>Lushai</i>	Serchhip	Keitum
Nagaland	7	<i>Ao</i>	Mokokchung	Mopungchuket, Longkhum and Monsenyimti
	8	<i>Konyak</i>	Mon	Longwa, Mon, and Wakching

9	Chakesang	<i>Phek</i>	Enhulumi and Tetsumi
10	Sumi	<i>Zunheboto</i>	Lumami



**Fig.1 Location of the clusters of villages in Meghalaya, Mizoram and Nagaland**

## 2.2 Methods

In this study, primary and secondary data were used. An extensive survey of the available literatures on forest management types, local institutions involved in forest management in the states of Meghalaya, Mizoram and Nagaland were carried out. In Meghalaya three tribes were selected namely, Garo, Khasi and Jaintia. These three tribes are the principal of Meghalaya. Garos dominate the East Garo Hills, West Garo Hills and South Garo Hills districts, while the Khasis dominate the East Khasi Hills and West Khasi Hills districts. Similarly, the Jaintia tribes dominate the Jaintia Hills district. Jaintia along with Khasis, Wars, Pnars are known as Hynniewtrep. They are known by different names such as Syntengs, Jaintias and Pnars given to them by different anthropological authorities. Apart from the above listed, there are Lalung, Vaiphe, Viate and Hmass in the Jaintia hills.

In Mizoram two tribes viz., Mizo and Lushai were selected for the above study. Mizos are a close-knit society with no class distinction and no sexual discrimination. About 90% of them are cultivators and the village functions as a large family. Previously the

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village and the clan formed units of Mizo society. Birth, marriage, and death in the village are important occasions and the whole village would typically become involved. The Mizos are mainly an agricultural people. Jhum cultivation is the traditional form of agriculture that is practiced. The Lushai, being one of the major tribes of the Mizo people, influenced neighbouring, smaller tribes, such as the Lai/Pawih, the Ralte, the Hmar, the Paite and the Rangte/Gangte. Presently all the ethnic Mizo and Lushai people are Christian. The major Christian denominations are Presbyterian, Baptist Church of Mizoram, Salvation Army, Seventh-day Adventist, Roman Catholic and Pentecostal.

Correspondingly, in Nagaland, four tribes were selected namely, Ao, Konyak, Chakesang and Sumi. The main territory of Ao tribe is Tsula (Dikhu) Valley in the east to Tsurang (Disai) Valley (in the West) in Mokokchung District. Chakesang is also one of the major tribes in Nagaland. The word Chakesang comprise of three tribes, cha - Chakri, Khe - Khezha, Sang- Sangtam. Most of the villages of this tribe fall under the Phek District and Pfutero, Chozuba sub-division of Nagaland. Likewise, the Sumis tribe (also known as 'warrior tribe') mostly inhabits central and southern regions of Nagaland; Zunheboto is the district of the Sumis however, they also live Dimapur, Kohima, Mokokchung and Tuensang district.

The primary data was collected from 10 districts inhabited by the above described 9 major tribes spread over 22 villages. Interviews were also held with officials of State Forest Department, Autonomous District Councils and Traditional Heads. Various participatory research tools viz., PRA exercises, group discussion and interaction with the head of the selected households through questionnaires were used for collection of data. The interview scheduled with the villagers comprised of forest type, management, institution involved in management and ownership. The household survey was administered to a random sample of minimum 30 households in each cluster.

### **3. Results**

The institutional arrangement in north-east India differs from one ethnic tribe to another; sometimes, even within the same tribal community from one region to the other depending upon local bio-physical setting and socio-economic condition of the people. The structure and functioning of the institutions are given below in 3.1.1 to 3.1.9.



### 3.1.1 Traditional Institutions of in *Khasi* community (Meghalaya)

A typical traditional institution in the Khasi community constitutes the *Hima* which falls under the control of the *Syiem*. The *Syiem* is the head of the state (i.e. *Hima*) and looks after the administration. The head of the village council is known as Rangboh, Sardar or *Myntri Shnong* (village headman). He supervises the welfare of the villagers. Law and order is enforced and handled by the *Myntri shnong*. The *Kur* (clan) has its own authority and functions within the clan's affair, regarding matters, which may concern the village. The clan has its jurisdictions in areas where families belonging to the particular clan reside in the village. All internal affairs of the clan are looked after and controlled by the head of the clan (*Kni Kur/Kmie kur*) and the elders. The *Ing* (Family base) comes under the *Kur* where the father plays a very important role (Fig.2).

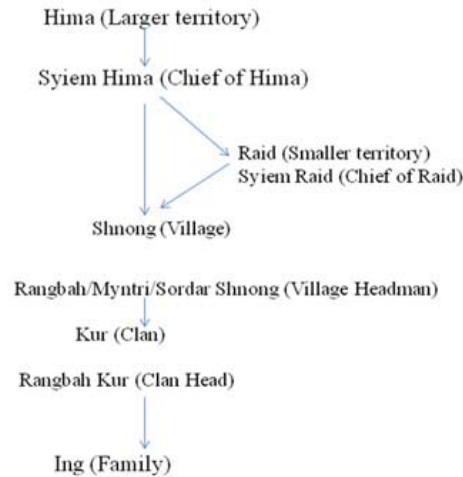


Fig.2. Structure of a typical traditional institution in Khasi Hills, Meghalaya.

### 3.1.2 Traditional Institution of *Garo* community (Meghalaya)

The land in Garo hills belongs to the clan known as A'king land and is under the custody of a female head-the *Nokma*. The husband of *Nokma* acts on her behalf in all the clan decision-making.<sup>14</sup> The *Nokma* has no authority to take decisions on the land and its

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use, which are made collectively by the clan representatives (*Chra*). The *Chra* consists of her maternal uncle and brothers. The *Nokma* has no power of selling any part of the territory to another village or man without the permission of the respective *Maharis* in the village.<sup>15</sup> The institution of *Mahari* consists of the members closely related through common motherhood and collectively responsible for the conduct and security of the members and protection of the family property. The structure of a typical traditional institution that exists in Garo Hills is depicted in Fig. 3.



Fig.3. Structure of a typical traditional institution in Garo Hills, Meghalaya

### 3.1.3 Traditional Institution in Jaintia community (Meghalaya)

In Jaintia hills, the villages clustered around a particular area are recognized as the component of a single political entity known as the 'Elaka ' (province). The Chief of the Elaka is called 'Doloi'. *Doloi* are elected from the senior members of a particular clan for the rest of his life and the rule is strictly followed. The *Doloi* can be removed from his office by his people, for his misrule or corruption. *Doloi* are assisted by the *U Basan* (mean elder) which is also elected for life term. The number of *Basan* depends on the size of the Elaka. The aggregation of *Elaka* which differs in sizes formed the Jaintia *Syiemship* (kingship). The chief of the Jaintia *Syiemship* is known as *Raja* (King). There is a difference between the administration of the *Raja* and the administration of the *Doloi* in Jaintia Hills. *Doloi*

represents the people of his respective *Elaka* in the Raja's Durbar. This traditional political system of governance still continues to exist till date except for the kingship which does not exist anymore. Jaintia Hills was originally known in the local parlance as '*Ka Ri Khadar Dolo*' (The Land of the Twelve Tribal Chiefs). Because in those ancient days, Jaintia Hills was ruled by the twelve Dolois who had their own *Elaka*, boundaries, power to govern and a sizeable population. The structure of a typical traditional institution of Jaintia Hills is depicted in Fig. 4.



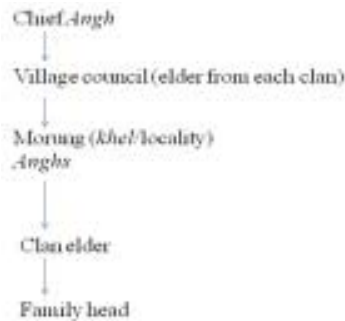
**Fig.4. Structure of a typical traditional institution in Jaintia Hills, Meghalaya.**

### **3.1.4. Traditional institution in the Konyak community (Nagaland)**

Konyak community in Mon district, situated in northern part of Nagaland, also called the land of *Anghs*. Under the Chief *Angh*, each village has smaller *Anghs* who are responsible to rule and protect their villages. Villages also have village councils, formed by village elders, who represent the various clans and *khels* (sectors). In every village the land is owned by the Chief *Angh*. However, *Morung/Khel* or clan also owns certain part of land/forest called "Wan" within which number of individually owned plots may exist. *Morungs* can also be considered as a branch office of the village administration. Certain rules and regulations related to the welfare of the people are tackled by the *Morung* authority. Every *Morung* also make rules to protect the forest of their respective *Khels*. The Chief *Angh* and his Councils appoints *Anghs* in every *morung*. In case of any disputes concerning the

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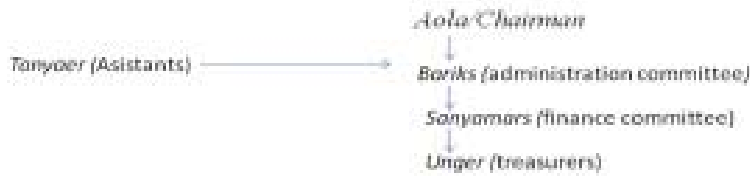
ownership of land, forest, rivers or other such properties among the clans it is first tried among the clan. If the problem cannot be solved among their respective clans, the case is taken to the 'baan' court (*Khel*) and lastly if it cannot be solved at 'baan' level it is taken to the village court where the final judgment is passed by the Angh. However during our study in Wakching village it was noted that even though the *Angh* is a member of Village Council he does not have the power to give final judgment as in other villages of Mon district, the final judgment is passed by the village council.



**Fig. 5. Structure of a typical traditional institution in Konyak community of Mon district of Nagaland.**

**3.1.5. Traditional institution in the Ao community (Nagaland)**

In the traditional village institutions of the Ao community, the '*Putu Menden*' functions as a village council. The *Putu Menden* represents the different clans of the village and rules over the village state republic for 30 years, until the next generation takes over. *Putu Menden* is the traditional village council of elders which is empowered for internal administration, resource management, agriculture, external diplomatic relationships, security and general welfare of all community members. These members comprises of *Bariks* and *Sanyamar* representing one member from each clan. *Sanyamar* is the finance management committee and they do all works that deals with financial matter. Clan members select one *Unger* who acts as treasurer. *Bariks* and *Unger* specifically carry the responsibility of village administration, formulation of village policy in relation to other villages and most of all adjudication in matters of dispute and litigation. *Tanyaer* are the assistants who are selected by their respective *Bariks* to carry out necessary works.



**Fig. 6: Structure of Putu Mendem of Ao community**

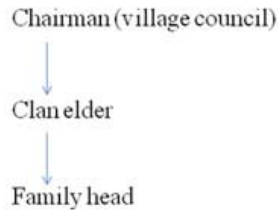
The function and structure of the 'Putu mendem' vary from village to village but with similar norm and structural framework. In Monsenyimti village of Mokokchung district, the Aola is the Head. This set up also comprises of Pangsang (young soldier like), *Mapangers* (persons who help in transferring informations) and Sanphor (Party responsible to take action). Today all the matters relating to control and regulation of the forest resources lies with the Aola the village chairman (Fig. 7). Similarly in Longkhum village, the Aola (eldest head) also called as Sami headed the governance along with the *Tatem* (elder from each clan) and Tekong (party responsible for enforcing order and collection of fine and taxes) (Fig. 8).



Fig 8: Structure of traditional institution in Longkhum village      Fig 7: Structure of traditional institutions in Monsenyimti village

### 3.1.6 Traditional institution in the Chakesang community (Nagaland)

Traditionally the village priest/Mewu was the head and everything was done under his guidance and approval in Chakesang community. Today the village council is responsible in taking care and implementing laws and regulations in the village, headed by the village council chairman and its members.



**Fig. 9. Structure of traditional institution in Chakesang community**

### 3.1.7 Traditional institution in the Sumi community (Nagaland)

The Sumi Naga tribe has a traditional hereditary chiefship (Akukao) system. Akukao is succeeded by his eldest son. The chief (Akukao) owns and controls the land and its resources. The powers of the chief are confined to the village territory without interference from the other chief. Unlike the Konyak chief the Sumi chief have no subordinate chief under him. He allots land to the landless for cultivation. He also received free services from the villagers. The Chocomi (council members) are influential individual chosen by the chief himself from each clan to assist him in the governance of the village. The opinions of the chief have precedence over the elected members of the village council. In some cases the chief are made chairman of the village council. 'Gaon Buras' are village elders nominated by the Village Councils. The number of "gaon buras" in a village depends on the total population and number of localities or khels. Gaon Buras are nowadays becoming more important in governance and administrative system of the villages.

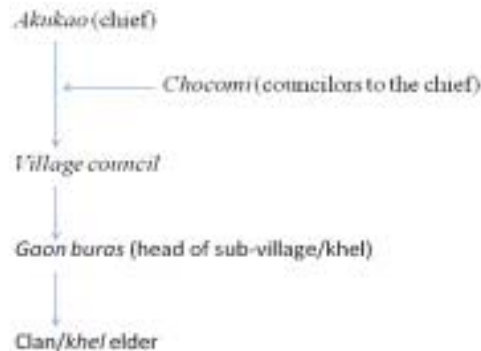


Fig. 10. Structure of traditional institution in Sumi community

### 3.1.8 Traditional institution in Mizo community

In Mizoram, forest management was under the administration of 'chieftainship'. Here the chief had absolute decision-making powers. The Chief (Lal) was the supreme head of the Village Council. Below the Chief were the Khawnbawls or the Counsellors selected by the chief. Under the Act of 1956, the Chief was made the Chairman of the Village Authority without any other discretionary powers. Even the benefits he was entitled to in the past such as free voluntary services from his subjects were withdrawn. Other important official of village government was the Val Upa (youth commander). The Val Upa operated through the organization of Zawlbuk (Bachelor' Dormitory) by imparting strict discipline and vigorous

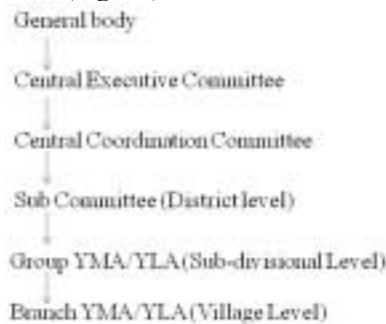
training in the art of tribal warfare and defense to male youth (Fig. 11). This institution no longer exists in any part of Mizoram.



**Fig.11. Structure of typical Traditional institution in Mizoram**

### 3.1.9 Modern institutions of Mizoram Young Mizo Association (YMA) and Young Lai Association (YLA)

The institutional arrangement as of today in Mizoram is embedded within Young Mizo Association (YMA), Young Lai Association (YLA) and the village council. The YMA and YLA are the modern form of the *Val Upas*, the part of earlier traditional institutions. These institutions exist in most of the villages to lead and commands the youths in certain social activities. Due to the fact that people have dependence on multiple resources derived from forest, common land and private land, the village institutional arrangements do have an important role and relevance. YMA branches take the initiatives for creation and conservation of forests with the support of the village councils. Young Lai Association (YLA) has taken the responsibility of community forests management in collaboration with the village council in Lai Autonomous District Council. The basic institutional arrangement of YMA and YLA is almost similar (Fig. 12).



**Fig. 12. Structure of institutional arrangement of YMA and YLA**

### 3.2 Forest typology

Twelve types of community conserved forest were recorded in the villages surveyed in the study. The structure and composition of community forest differ a great deal. A brief description of different forest types is given below.

#### 3.2.1. Group of village forest (Paid forest) of Meghalaya

This type of forest is found in the clusters 1 and 2 in the state of Meghalaya. The forests are jointly owned by a group of contiguous villages. The area under this type of forest is generally large and stretches from one village to another. These forests are managed by a council comprising the head of the group of villages (*Syiem Raid or Sordar* in the khasi community and *Doloi* in Jaintia community) as chairman and the headmen of all the villages within the territory (Raid).

#### 3.2.2 Village forest

Village forests were found in all the villages selected for the study. They are called by different name in different tribes (Table 2). The forest cover of this type of forest is in the range of 20-70 ha. In most villages, collection of timber and NTFPs such as fuelwood is restricted to personal use only and not for commercial purposes. Some villages have more than one village forest. In these cases, the village council has the responsibility to ensure sustainability of the forests. In most of the village forests tree can be felled for construction of houses and other community uses with prior permission from the village councils or institutional head like the Angh (Konyak), Aola (Ao), Doloi (Jaintia) of the community.

#### 3.2.3. Restricted forest

The forest type is found in cluster 2. *Locally called* as Law Adong, it either under the control of a particular village or under the control of a *Raid* (group of villages). This category of forests is similar to village forest in terms of their overall management. The only difference is in the degree of protection, where forests are given a higher degree of protection, and access to forest resources is restricted. They are usually small and are reserved particularly for the poorer families in the village and for some occasional needs by the village as a whole. Extraction of timber and fuelwood is usually restricted from such type of forest, but no restrictions on collection and extraction of mushrooms, edible fruits and vegetables if done without affecting the health of the forests. At Mawkohphet village these forests are managed by the Myntri Shnong (village elders) with the help of village Durbar (village council).



Table 2- Forest typology and its management

Activities	1	2	3	4	5	6	7	8	9	10	11	12
Local name	Raid forest	Village forest	Restricted forest	Sacred forest	Clan forest	Private forest	Cemetery forest	Regeneration forest	Bamboo Reserve	Recreation Forestry	Reserve Forest	Medicinal Plantation
	Law raid (kh), Khlooi raid (J)	Law shnong (kh), Khlooi chnong (J), Songni borung(G) Ewulu (C); Arem (A)	Law adong (kh)	Law kyntang (kh), Khlooi U Blai (J); Asong kasi (G)	Law kur (kh), Khlooi kur (J); Khei forest (Ko); Senuwu (C); Kidong Lu- Arem (Ao)	Law Rikynti (Kh); Ewu (C); Nijalu- Arem (Ao); Mimal ram (M);	Law balang (kh)  Khlooi Balang (J)	Champpe. A (G)	Wa. Grin (G)	Intihlinna (M)	Ngaw Hak (M)	Dandawi (M)
Size (ha)	35-50	20-70	4-10	1-100	5-20	0.4-5	1-30	3-5	10-15	10	5-10	50
Management	Group of villages council	Village council	Village council	Village council	Clan council	Private	Church	Village council	Village council	Village council/YM A	Village council/YMA	YMA/YLA
Degree of protection	Low	Low	High	Very high	Very Low	Very low	High	Very high	Low	High	High	Very High
Access to the forest resources	All	All	Prior permission	None	Clan members	Individual owner	All	None	All	None	Prior permission	Prior permission
Shifting cultivation	Allowed	Allowed	Prohibited	Prohibited	Allowed	Allowed	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Collection of timbers	Allowed	Allowed	Prohibited	Prohibited	Allowed	Allowed	Prohibited	Prohibited	Allowed	Prohibited	Allowed	Prohibited
Collection of NTFPs	Allowed	Allowed	Allowed	Prohibited	Allowed	Allowed	Allow	Prohibited	Allowed	Prohibited	Allowed	Prohibited
Collection of fuelwood	Allowed	Allowed	Prohibited	Prohibited	Allowed	Allowed	Prohibited	Prohibited	Allowed	prohibited	Allowed	Prohibited
Hunting	Prohibited	Prohibited	Prohibited	Prohibited	Allowed	Allowed	Allowed	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Grazing	Allowed	Allowed	Prohibited	Prohibited	Allowed	Allowed	Prohibited	Prohibited	Allowed	Prohibited	Prohibited	Prohibited

A=Ao, C=Chakesang, Kh=Khasi, Ko=Konyak, J=Jaintia, G=Garo, M=Mizo.

### 3.2.4 Sacred forests/groves

These forests, which may belong to individuals, clans or communities, are set aside for religious purposes. It was found in all three clusters of Meghalaya and is called as *Khloo U Blai*, *law Kyntang* and *Asong kusi* in Jaintia, Khasi and Garo respectively. They are managed by religious head or persons to whom the religious ceremonies for the particular locality or village are entrusted in accordance with customary practice (e.g. *Lyngdoh* in Khasi and *Doloi* in Jaintia). Sacred forests are mostly primary forest and are well preserved, often in their pristine state and are rich in biodiversity. The size of sacred forests in the study areas varied from a grove of a few trees to more than 100 ha. According to the Forest Management Systems in Meghalaya project (Meghalaya Department of Forests and Environment),<sup>15</sup> the sacred groves covered an area of about 10 511.7 ha in Meghalaya. Tiwari et al.<sup>14</sup> reported that a sacred forest serves as homes to many medicinal and aromatic plants and also a repository of several endemic and endangered plants. There were instances of having sacred groves in Nagaland where people worshipped and kept those places untouched. People even practiced offering of animals and eggs as sacrifice to the spirits of the jungle, but with the change of beliefs and religion these are no more practiced.

### 3.2.5 Clan forest

These types of forest are found in clusters 1, 2, 8 and 9. At times, more than one clan inhabits a village and many of them own an area of forest. Some clans may own forests located outside their village. All members of the clan are entitled to get a share of the benefits which are derived from the use of these forests. The management of clan forests is the responsibility of the whole clan. Access to the forest and collection of forest products are permitted only for households belonging to the particular clan. In Domjyrti village, clan forests belonging to clans *Jyrwa*, *Lyngdoh*, *Kharwar* and *Nongsiej* were recorded.

### 3.2.6 Private forests

Private forests are found in all the clusters. It is called locally by different name in different communities (Table 2). The forests are generally small in size, and owned by individuals scattered within the village boundary. In all the states selected for the study, these forests are predominantly used according to the requirement and wishes of the owner.

### **3.2.7 Cemetery forest**

These are basically church forests. The main purpose of these forests is for cremation of dead bodies. The cemetery forests are generally small in size of few hectares but the cemetery forest of Catholic Church in Mawkyndeng village of Jaintia Hills is about 30 ha. The Khasi and Jaintia communities called them *Law balang* and *Khloo balang* respectively. These cemetery forests are usually gifted by individual or clan to the church or bought by the Church. The particular church manages and regulates the use and access to the forest resources. People have free access to collection of non timber forest products.

### **3.2.8 Regeneration forest**

Regeneration forest were found only in cluster 3 and locally known as *Champe. a*. The regeneration forest is managed by the *Nokma*. Extraction of trees is not allowed from this forest.

### **3.2.9 Bamboo Reserve**

The bamboo reserve was recorded o in cluster 3 where Village Councils or *Nokma* manage this type of forests in Garo Hills of Meghalaya and YMA in Mamit district of Mizoram. The villagers have full access to the bamboo reserve and collect the bamboos for bonafide needs for example for constructing houses and temporary sheds.

### **3.2.10 Recreation Forest**

Recreation Forests were seen in Mizoram. The YMA is taking a leading role for conservation and maintenance of such forests. Rawpuichhip Village (cluster 5) the recreation forestry and is presently conserving a land of about 10 hectares. No trees or other forest resources are allowed to be extracted from this type of forest.

### **3.2.11 Village reserved forest**

This type of forest was seen in Mizoram. The Reserved forests maintained by the villages in each case are reserved by the locality and is not legally or statutorily reserved by the Government. Most of these are converts of earst while safety and supply forest. These forests are completely under the control of village authorities. In each Village, the main purpose of the reservation of this forest is retaining of green cover under environmental

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benefit. Extractions of goods are strictly prohibited. The Lengte Village reserved forest is under the authority of the Young Mizo Association (YMA) branch of Lengte village. The Community Reserved Forest of Keitum Village is under the authority of the Village Council, however, the management rests with the YMA. The Young Lai Association (YLA) Branch, Lawngtlai AOC Veng (Lawngtlai District) manages the YLA Reserve forest of the village.

**3.2.12 Medicinal Plantation:**

The Central Young Mizo Association (CYMA) has established two Medicinal plantations of 50 Ha each; at cluster 5 and 7 for in-situ Conservation of Medicinal Plants as well as ex-situ conservation. It may be noted that Medicinal Plantation mentioned above are solely owned and created by the Central Young Mizo Association, hence, the people living in the proximity of the plantation neither ownership nor access these resources.

**Discussion:**

The hill regions of north east India, predominantly inhabited by the tribal communities, have a long tradition of community based forest management. The traditional forest management practices vary from one community to the other, even within the same community sometimes it varies from village to village. For maintaining the sustainability of the forest resource, the non-timber forest products like bamboo shoots, medicinal plants are not allowed to be exploited for commercial purpose in all the community owned forest. Timber logging, fishing and hunting are prohibited by the village council, except in case of raid forest of cluster 1 and cluster 2 where shifting cultivation is allowed for poor people with permission of the village durbar. Collection for timber is also allowed for domestic uses with prior permission in raid forest and village forest. The sacred forest get highest degree of protection, since no activity of any type is allowed in this type of forest (Table 2). This management practices have been in existence for many centuries and certainly long before the introduction of modern forest management to India in 1876.16

It is observed that rules and regulations for the management of community forest depend on cultural, social, traditional characteristics as well as resource availability of the site. This type of management and control of forest resources by the community have also been reported from Nepal. In this case, the watchman or patrol groups (Shingo Naua) were appointed for protection of the forests and control access for collection and cutting of firewood

and fodder, and for livestock grazing, according to the rules set up by the forest user group committee.17-19

Based on the survey results, the local institutions involved in forest conservations may be grouped into three types viz., Traditional (Khasi, Jaintia and Garo community), Quasi-traditional (Sumi, Ao and Konyak community) and Modern institutions (Mizo and Chakesang community).

**1. Traditional institutions:** Management of community forests by traditional institutions is prevalent in Meghalaya. The Khasi, Garo and Jaintia tribe of Meghalaya have a tradition of conservation which one passed on from generation to generation in the form of beliefs and customs. Maintenance of sacred forests and restricted forests has been invogue since time immemorial.<sup>20</sup> It is found that traditional management practices of these forests has not only helped in conserving the resource as evident from the presence of large patches of well protected forests (for example 700 ha village protected forest in Pynursla) and ensuring its sustainable use but also has been a source of common good and 'safety net' for the communities.<sup>9</sup> More than one category of forest has been recorded within the boundary of a single village. Over time, these communities have evolved a system of combining forest conservation and sustainable use at a micro level<sup>21</sup>, unlike much of national and international efforts which are aimed at meeting these requirements at national or global scales.

**2. Quasi-traditional:** This type of institutions is observed in parts of Nagaland. Here the traditional institutions have been merged with modern institutions in order to facilitate the fund flow and introduce modern techniques. The traditional heads viz., Aola, Angh and Akukao of Ao, Konyak and Sumi community respectively function along with the village council at present and sometime the traditional heads are made the chairman of the village council. The position and power of the traditional heads have been transferred to the village council. It was observed that the Konyak community of Mon district, the Angh (eldest head) has the authority to take the final decisions like in Mon village while in Wakching village even though the Angh is a member of Village Council he does not have the power to give final judgment as in other villages. Thus at times the traditional institution power and roles have been transferred to modern institutions like village council as in Nagaland while the heads of traditional institutions and village elders have been made chairman or members of the councils.

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**3. Modern institutes:** Involvement of modern institution in forest conservations was noted in Mizoram (YMA and YLA) and part of Nagaland (Chakesang community). With the abolition of chieftainship in Mizoram, respective village councils were authorized to allot land that was subsequently verified by the state Land Revenue Department. Under the Village Council administration the community reserved forests were gradually encroached and exploited upon by the people and the village council created under the district council was helpless to protect the forest. This has led to the involvement of the YMA/YLA in protection and conservation of forests by joining hands with the village councils. These non-government organizations have powerful influence on the Mizo society. The YMA has taken a leading role in the conservation and maintenance of forests resources in Mizoram. The village reserved forests were found to be under the authority of the YMA in the village of Langte and Keitum. It was found in the study village that the YMA also took a leading role in creation of medicinal plantation and recreation forests.

Similarly, the Mewu (village priest) of Chakesang community of Phek district, previously was the head and all works and programmes were approved by him, however today this has been replaced by the village council. A 600 years old community reserved forest in Tetsumi village of Phek district is found to be preserved by the traditional institutions with involvement of modern institution like village council.

After analyzing the governance system of the communities, it is observed that the Sumi and Konyak governing system are autocratic in nature with the traditional head Akukao and Angh still have the final say even now in decision making process of the villages. Whatever the chief says becomes law in the case of the Sumi. But in some Konyak villages (Wakching) the Angh even though, he is a member of Village Council he does not have the power to give final judgment as in other villages. Whereas the chiefs of Mizo (Lal) and Chakesang (Mevu) communities who were also autocratic in functioning but now they have been replaced by the village council system which is democratic in nature. While in the case of Meghalaya, all the three communities viz., Khasi, Jaintia and Garo are democratic in nature right from the prehistoric age. The Khasi and Jaintia especially are very popular for their democratic form of durbar which is practiced till today. Women were not allowed previously to take part but, with the changing environment, some durbars allow them to take part. In some village the people have made women organization for providing space for their participation in decision making process. The traditional heads like the Doloi, Sordar,

Syiem and Rangbah shnong even though they are powerful and influential in the society they derive their power came from the durbar. The durbar can sack them if they feel that they did not work for the welfare of the village or society.

The role of traditional institution in conservation and protection of forests in the hill regions of northeast India is commendable. Most forest biodiversity in the state of Meghalaya, Mizoram and Nagaland are housed in the community conserved forests on the extent of government managed forest is very limited. Indigenous people have defended forests and biodiversity under threat in virtually all parts of the world.<sup>22</sup> It was found that the forests in the study villages are mostly managed by the traditional communities where as in the rest of the country and other part of the world forests are owned by the state and the state policy do not favour the community participation in state owned forests. So the local communities have little interest in conserving or managing them.<sup>23-26</sup> The decline of traditional institutional arrangements and the breakdown of the community's collective stake in natural resources management in other part of the world have often led to degradation of forests.<sup>27-28</sup> For example, the rapid and growing deforestation rates in Indonesia are directly linked to violations of indigenous and other local people's rights.<sup>29</sup> In India too, Gokhale<sup>26</sup> reported that in Karnataka, during the erstwhile Mysore state, the community managed the forest and about 6% of the forest was under kans forest (sacred forest) but with the coming of the British the right of the people were curtailed and the forest were exploited for timber. So, many governments have introduced decentralized forest governance arrangements with a focus on collaborative or community management of forests to preserve the forest resources.<sup>30-32</sup>

## **Conclusion**

The traditional institutions differ from community to community and also within the same community: from one village to another. In Meghalaya these institutions have change, to accommodate the change in belief system of the people but the function and system of arrangement are still intact. In Mizoram, the traditional institutions have been replaced by the modern village councils created under the district council and the Young Mizo Association (YMA) and Young Lai Association (YLA). While in Nagaland some communities like that of Ao, Sumi and Konyak still have their traditional institutional arrangement intact with slight change in position and function of the traditional heads to accommodate the village council. These traditional institutions still guard and regulate the

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management interventions in these forests. In most villages people still respect and obey the traditional institutions of the village. These traditions are worth preserving as it helps in better performance in the conservation and management of the forests and its resources in the villages. Moreover, there is a need to make use of traditional forest knowledge evolved over generations by communities for sustainable forestry. The decision making system of several traditional communities are generally superior to modern institutions established under present dispensation of joint forest management.

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**II**

**ABSTRACTS OF  
PLATINUM JUBILEE LECTURE**



**PLATINUM JUBILEE LECTURE**

**Acetylcholinesterase Inhibition and Detection of  
Anticholinesterase Agents in Water Samples**

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**ABSTRACT**

It is a paradox that organophosphate pesticides which were propagated as the safest for the environment turned out to be equally deleterious as the organochlorines (OC) banned in the 1970s. Such events are closely related to social evolution of man and modernization of agricultural practices invariably accompanied by three forms of stress (eutrophic, exploitative and disruptive) to the natural homeostatic processes of conservation of the biosphere. In this context acetylcholinesterase is a very significant enzyme which has been addressed by environmental scientists for the last four decades. The organophosphates (OP) and carbamates (CA) were introduced globally as a fast track measure against the ills of the organochlorines such as DDT. The reason for complacency was the specific inhibition of acetylcholinesterase (AChE), the key enzyme of neural transmission which was the target for pest control. Eventually, as with all xenobiotics, there was an overload of OP and CA compounds in soil and water. This event posed genuine concern because this hyper concentration of OP and CA pesticides became as lethal as the banned OC compounds and migrated to non target organisms, fish and mammals including humans. The concern was not unfounded; the specificity of mode of action of the OP and CA pesticides was based on AChE inhibition; resultant uncontrolled and unremitting signaling led to convulsive death of the pests. All vertebrates being cholinergic also became the target of OP and CA contaminations.

Research on the possible effects of OP and CA compounds on the non target organisms, fish and mammals gained momentum and it has been amply documented that these deleterious compounds have both target (anti ChE) and non target actions (anti-

hormonal). The former was elicited by concomitant elevation of ACh and inhibition of AChE while the non neuronal effects were manifested as anti hormonal or endocrine disruptive actions in fish and mammals. These non target effects were later found to be more aggressive in physiological dysfunction and neural disturbance compounded the deleteriousness of the OP and CA agents. Debilitating endocrine functions were recorded in the thyroid, gonads, adrenals, pituitary and hypothalamus. The specter of OC compounds were minimized by the ban, but OP and CA compounds remained as agents of destruction in the environment.

Attention was drawn to the methods of detection of these anti cholinesterase agents where the role of the enzyme AChE became highly significant. The detection methods employed are highly sophisticated and also cost intensive. Initiatives were undertaken to utilize the AChE as a detection tool for which purpose it had to be immobilized. The immobilized acetylcholinesterase can then be used as an ENZYME SENSOR for the detection of organophosphates and carbamates in environmental water samples. At first the enzyme acetylcholinesterase (AChE) is purified from goat brain which is then immobilized by covalent binding to a polymer, polymaleinic anhydride. Immobilized enzymes are highly cost effective products which can be reused several times without losing the normal properties of the enzyme. With the immobilized goat brain AChE it has been possible to analyze the specific inhibition of immobilized Acetylcholinesterase activity by an organophosphate and a carbamate compound at the levels of femtogram (fg) and picogram (pg) level of contamination respectively. Contrastingly methods used to detect low level of pesticidal contamination in environmental water samples is by sophisticated equipments such as HPLC/ Gas chromatograph in highly sophisticated laboratories are highly cost intensive. Thus this facility cannot be offered to the everyday need of the agricultural sector, namely the farmers toiling in the fields and exposed chronically to the harmful agents. Consequently this large portion of the Indian population is exposed to toxic levels of OP and CA compounds. If the detection system of the ENZYME BIOSENSOR is commercialized the same may be used by the farmers in the field and in the agricultural households to have the knowledge that they are not using contaminated water for their daily chores and thereby remain informed of the level of contamination by anticholinesterase agents.

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**III**

**ABSTRACTS OF  
AWARD LECTURE /  
YOUNG SCIENTIST AWARD  
PROGRAMME**





***YOUNG SCIENTIST AWARD PROGRAMME LECTURE***

**TREATMENT AND STABILIZATION OF SOLUBLE Cr (VI) OF SODIUM  
DICHROMATE PLANT RESIDUE BY DOWN DRAFT SINTERING TECHNIQUE**

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**Key words:** Stabilization, hexavalent chromium, leaching study, dichromate plant residue, down draft sintering.

**ABSTRACT**

Enormous amount of dichromate sludge residue is generated during manufacture of sodium chromate. It contains appreciable amount of water leachable chromium to the extent of 2000ppm. The sintering treatment of the dichromate sludge residue material has been made in presence of additives such as fly ash, gypsum and coal to stabilize the soluble chromium in the residue by using down draft sintering technique. The sintering technique stabilizes 99.9% water soluble chromium (VI) and shows the water leachable chromium of 0.004ppm at pH 10.0. The leaching of chromium is very negligible even also after boiling in hot water.



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**IV**

**ABSTRACTS OF  
SYMPOSIUM / INVITED LECTURE**



**Co-ordinated action of macrophytes and microbes on  
bio-remediation of Industrial effluents**

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**Keywords:** Bioremediation, heavy metals, arsenic, chromium, iron

In West Bengal the industrial effluents generated from different types of industries may be from organized and unorganized sector, as a result of which the effluent generated may not follow the norms stipulated by the State Pollution Control Board. This mostly occurs in rural and semi-rural background. These effluents are generated into the surrounding eco-system containing the different types of flora and fauna. The effluents are acted upon by a host of macrophytes and microbes growing in the vicinity. Two such case studies include the tannery effluents discharged in the lentic eco-systems containing hexavalent chromium and the suspended airborne particulate containing compounds of iron and lead. In addition to these cases of pollutants, there may be the geologic problem associated with arsenic contamination of the ground water in the form of arsenate. In the first case, the aquatic macrophyte like Pistia and Lemna act as effective bioremediating agents, effectively tolerating up to 10 ppm of Cr concentration. Moreover the colonization and stabilization of the aquatic bacteria Bacillus cereus provide effective rhizofiltration. The problem in the second case is more composite in nature and was tackled by roadside weed plants, which provide additional adsorptive surface. The soil borne and water borne species of Bacillus can also act as effective bio-accumulator of iron and lead which relieves the ecosystem from the excess load of heavy metals. This has a positive effect on the soil borne microbes and fertility and water contamination or biomagnifications. It can be shown statically that which species of bacteria and macrophyte can be effective bio-remediator. The arsenic contamination in the vast tract of lower Bengal is a well known menace and can be effectively reduced by versatile microbes like species of Bacillus and Pseudomonas, The actual identity of all these bacteria can be identified by 16S r RNA technique and used as artificial consortium to minimize the arsenic contamination of the drinking water or even in the treatment of the

industrial sludge. Conclusively it may be said that the mother nature has all the tools necessary for combating the increased threat of pollution, only we need identify them and apply them in the proper perspective.

**Sub-Section: Environmental Management & Socio-Economic  
Analysing population Dynamics of Invasive Species -an approach towards  
Bioresource management**

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**Key Words:** Invasive species, matrix models, population structure and dynamics, conservation programme, bioresources.

**ABSTRACT**

Invasive species represent the second greatest threat to bioresources after habitat loss, and their impacts are increasing worldwide with the rise of globalization. Once established, they can cause irreparable ecological harm and can threaten human health and food security. India's commitment to the Convention on Biological Diversity demands for a comprehensive assessment of invasion issues. Hence for management of bioresources, we must determine priorities and appropriate management techniques to solve these complex and increasingly pervasive issues.

Matrix population models that integrate population dynamics and population structure are a powerful tool for investigating population dynamics. It has also been long known that age specific effects have a profound influence on overall population dynamics. The species *Parthenium hysterophorus* L, *Tridax procumbens* L., *Bidens pilosa* L., *Amaranthus spinosus* L., *Portulaca oleracea* L. and *Euphorbia hirta* L. important were selected for population dynamics study. These species are reported to cause colossal loss of bioresources. The constructed models helped in furthering our understanding of population dynamics, helped in predicting the population level of cropping, projected future population growth and differentiated age specific characteristics. It is believed that such study may not only help in invasive species monitoring and their control programme but also help in better management of bioresources and guide their conservation programme

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**Sub-Section: Agriculture, Energy & Geology**  
**Salicylic acid signaling in plants under stress: an environmental  
issue for sustainable crop management**

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**Key words:** Environment, Geno3D, Rice, Salicylic acid

**ABSTRACT**

Rice is a universal crop that needs reduction in cultivation land but enhanced crop yield. Exogenous application of 50 $\mu$ M SA to rice grown for 5-20 days resulted in elevated root/shoot level of antioxidants at day 15. The knowledge of *Oryza sativa* genome can be exploited to produce pathogen resistant rice varieties for environmental stress management. Here we report the genes of SA signaling from *Arabidopsis* and their protein products with structure prediction of corresponding gene sequences in rice. Seven proteins from *A. thaliana* and *O. sativa* were modeled using Geno3D. Structure superimposition had 70-80% similarity with RMSD>1.7 suggesting similar SA signaling function of rice sequences as that in *Arabidopsis*.



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*Abstracts of Symposium/Invited Lectures*

**Sub-Section: Agriculture, Energy & Geology**  
**Environmental Impacts Due to Use of**  
**Organic Wastes in Agriculture**

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Organic waste is produced wherever there is human habitation. The main forms of organic waste are household food waste, agricultural waste, human and animal waste. Organic recycling is vital for supplementing plant nutrients and maintenance of soil fertility, a key factor in crop yields. India has vast potential of organic waste resources. Presently, most of the solid refuse is disposed off in low-lying areas without taking proper precautions. This is observed to result in breeding of rodents, flies and other domestic pests and also tends to pollute the surface as well as ground waters. Once the ground water source gets polluted the effect may persist for decades or even centuries.

The reclamation of surface water is easier than reclamation of ground water; hence prevention of ground water pollution due to open refuse dumps is very important. Continuous use of fresh wastes on agricultural land for cultivation of crops may result in the pollution of soil. It is evident that, soil incorporation of urban solid wastes (USW) appears to be attractive proposition but requires a careful evaluation of the possible effects on soil and plants. There is a vast potential to recycle the nutrients contained in USW provided care is exercised to closely monitor the hazards like accumulation of salts, sodium, toxic heavy metals and biological pollutants. Most of the potential problems associated with USW application on land can be avoided by judicious management through proper selection of wastes, soils and crops and proper reliance on soil and soil plant testing.

The addition of sewage sludge to soil provides a useful source for supply of plant nutrients, especially N and P and also organic matter, which improves soil physical properties. However, sewage sludge is enriched by heavy metal contents, such as Zn, Mn, Cd, Pb and

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Cr which can be toxic to animals and humans when applied above certain limits. Sewage sludge usually contained a wide range of trace elements depending on their sources, and may exist in potentially toxic levels. Among the potential toxic elements Zn, Cu and Ni are essential to plant but become phyto-toxic in excess. Cadmium Pb and chromium Cr are considered as non- essential for plant growth, but they are of primary concern because of their potential hazards to animals and humans through plant accumulation.

Nutrients in an ecosystem recycle through soil organisms, plants, and grazing livestock. Appropriate management can enhance the nutrient cycle, increase productivity, and reduce costs. Rising levels of gases in the Earth's atmosphere have the potential to cause changes in our climate. Some of these emission increases can be traced directly to organic wastes. The disposal and treatment of waste can produce emissions of several greenhouse gases (GHGs), which contribute to global climate change. The most significant GHG gas produced from waste is methane. It is released during the breakdown of organic matter in landfills. Other forms of waste disposal also produce GHGs but these are mainly in the form of carbon dioxide. The annual contribution to global methane budget from Indian rice paddies is less than 4 Tg and not 37 Tg as was propagated by the western agencies. CO<sub>2</sub> equivalent emissions from agriculture have also been quantified. These estimates helped Indian policy makers greatly in their negotiations on global climate change. The possible strategies for mitigating methane and nitrous oxide emissions from agriculture have also been identified.

The problem of waste disposal on the land must be evaluated by historical evidence, which indicate that animal as well as properly treated municipal wastes can be utilized at rates required for optimum crop growth with a minimum of pathogen and chemical hazard. Waste should be applied on the basis of crop fertility requirements and / or water needs, whichever is less. This will keep the pathogen and metal burden rates minimal.

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**Sub-Section: Climate change Plant Mediated Greenhouse Gas,  
Nitrous Oxide Emission from Wheat Agriculture**

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**Keywords:** Nitrous oxide, wheat, transpiration, stomatal frequency, photosynthates

**ABSTRACT**

Experiments were conducted on four varieties of wheat namely Sonalika, HUW 468, HUW 234 and DBW 14 grown in alluvial soils of North Bank Plain Zone of Assam to identify important factors associated with regulation of N<sub>2</sub>O transport through the plant system. N<sub>2</sub>O fluxes from wheat varieties ranged from 40µg N<sub>2</sub>O-N m<sup>-2</sup> h<sup>-1</sup> to 295µg N<sub>2</sub>O-N m<sup>-2</sup> h<sup>-1</sup>. Leaf area, tiller number, rate of leaf transpiration and stomatal frequency of leaf and leaf sheath, were found to bear significant relationship with N<sub>2</sub>O emission. Significant differences in seasonal integrated N<sub>2</sub>O flux or E<sub>sif</sub> (ranging from 3.25 to 3.81 kg N<sub>2</sub>O-N h<sup>-1</sup>) were recorded within the varieties. High N<sub>2</sub>O emitting cultivars had comparatively lower yields than the low emitting ones primarily because of the ability of the low emitting varieties to partition greater amount of photosynthates towards the developing grains.

**Sub-Section: Environmental Management & Socio- Economic  
Corelation of Flouride with other Parameter of Physico-chemical Studies of  
Daltonganj Block Area, Palamau District, Jharkhand to identify Fluorosis  
Affected Areas and its Impact on Environment**

**K. K. Tiwary, R.R. JHA, A. K. Shrivastva and S. Mishra**

*P. G .Department of Chemistry,*

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**ABSTRACT**

Physico-chemical studies of ground water samples both from bore wells and dug wells of daltonganj block areas of Palamau district of Jharkhand have been carried out for

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various parameters in general and that of fluoride concentration in particular in pre-monsoon season of 2009. Though, generally ground water of both types of wells are of good quality in certain areas it is confronted with slightly high concentration of fluoride causing dental fluorosis among children. In dug well fluoride concentration in 7 samples area bit higher side while in bore wells too, 7 samples are on higher and rest 7 within lower limit. The other variables so far analysed are within permissible limit of WHO for portable water in both types of wells samples. The variation observed in Table I and 2 in various parameters are due to its geogenic origin, of the various parameters and also of the nature of depth of wells of different places in the study area.

**Sub-Section: Environmental Pollution & Waste Management**  
**Fluorosis endemicity in some areas of**  
**Bihar- concern and Mitigation Measures**

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**Key words:** Natural fluoridation of ground water, physical deformities, fluorosis endemicity in Bihar, mitigation measures, low cost domestic defluoridator using brick chips, collaborative work with Institute of Fundamental Studies, Sri Lanka

**ABSTRACT**

Fluoride can reach human body through natural sources-water and soil and also through food stuffs, toothpaste and even air. However drinking water extracted from ground water aquifers is the most common source of fluoride intake. India is among 25 nations in world where fluoride contaminated ground water is creating health problems. Nearly 66 million people including 6 million children below the age of 14 years in 20 states of our country including Bihar are affected with dental, skeletal and non-skeletal fluorosis due to intake of fluoride contaminated drinking and cooking water. In Bihar 4157 habitations spread over 98 blocks in 11 districts have been found to have visible cases of fluorosis in large number of the population due to high fluoride level in the drinking water sources.

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The present socio-scientific study reports an extensive health survey and systematic physicochemical analysis of different drinking water sources in fluoride endemic areas of Gaya and Nawadah districts of Bihar.

A team of researchers led by two authors have been working on a model of low cost domestic defluoridators using brick chips. These defluoridators are low-cost, easy to fabricate and handle and easy to procure the filter material (ie brick chips) which are locally available everywhere in abundance. Moreover, it is convenient to dispose of and replace the filter material by beneficiaries themselves, most of whom are illiterate villagers. Research work on this type of defluoridator is being carried out in Sri Lanka under the guidance and supervision of Institute of Fundamental Studies, Kandy, Sri Lanka. About 3000 defluoridators are presently being used by villagers in fluorosis endemic rural areas of that country.

A team of researchers including the two authors and Mr. Kumar Karamvir a P.G. student of Env. Sciences, A.N. College, Patna, on the invitation of the Institute of Fundamental studies, Kandy, Sri Lanka, visited there from 10th to 16th July 2011 and interacted with the team members working on mitigation of fluorosis in that country. The team members also visited a number of fluorosis endemic villages and interacted with the beneficiaries there.

The salient features of the results of study and also the measures which have been taken to mitigate fluorosis in the study areas will be presented. The presentation will also include the first hand experience which the authors gained during their visit to Sri Lanka, the suggestions which have been placed before the Public Health Engineering Department (P.H.E.D), Govt. of Bihar with regards to effective and long lasting mitigation measures against fluorosis and the possible collaborative research work on mitigation of fluorosis with the Institute of Fundamental Studies, Sri Lanka.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**A potential source of food from red algae found in the**  
**Rivers of Manipur, North-East India**

**M. Romeo Singh<sup>1</sup> and Asha Gupta<sup>2</sup>**

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**Key words:** Nutrient, Lemanea, minerals, Rhodophyta, freshwater, Manipur

**ABSTRACT**

Lemanea is a filamentous fresh water red algae belonging to Rhodophyta. It is consumed and extensively harvested by the local people of Manipur (Latitude 23.80° N to 25.68° N and Longitude 93.03° E to 94.78° E) a state in the north-east of India bordering Myanmar. People have been using it since times immemorial in the form of dried, fried, roasted and as local delicacy because of the fishy smell, taste and flavor it possesses. The alga grows during cold winter months (December to February) in the rivers of Manipur with disjunct distribution on rocks, boulders, cobbles, bricks, sandstones etc. The proximate composition, ash, protein, lipid, carbohydrate, total free amino acid, crude fiber, carotenoid and mineral profile of five species of Lemanea from four rivers of Manipur northeast India were studied. The species studied were Lemanea australis, Lemanea torulosa, Lemanea fluviatilis, Lemanea mamillosa and Lemanea catenata . It was found that the ash content lies within the range (7.90-30.45%DW), Crude fibre (0.79-3.03%DW), Total protein content was found to highest by L. fluviatilis (31.07% DW) and lowest by L. mamillosa (17.48% DW) on dry weight (DW) basis. Maximum carbohydrate content was found to exhibit the highest value by L. australis from site-II (38.20% DW) and lowest in L. mamillosa from site-IV (9.60% DW). Free amino acid was highest in L. fluviatilis of site-IV (17.20% DW) and lowest in L. mamillosa (9.60% DW) of site-V. Carotenoid content was reported to be maximum by L. australis from site-I (0.65 mg g-1FW) and minimum by L. catenata from site-VI (0.56 mg g-1FW) on fresh weight (FW) basis. The algae were found to contain nutrients in the ranged as N 111.48±0.44-226.28±0.37, P 72.42±0.33 -150.71±0.25, K 363.05±0.50 - 1003.20±0.39, Ca 111.59±0.42 - 113.76±0.50, Mg 70.87±0.41-135.65±0.17,

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Fe  $16.95 \pm 0.34$  -  $26.18 \pm 0.35$ , Mn  $5.26 \pm 0.48$  -  $20.34 \pm 0.22$ , Zn  $1.22 \pm 0.44$  -  $5.25 \pm 0.41$ , Cu  $8.23 \pm 0.43$  -  $13.09 \pm 0.41$ , Co  $7.98 \pm 0.37$  -  $10.74 \pm 0.19$  mg 100g-1 DW and Na/K  $0.18 \pm 0.73$  -  $1.31 \pm 0.50$ . It was found that the algae contain rich source of protein, carbohydrate, lipid and minerals like K, Ca Fe, Co and low value of Na/K ratio. The investigation provides support for utilizing this fresh water red alga as food supplement for use in human nutrition, with cautions for its indiscriminate exploitation.

**Sub-Section: Ecology, ecosystem & Biodiversity  
Environment and wetland Conservation**

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**Key words:** Wetland, conservation, environment, pollutants.

**ABSTRACT**

Wetlands cover at least six per cent of the earth and have become a focal issue for conservation due to the 'ecosystem services' they provide. More than three billion people, about half the world's population, obtain their basic water needs from inland freshwater wetlands. Also, the preservation of wetlands is essential in land use planning. Wetlands contribute to the social, economic and environmental health of people. Wetlands filter pollutants and conserve nutrients and sediments from rainfall and urban storm water runoff. The wetlands purify water and provides habitat for fish, water fawl, and animals. Wetlands also help in reducing occurrence and intensity of floods.

**Sub-Section: Environmental Management & Socio-Economic  
Environmental conservation through religion: Some success stories from  
Indian Himalayan region**

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**Key words:** Badrivan, kail Bakriya van, land/forest rehabilitation, biodiversity conservation, religion, Indian Himalayan region.

**ABSTRACT**

Continued degradation of land and biological diversity in the Indian Himalayan region is of serious concern in spite of a number of R&D interventions. One of the basic reasons for ineffectiveness of the interventions adopted for degraded land/forest rehabilitation and biodiversity conservation could be non-integration of sacred/cultural and scientific values in their approach and strategy. Keeping the above in mind, an innovative programme under the name of 'Badrivan Restoration Programme' was launched by the Institute (GBPIHED) at Badrinath (Uttarakhand) from September 1993 to November 2001, which resulted in successful revival of Badrivan (the ancient sacred forest of Badrinath shrine) at Badrinath. As a follow-up of this programme, another programme entitled 'Sacred Forest Programme' was launched at Lohaghat (Uttarkhand) w.e.f. August 2004, which has now resulted in the establishment of a sacred forest 'Kail Bakriya van' with the involvement of various stakeholders. Above-mentioned two success stories clearly demonstrated the value of adopting 'cultural/religious approach' for reforesting degraded lands and biodiversity conservation, and also illustrated the importance of blending science and religion for the protection of environment and conservation of natural resources.



**The natural resources - biodiversity conservation**

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**Key words:** Natural Resources, renewable-non renewable, Natural resource management, conservation, biodiversity

The natural resources are two types, renewable and non renewable. Renewable resources are generally Biotic resources which can renew themselves .Non-renewable resources are abiotic which cannot be re-made or re-grown.It is essential to conserve these natural resources as they are finite. A conservation management system is a procedure for maintaining a species or habitat in a particular state and are vital for sustainable development. Conservation management involves the control of environmental and socioeconomic factors in order and to maintain the capacity of ecosystems, to renew and grow.

Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a focus on how management affects the quality of life for both present and future generations. Natural resource management deals with land use planning, water management, biodiversity conservation,

Integrated natural resource management (INRM) is a process of managing natural resources in a systematic way, which includes multiple aspects of natural resource use. There are various computer models developed to assist natural resource management.

Geographic Information Systems (GIS): GIS is a powerful analytical tool as it is capable of overlaying datasets to identify

**Biodiversity Conservation:** The biodiversity conservation is an important element in natural resource management. Biodiversity is a description of the extent of natural diversity.

**Precautionary Biodiversity Management:** The threats on biodiversity include biological resources; forest deterioration and deforestation; the invasion of "alien species" and climate change

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There are 4 methods to manage the precaution of biodiversity in natural resources management, they are 1. Ecosystem based Management 2. Adaptive management 3. Environmental impact assessment 4. Protectionist approaches.

**Sub-Section: Climate change  
Environmental Modeling, Predictions and Impacts:  
Climate Change and Health Effects**

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**Keywords:** Environmental modeling, Seasonal climate prediction, Ecosystem, Fish population, Climate Change, Health Effects

**ABSTRACT**

Climate is changing in many ways. Global mean temperatures have been rising steadily over the last 40 years, with the six warmest years since 1860 occurring in the last decade. In the U.S. most of the observed warming has occurred in the West and in Alaska. However, there are regional variations in the signature of climate change, with warming in the western U.S. but little or no annual temperature change in the southeast U.S. in recent decades. Evidence for warming is also observed in seasonal changes with earlier springs, longer frost free periods and longer growing seasons, and shifts in natural habitats and in migratory patterns of birds. The Gulf of Mexico region is prone to severe weather events throughout the year and is affected due to environmental changes over the coastal regions (ex. flooding and sea breeze circulations, tropical cyclones/hurricanes, ENSO etc.). Understanding, modeling and predicting weather/climate dynamics and meteorological coastal processes for the Gulf region is important for agriculture, fisheries and forestry management as this region is of interest for the country's economy and social aspects. Our goal is to investigate the seasonal patterns of meteorological parameters in order to predict their impacts on ecosystem and fish populations over the Grand Bay National Estuarine Research Reserve (GBNER) area using the Penn State/NCAR Mesoscale Model (MM5). In the present study, the MM5 version 3 Weather/Environmental model was run using data assimilation techniques where non-conventional data from various sources are fed into the model as initial and lateral boundary conditions to simulate seasonal variations of surface

features and precipitation. Other simulation parameters include sea surface temperature, sea level pressure and surface wind magnitude. The climatic and seasonal fluctuations of these parameters have important implications for the GBNERR ecosystem. We also investigate the aspects to address the increased mortality and other serious health effects of the cardiovascular diseases and lower respiratory diseases affected by water and air pollution. Air pollution of particulate matter PM 2.5 data were obtained from Environmental Protection Agency (EPA) and Mississippi Department of Environmental Quality (MDEQ), and the data for cardiovascular heart diseases and lower respiratory diseases were obtained from the Mississippi Department of Health for the period 1998-2009. After correlating the data with the effects of health, the results showed that mainly Hinds County has suffered serious health effects due to air pollution. One will then search for the deeper relationship of lower respiratory diseases and cardiovascular diseases with environmental pollution. The results will reveal essential facts that will help aide our society in developing a safer, cleaner environment.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Patterns of plant diversity and community attributes across the vegetational landscape of north-eastern Uttar Pradesh. India**

**R.P. Shukla and A.K. Yadav**

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**Key words:** Community features, Disturbance, Diversity patterns, Physiognomic groups, Vegetation.

**ABSTRACT**

The terrestrial vegetation of north-eastern Uttar Pradesh was categorized into broad physiognomic groups- the grassland, old-fields wasteland and forest, and the pattern of species diversity and other features of various terrestrial communities across the landscape of north-eastern U.P were analysed. The regional grassland vegetation was most species-rich (375) followed by forest (281), wasteland (175) and old-field (111) in that order. Grassland shared a good number of species (55) with the old-field than it did with wasteland community (45). The wasteland or edge community was very close to forest community as

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evident from the extent of species sharing (124). About 30% of the grassland and old-field species exhibited aggregation which ranged from visual local dominance to extensive mat. The aggregation of most of the species owed to en mass seed germination but a few perennials also showed ramet proliferations. About 13% species showed localized and rare occurrences; viz. *Bacopa monneiri*, *Rauvolfia serpentina* and *Tribulus terrestris*.

The plantation forests of *Shorea robusta* and a few other tree species were analyzed to compare the plant diversity patterns of plantation forests with mixed natural growth forests along the disturbance gradients. The Disturbance Index (DI) was developed to measure diversity indices in relation to disturbance level. The increase in the number of woody species including climbers was more spectacular towards the core of the regional forest vegetation. The IVI of the two undertrees, *Mallotus philippensis* and *Clerodendrum infortunatum*, steadily increased in stands towards periphery. Other shrubs dominated those forest stands which faced intermediate disturbance. The value of diversity index (H) was maximum for mixed forests and near maximum for sal stands at intermediate disturbance level. The sal-dominated communities could sustain much greater diversity at considerably greater disturbance as compared to other plantation forests of the region. The H value, however, was quite lesser at low disturbance. Several species increased their ramet production with increase in disturbance level. The age structure and spatial pattern of ramet population were also correlated with the level of disturbance. In a forest environment, which is too stressful to allow regeneration through seed, a non-seed regeneration of a group of woody perennials may help maintain the minimal vegetation cover and considerable plant diversity.

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**Sub-Section: Environmental Pollution & Waste Management**

**Urban wastewater generation in India - Environmental repercussions and scope**

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**Key words:** urban wastewater, water scarcity, irrigation, reuses

**ABSTRACT**

Fresh water scarcity needs no introduction and the apprehension is more acute when one recognizes the severity of surface water pollution. In India, the problem is compounded everyday with increasing population with higher per capita income, urbanisation, industrial growth, demand for agricultural sectors. Urbanisation in India, since the beginning of last century, increased steadily and was rapid after independence. At present, total urban population in India is 377 million. Thus, the concomitant increased urban wastewater in which domestic part constitutes the largest portion (industrial wastewater volumes are smaller) pose the greatest threat to water supply sources- surface water and groundwater. It has been estimated that about 73 million working days are lost due to water related diseases. To treat all the wastewater generated in India would cost around Rs 400000/- million which is difficult for a country like India and many other nations. The situation may not improve in near future with centralised treatment systems constrained not only by financial burden, but also technical hitches are there. To handle the situation, reclamation within agricultural system is a sustainable approach that demonstrates commitment in lowering off-site environmental impact and definitely holds strong conviction but reuse options for such wastewater in suitable niches nearer the generation points also calls for attention. According to WHO more than 10 % of the world's population consumes wastewater irrigated food. In India untreated wastewater (and treated) use in peri-urban areas is a common practice risking the health of farmers' and consumers both, soil quality, surface and ground water quality. Nonetheless, the wastewater has a tremendous scope not only in saving fresh water resources but also contributing in increased agricultural productivity and livelihoods of farmers in peri-urban areas.

**Sub-Section: Environmental Management & Socio-Economic  
Endocrine Disruptors and Obesity -White adipose tissue as target organ**

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**ABSTRACT**

Obesity is a multifactorial disorder affecting millions worldwide, predisposing long-term pathophysiological changes (micro- and/or macro-vascular complications) and degenerative diseases. It is of major global concern, attributed to changes in life style, food habits and environmental factors. Scientific evidence suggests that developmental exposure to environmental hormone-mimetics may affect many health problems including obesity, diabetes, cancer, cardiovascular complications etc. Recently, studies have shown that exposure to Endocrine-Disrupting Chemicals (EDCs), as one of the major etiological factor for the development of obesity in both humans and animals, and the rising epidemic of obesity during the past 40 years (NIH) support for the rapid increase of the environmental burden of chemical toxins.

EDCs are compounds that mimic or interfere with the normal actions of all endocrine hormones including estrogens, androgens, thyroid, hypothalamic and pituitary hormones. EDCs are lipophilic, resistant to metabolism, and/or able to bioconcentrate up the food chain and are of major concern regarding the health related issues. Natural EDCs such as phytoestrogens are weak in eliciting their antagonistic effects and synthetic organic compounds such as diphenyl ether, diethylstilbestrol, the plasticizer bisphenol A, heavy metals, solvents, pesticides, phthalates, dioxins, polychlorinated biphenyls (PCBs), and butyltins are potent and demonstrate toxicity, documented mostly using model systems and cell cultures.

White adipose tissue (WAT) is the central fat tissue involved in obesity and data suggests that EDCs become stored in body fats and can be transferred to the developing offspring via the placenta or via the egg (model systems). In-vitro, EDCs promote accelerated adipocyte differentiation probably via activation of endogenous ligands (estrogens) of nuclear transcriptional factor, or through their impact on retinoid receptors, or interaction with

Peroxisome proliferation activated receptors (PPARs). A considerable level of complexity and heterogeneity exist among the various adipose tissue depots. Subcutaneous and visceral adipose depots are the best characterized amongst the adipose depots, especially with respect to their contribution to disease/obesity leading to insulin resistance. EDCs could affect not only the physiological role of WAT, but also influence the development of obesity/associated diseases leading to secondary complications such as micro and macro vascular complications.

### **The natural resources - biodiversity conservation**

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**Key words:** Natural Resources, renewable-non renewable, Natural resource management, conservation, biodiversity

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**V**

**ABSTRACTS OF  
ORAL PRESENTATION**



**Sub-Section: Agriculture, Energy & Geology**  
**A Study on the Feasibility of the Piezoelectric Tree as an**  
**Energy Harvester in Rural India**

**Dhruba Jyoti Purkait\*, Tathagata Guha Mazumdar\*\*, Shrinwanti Banerjee#, Prof. Malay Gangopadhyaya ( Professor At Institute Of Engineering And Management)**

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*# Department of Electronics and Communication, Institute of Engineering and Management*

**Key words:** Rural electrification, energy harvesting, piezoelectricity, windspeed, piezoelectric tree.

**ABSTRACT**

The problem of rural electrification, especially in remote hamlets, is an acute one. In recent years, as grievances with centralized schemes has surfaced, the focus has shifted to decentralized- localized schemes of power generation as a fillip to centralized power distribution. In this study, electrical energy was harvested from wind induced mechanical vibration energy using a cross flow vibrating piezoelectric leaf consisting of a polymer leaf and a stalk with a film of robust and flexible piezoelectric material, in this case PVDF, clamped to it. The device is driven to oscillate like a leaf flapping in the wind. The device was tested in a wind speed range of 0-12 m/s to check its wind response and power generation capabilities. Changes in alignment, shape and size were made to the design of the leaf subsequently. It was seen that the best response was generated using an equilateral triangular polymer leaf clamped to a PVDF stalk that was aligned vertically to the direction of the wind. To study the practical feasibility of such a system, the piezoelectric leaf was studied at length over a period of two days in a typical rural village( Ramnagar, Malda District, West Bengal) The recorded wind speed range varied from 1.2m/s-10.1 m/s . The electric signal generated was rectified and stored in a capacitor. The voltage response varied between 4.2V-23V.

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Based on the study, additional theoretical improvements pertaining to reconfiguration of the leaf were proposed to deal with any sudden spike in wind speed. Moreover, a theoretical model of a commercially viable piezoelectric tree with several such vibrating elements was analyzed and several advantages of easy and cheap installation, operation and maintenance and wide scale rural usability due to a broad response band were noted.

### **Sub-Section: Agriculture, Energy & Geology**

An Innovative Frame Work for Water Resource Management

for Meeting the Future Energy Requirements

**B.Rajasekhar, J.santosh, T.Raghavendran, T.Ashish, Anil Neerukonda** *Inst of Tech and sciences, Unisys Global Services India-Bangalore, GMR Institute of Technology, Pydah College of Engineering, Vishakapatnam*

**Key words:** Water Resources Management Division, hydropower, social, economic, environmental and technical.

### **ABSTRACT**

The objective of the Water Resources Management Division is to administer various statutes as they relate to the allocation of water, stream alterations, protection of water supply areas, licensing of well drillers and other aspects of water resource management. Water Resources Management is the integrating concept for a number of water sub-sectors such as hydropower, water supply and sanitation, irrigation and drainage, and environment. An integrated water resources perspective ensures that social, economic, environmental and technical dimensions are taken into account in the management and development of water resources.

**Sub-Section: Agriculture, Energy & Geology**  
**Soil quality assessment under different soil management practices**

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**Key words:** Soil quality-physical indicators- chemical indicators- biological indicators-ecosystem functions

**ABSTRACT**

The present study aims to enhance the local knowledge concerning the best use of land and their management with the purpose of improving soil quality or health for sustainability of crop production in Kurnool district, India. In this connection, 15 soil samples were collected at KVK Yagantipalle and physical properties noted at field level. Samples were analyzed for pH, electrical conductivity (EC) organic Carbon available nitrogen, phosphorus and available potassium. Results indicate that surface soils varied from sandy clay loam to clay loam. Bulk density was high in soils of conventional farming (1.32 to 1.48 g/cm<sup>3</sup>) when compared to organic soil (1.02-1.06 g/cm<sup>3</sup>) and forest soil(0.80- 0.91 g/cm<sup>3</sup>) due to soil compaction by repeated tillage at same depth ,excess animal traffic ,Poor aggregation and low organic matter. The pH and EC were higher in conventionally cultivated soils as compared to organically cultivated soils and forested soils. Soil organic carbon (SOC) content of organic farming (0.82-1.06 %) and forest (1.52-1.87%) soils was high when compared to conventional farming (0.30-0.39 %). SOC is the most important constituent of the soil due to its capacity to affect plant growth as both a source of energy and a trigger for nutrient availability through mineralization. Soil available nitrogen, phosphorus and potassium contents were higher in conventional farming than organic and forest soils probably due to indiscriminate and excess usage of inorganic fertilizers. Earthworms were present in forest and organic farming soils only. No earthworms were observed in conventional farming due to excessive usage of chemical fertilizers and pesticides without addition of organic manures. From the results, it may be concluded that, soil and crop management practices that add or maintain soil carbon appear to be among the most important factors for restoring, maintaining, or improving soil quality. This includes utilizing reduced tillage, producing green manures or cover crops, applying supplemental animal or poultry manures or composted materials when available, and enhancing biological diversity to facilitate nutrient cycling and maintain soil structure.

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**Sub-Section: Agriculture, Energy & Geology**

Biological Pretreatment by *Trichoderma reesei* for fermentable  
sugar recovery from corn stover

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*Key words: biological pretreatment, fermentable sugar, cellulolytic fungi*

**ABSTRACT**

Alternative energy sources have become even more relevant, not only due to the continuous depletion of limited fossil fuel stock, but also for a safe and better environment. Lignocellulosic materials are an attractive feedstock for biofuel production due to their abundance, availability and relatively low cost. Pretreatment of naturally resistant cellulosic materials is essential to increase surface area, bulk density, remove hemicellulose, reduce cellulose crystallinity, and increase the porosity of the materials so as to make it accessible for hydrolysis. Three strains of cellulolytic fungi, *Trichoderma reesei* (NCIM 992, NCIM 1052 and NCIM 1186) were studied for their efficiency of sugar recovery from corn stover. *T. reesei* 1052 was found to be the best among three with 1.29 and 1.74 times more production of reducing sugar (614mg /g dry wt glucose) at 72 h in comparison to other strains which were found to be slow releasers and attained maximum at 240h. *T. reesei* 1052 was further analysed for biological treatment of corn stover and pretreated cornstover. There was an increase in the release of fermentable sugars, and was higher in the pretreated corn stover than the untreated corn stover. The pretreatment using microorganisms overcome the recalcitrance of lignocellulose, increase enzyme efficiency and improve the yields of monomeric sugars from corn stover which helps in subsequent hydrolysis and fermentation processes for ethanol production.

**Sub-Section: Agriculture, Energy & Geology**

An estimation of microbial count including nitrogen fixing bacteria in agricultural fields of Aligarh district irrigated with untreated sewage water

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**Key words:** Sewage irrigation, alluvial soil, microbial population, heavy metals.

**ABSTRACT**

In the peri-urban areas of India sewage water is a valuable resource for agricultural production. This study investigates of the impact of domestic and industrial sewage water irrigation on chemical and biological characteristics in alluvial soils of Aligarh district. Ten fields which were irrigated by only sewage water (SI), eight of which were partially irrigated by sewage water (PSI), and for the remaining two, the source of irrigation was tube well water and treated as control. The results indicate that the soil organic matter and CEC increased with sewage irrigation and duration of irrigation. There was a significant increase in the bacterial and fungal population and decrease in actinomycetes population in sewage irrigated soils are compared to control. The population density of bacteria and fungi in sewage irrigated soils increased with the duration of sewage irrigation. Soil organic matter was significantly positively correlated with soil bacterial and fungal population, and negatively correlated with actinomycetes. The results also showed that the number of asymbiotic nitrogen fixing bacteria decreased in presence of sewage water, while sewage water had no appreciable effect on sulfur-oxidizing bacteria. The total nitrogen content and total heavy metals concentration in SI were 2-2.4 times the control, while in PSI it was 1.5-1.6 times higher. The concentration of DTPA extractable heavy metals showed no difference between partial sewage irrigated and sewage irrigated soils, which may be due to deposition of heavy metals in crops grown on the soils.



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**Sub-Section: Agriculture, Energy & Geology**

**Pollution Caused Due to Coal and Blackstone Mining in Pakur (Jharkhand)**

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**Key words:** Biodiversity, black stone, extinction, flora and fauna.

**ABSTRACT**

Pakur is a small district in Santhal Pargana Division of Jharkhand is well known for its black stone mines as well as its coal deposits. It exists between 230 to 400 & 250 to 180 - north latitude and between 860 -280 and 870-570 east longitudes. It is surrounded by Sahibganj district in the north, Birbhum District of West Bengal in the south, Murshidabad & a part of Birbhum district of West Bengal in the east and Dumka & Godda Districts in the West.

There are more than 500 black stone mines in operation. After mining the black stones are transported to the neighboring states by heavy trucks and Railway wagons. The same is with coal. Coal is mined at Panum Coal mines, a private mine and is transported to nearby areas. The ongoing mining activities causing severe impact on local environment. Air, water and soil pollution are rampant due to mining activities. Diseases like tuberculosis and pneumoconiosis are very common in and around mining areas. Soil erosion and loss of local flora and fauna are also under threat. The present paper deals with the impact due to coal and black stone mining in the local environment.

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**Sub-Section: Climate Change  
Effect of Solar Influences on recent climate  
change and global warming**

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**Keywords:** Climate Change, Global warming, CMEs, 11-year Sunspot Cycle.

**ABSTRACT**

This paper addresses for climate change and global warming studies through space based and ground based observations. The impact of solar influences on global climate change in has been discussed. The Sun has a strong influence on climate. A comparison of Sun and climate over the past 1150 years found temperatures closely match solar activity as discussed by Usoskin in 2005. The Sun has both direct and indirect influences over the Earth's temperature, and we can evaluate whether these effects could be responsible for a significant amount of the recent global warming. Storms on the Sun, in the form of solar flares and coronal mass ejections (CMEs), can launch showers of radiations and powerful magnetic fields into interplanetary space. Weather on Earth is the set of ever-changing ambient conditions in our atmosphere. Its elements include temperature, air pressure, wind speed and direction, humidity, precipitation, and so on. Sunspots are huge magnetic storms that are seen as dark (cooler) areas on the Sun's surface. These spots may be of diameter 37000 km and appear as dark spots within the photosphere, the outermost layer of the Sun. The number of sunspots peaks every 11 years. There is a strong radial magnetic field within a sunspot and the direction of the field reverses in alternate years within the leading sunspots of a group. So the true sunspot cycle is 22 years. The number and size of sunspots show cyclical patterns, reaching a maximum about every 11, 22, 88 and 176 years. The solar activities vary with sunspot cycles. The measurements made with a solar telescope from 1976 to 1980 showed that during this period, as the number and size of sunspots increased, the Sun's surface cooled by about 6° K. Apparently, the sunspots prevented some of the Sun's energy from leaving its surface. However, these findings tend to contradict observations made on longer time scales. Over the past few hundred years, there has been a steady increase in the numbers of sunspots, at the time when the Earth has been getting warmer. The data

suggests solar activity is influencing the global climate causing the world to get warmer. Observations of the Sun during the middle of the Little Ice Age (1650-1750) indicated that very little Sunspot activity was occurring on the Sun's surface. The Little Ice Age was a time of a much cooler global climate and some scientists correlate this occurrence with a reduction in solar activity over a period of 88 or 176 years. Measurements have shown that these 88 and 176 year cycles influence the amplitude of the 11 year sunspot cycle. Incidentally, the Sporer, Maunder, and Dalton minima coincide with the colder periods of the Little Ice Age are explained through the greenhouse effect. This made us to link the influence of sunspots on the Earth's climate. .

### **Sub-Section: Climate Change**

#### **Evaluating the Potential of Bioghar to Increase Carbon Sequestration in Soil for Mitigating Climate Change**

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**Key words:** Biochar, C mineralization, soil carbon, pyrolysis temperature.

#### **ABSTRACT**

Increase in pyrolysis temperature from 400<sup>o</sup>C to 600<sup>o</sup>C increased the ash and fixed carbon content and widened the C:N of biochar prepared from different C3- (rice hull and wheat straw) and C4- (Mizestover and switchgrass) crop residues. In general increase in pyrolysis temperature made the biochar more resistant to decomposition in soil. The decomposition pattern of C3 and C4 biochar exhibited different trend and it was more so with soil type. The carbon sequestration biochar amended soil was more conspicuous in acidic (pH) Alfisol with less organic matter than the neutral (pH) Mollisol with higher organic matter. Overall, the biochar prepared from maize stover at 600<sup>o</sup>C holds greater promise for soil C sequestration.

**Sub-Section: Climate Change**  
**Optimum Utilization of the Solar Energy by Employing the Design of**  
**"Passive Solar Buildings" In the Building Construction**

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**Key words:** Solar energy, direct sunlight, Solarium,.

**ABSTRACT**

Passive Solar Energy Heating of Interior Air in a cold climate is extremely easy and inexpensive to implement. Passive Solar Energy Heating begins with vertical equator-side (south-facing) glass (or north-facing glass in the southern hemisphere). The winter sun is quite low often less than 30 degrees above the horizon in the winter. Direct sunlight easily penetrates vertical glass and can heat a room well above 80 degrees F, when it is below freezing outside.

When there is snow on the ground, the reflection of the low winter sun off of the snow significantly increases the Passive Solar Energy Heating effect, with reflected sunlight on your interior ceiling.

In the summer, the noonday sun is 47 degrees higher than in the winter. Place-based, location-specific overhangs are designed above the equator-side windows, so that no direct sunlight can enter the glass in the summer, when the sun rises in the northeast, is nearly straight overhead at noon, and then sets in the northwest. Understanding the precise seasonal path of the sun in your location is critical to effective passive solar energy heating, and passive solar energy cooling, especially in hot humid climates.

Roof-angled glass should always be avoided in all locations. Roof-angled glasses are a solar furnace when the summer sun is nearly straight over head. Most of low winter sunlight reflects off of roof angled glass due to the nearly-parallel "angle of incidence".

In the winter, warm air rises and the hottest air in the room touches your ceiling glass. This creates high heat transfer, large energy bills, due to the large temperature differential across the ceiling glass, which has low resistance to heat flow. Roof-angled

glass is like a thermal hole in your ceiling or roof.

Instead of having only one wall between your interior and the summer or winter outside temperature extremes, our Passive Solar Energy Homes have two layers of glass. The engineering principle is that two small temperature differentials produce much lower heat transfer than one large temperature differential as in the case of a traditional building with no Thermal Buffer Zone on any side. Passive Solar Energy Home, we generally design in a Solarium with a lot of protected vertical glass on the equator side of the thermal envelope. It is important that it be isolated from the interior (sleeping quarters) of the home. The Solarium then acts as a Thermal Buffer Zone- at moderate temperatures that are typically between interior and exterior temperature extremes. There is then a lot of interior glass that divides the Solarium or Greenhouse space from the interior of your home. Instead of having only one wall between your interior and outside temperature extremes, you have two layers of glass. The engineering principle is that two small temperature differentials produce much lower heat transfer than one large temperature differential.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Genetic variation of *Suaeda nudiflora* (Willd.) Moq. as evident by  
chromosome and RAPD markers**

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**Key words:** DNA polymorphism, RAPD markers, somatic chromosome *Suaeda nudiflora*.

**ABSTRACT**

Genetic variation of different ecotypes of mangrove associate *Suaeda nudiflora* was investigated through RAPD and chromosome analysis obtained from Bhitarkanika mangrove forest of Orissa. Somatic chromosome varied from  $2n=36, 40$  and  $54$  in different ecotypes. OPA-08, OPA-11, OPD-08 and OPN-04 primers showed marker bands ranged from 330bp to 2400bp that differentiate five ecotypes genetically. RAPD analysis showed

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two broad groups with Ecotype-I (Chandbali) and II (Rajnagar) forming a single sub cluster while ecotypes III (Dangmal), IV (Gupti), V (Khla) obtained from comparatively high saline area grouped together into another sub cluster. The probable mechanism of overcoming high salinity stress by maintaining polyploidy is suggested.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**A Status Survey of Asian Elephant (*Elephas maximus* Linn.) in Kuldiha Wild Life Sanctuary of Odisha**

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<sup>2</sup> A.K. Patra, Professor and Ex-HOD of Department of Zoology, Utkal University

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**Key words:** Survey, asian elephant, Kuldia, Odisha.

**ABSTRACT**

The bounty of floral and faunal wealth congregating in the bordering Chunk of Kuldiha reserve forest in Balasore district in Odisha provides it as "Kuldiha wild life sanctuary" vide notification number 243 dt.04.01.1984 of forest and environment department of Odisha. The sanctuary lies between 21°45' to 21°30' N latitude and 80°30' to 80°45' E longitude. It covers an area of 272.75 sq km. comprising three major reserved forests namely Kuldiha, Tenda and Devgiri.

This paper highlights a survey of Asian elephants in the said area along with its biodiversity. The sanctuary has a good no. of faunal species of amphibians, reptiles, birds, and mammals. It also houses as many as 290 nos. of floral species including 71 elephant fodder plants which belong to 37 families of 19 orders. Kuldia provides a wide range of micro-habitat which allows the wild elephants to avail their freedom for various ethological activities like playing, aggressing, breeding, feeding. They also come outside of the forests for crop raiding from near by lands. Presently 81 elephants were reported including 18 numbers of bulls, 40 numbers of cows and 23 numbers of calves. During the period 05.07.2005 to 12.04.2011, eleven elephants died. Three male of them committed natural death one male by poaching, three male by inter fighting, two female by suffering from

disease, one male by snake bite. Also, 1 female committed to death by falling from a height of 20 to 30 feet. Within 2003 to 2011, Elephants caused the death of two men, injured two men, damaged 401.66 acres of Crop, 207 houses and killed 3 cattle.

So far this scheduled - I animal shows a considerable increase in its population from 2002 (59) to 2007 (67) and 2010 (81).

**Sub-Section: Environmental Pollution & Waste Management**  
**Drinking Water Quality Analysis of Some Areas of Nirmali Sub-Division,**  
**District, Supaul, Bihar with Special Emphasis on Arsenic**  
**Contamination and Health Problem**

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**Key words:** Arsenic contamination, Tharia and Laximinia Villages,  
gastrointestinal and epidemiological diseases.

**ABSTRACT**

Arsenic occurs naturally in all environmental media and is usually present in the form of compounds with sulfur and with many metals arsenic exists in various valiancy states and to both organic and inorganic forms, the level of environmental arsenic are normally reported in terms of total arsenic. This research paper reports the Physico- Chemical analysis of drinking water from different sources in villages, Manjhari, Tharia and Lakshminia the analysis has shown high concentration of iron and of arsenic. All other parameters have been found to be with in permissible limit.

A good number of people in these villages have been found to have various types of skin problems which appear, to all probability, due to presence of arsenic in their drinking water sources. The people have been found to be suffering from in gastrointestinal and epidemiological diseases due to regular use of arsenic contaminated ground water drawn through hand pumps.

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Results of chemical analysis of surface and ground water samples have revealed that some of surface water bodies and hand tube wells water are free from hazardous arsenic contamination. Samples from some tube wells are Arsenic free as only nearly 40% of the analysed samples recorded toxic arsenic (from 200 ppb to a maximum value of 400ppb) beyond the desirable limit of 50 ppb as per BSI, IS: 10500, 1991. The area is inhabited mostly by illiterate and poor people who on their own are not capable of arranging for safe drinking water themselves.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Physico-chemical properties of soil under traditional homegardens in Mizoram, Northeast India**

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**Key words:** Physico-chemical soil properties, homegardens, Mizoram.

**ABSTRACT**

Physico-chemical properties of soil was studied at two depths (0-15 and 15-30 cm) across three differently sized homegardens (large (> 0.5 ha), medium (0.2 - 0.5 ha) and small (<0.2 ha) located in Mizoram, North-East India. Seventy five homegardens was sampled for the purpose. Soil moisture content and water holding capacity showed higher values in the large homegarden compared to the small and medium ones while soil pH was lower in the former than the latter. The results were presumably related to dense floor litter layer, greater accumulation of organic matter at the top soil (0-15 cm) and greater species richness/ density in large garden than the small and medium ones. Total organic carbon, total Kjeldahl nitrogen and ammonium-N, nitrate-N and available-P varied significantly within the homegardens ( $P>0.01$ ) and registered lower values in the small garden and they increased with the increase in garden size. A clear relationship was noticed between the soil nutrients and garden size in most cases.



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**Sub-Section: Environmental Pollution & Waste Management**  
**Isolation, Characterization and identification of microorganisms from the**  
**agricultural soil contaminated with pesticide**

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**Key words:** Agriculture, microorganism isolation, pesticide degradation.

**ABSTRACT**

This study is investigated the type of microorganisms that have a history of been treated of pesticide. When the microorganisms can survive in pollutant environment, it has potential to degrade substance that harmful to our environment. This is because environmental pollution, caused by the leaking of chemical fertilizers and pesticides to surface and groundwater, caused serious environmental and social problems. The soil samples had been taken from vegetables cultivated lands that have history in using of pesticide. The important microorganisms isolated from the agricultural soil are *Aspergillus niger*, *A.tumarii*, *A.candidus*, *A.flavus*, *Trichoderma*, *Penicillium sp*, *Fusarium Oxysporum*, *Bacillus sp*, *Klebsiella sp*, *Pseudomonas sp* and other Gram+ve and Gram-ve bacteria. The study reveals that the soil of agricultural fields is rich in microbial diversity. The main focus of the study is to isolate pesticide degrading microorganisms and to study their growth response in the presence of different concentrations of the pesticides.

**Sub-Section: Environmental Pollution & Waste Management**  
**Drinking Water Quality Appraisal of Jaipur Suburb Railway Stations with**  
**Special Mention to Chloride and Nitrate**

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*Key words: Railway stations, drinking water quality, chloride, nitrate,  
methemoglobinemia.*

**ABSTRACT**

Water is very important molecule for the sustaining and growth of life on earth. Clean drinking water is required by human beings and other living organisms. For the present study the water samples were collected and analysed for physico-chemical parameters namely pH, EC, TDS, Calcium and Magnesium Hardness, Total Alkalinity, Chlorides, Sulphates, Nitrates etc. with special reference to chloride and nitrate deliberation for drinking water of Sanganer; Baisgodown and Kanakpura railway stations. These railway stations are located quite near to the industrial areas of Jaipur city. The source of drinking water at every station is groundwater. The analysed values were compared with the standard values of Bureau of Indian Standards (BIS) and World Health Organisation (WHO). The analysis shows that the chloride and nitrate concentrations are in higher range of prescribed limits in the drinking water samples of Sanganer; Baisgodown and Kanakpura railway stations. High values of chloride and nitrate were found at Sanganer station with values 400 mg/l and 1.2 mg/l respectively. High chloride concentration cause salty taste of water. High nitrate concentrations above 100 mg/l in water can cause Methemoglobinemia in infants including birth defects and several other gastric problems in adults. Hence the study suggests the purification of drinking water in the study area to prevent any kind of diseases in human beings and work personnel at these stations.

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**Sub-Section: Toxicology & Bioremediation**

**Assessment of heavy metals concentration at six selected sites around the city of Haridwar, Uttarakhand, India**

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**Key words:** Road side, physico-chemical, heavy metals, ICPMS.

**ABSTRACT**

Environmental pollution of heavy metals from automobiles has attained much attention in the recent past. The present research was conducted to study heavy metal contamination in roadside soils of Haridwar. Roadside soil samples were collected from six sites and analysed for five heavy metals (lead, copper, zinc, nickel and cadmium). Their concentration and distribution in different road verge were determined by atomic absorption spectrophotometer (SIEMENS SRS 3000 sequential X-Ray photometer and ICPMS). The concentration of Pb, Cu, Zn, Ni, Cd contents ranged between 20.71±2.60 to 34.50±4.93 µg/g, 34.02±4.79 to 61.73±2.28 µg/g, 64.08±2.91 to 181.73±4.42 µg/g, 7±3.01 to 26.48±3.74 µg/g, <1 µg/g, respectively.

**Sub-Section: Environmental Management & Socio- Economic  
Impact of Occupational Noise on Coal Mines and Railway Workers**

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**Key words:** Occupational disease, impairment, NIHL, audiometry.

**ABSTRACT**

A close observation of the present Indian population reveals that a little more than one-third of the approximately 1.2 billion people constitute the industrial work force; a

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significant fraction (about 90%) of which works in informal sectors. Of these approximately thirty million workers are exposed to hazardous noise on the job and an additional nine million are at risk for hearing loss from other agents such as solvents and metals. Noise-induced hearing loss is thus one of the most common occupational diseases and the second most self-reported occupational illness or injury in India. While any individual can be at risk for noise-induced hearing loss in the workplace, workers in certain industries are often exposed to more serious levels of noise as compared to others. In this backdrop, a study was conducted on coal miners and railway workers belonging to the organized sector in West Bengal, India. In order to assess effects of noise exposure, audiometric assessment was done for individual workers to obtain the threshold at different frequencies from 250Hz to 8000 Hz. It was ensured that the subjects were free from symptoms like tympanic membrane rupture, presence of pus in the ear, presence of infection in the ear etc. For comparing the obtained data similar assessments were carried out on a control group of workers who were not exposed to such high levels of noise at their workplaces. Significant deterioration in auditory status was observed in the exposed group in both the occupations.

**Sub-Section: Environmental Pollution & Waste Management**  
**Defluoridation of water using bioadsorbent-Basil (*Ocimum sanctum* Linn.)**  
**leaves and its stem**

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*Key words: Defluoridation, fluorosis, bioadsorbent, basil, Tulsi,  
*Ocimum sanctum*, Lamiaceae*

**ABSTRACT**

Defluoridation of water was carried out by adsorption technique using Basil (*Ocimum sanctum*, Lamiaceae) leaves, stem and extract of fresh leaves at various doses and pH levels by boiling and shaking methods. With initial fluoride concentration of 5 ppm, it was observed that maximum 94 per cent of fluoride can be removed at a dose of 75 mg of fresh basil leaves for a sample of 100 ml at pH 9.0 for a contact period of 20 min, fresh basil stem with

a dose of 100 mg/100 ml had a removal efficiency of 75 per cent at pH 6, whereas for dry leaves and dry stem at a dose of 250 mg/100 ml, the removal efficiency was 78 per cent and 74 per cent at pH 6 and 7, respectively. This makes the fluoride concentration within the permissible limit of Indian Standard for drinking water (IS 10500:1991, Fluoride 1.0-1.5 ppm). The efficiency of adsorption of fluoride ion was affected by pH, adsorbent dose, type and size of adsorbent used. This developed technique is cost effective, environment friendly and most important easy to understand and can be adopted in rural as well as urban background throughout the year.

**Sub-Section: Environmental Pollution & Waste Management**  
**Bioaccumulation of Chromium by Aquatic Hydrophyte Lemna sp. and its associated Rhizosphere Bacteria**

**Rohit Das, Indrani Saha, Bidisha Mitra, Debadrita Bhowmick, Anandita Chakraborty, Disha Sengupta, Shamayita Roy, Sudeshna Shyam Choudhury\***

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**Key words:** Chromium, bioremediation, Lemna, bioaccumulation.

**ABSTRACT**

The release of chromium rich effluent is a problem in many water bodies around leather tannery complex in East Kolkata. In the lentic ecosystem of that area the Chromium concentration varied between 5mg/L to 15mg/L which is highly toxic. A maximum acceptable concentration of 0.05 mg/L (50µg/L) for Chromium in drinking water has been established on the basis of health considerations. Thus it is necessary to maintain the Chromium concentrations of these water bodies within the acceptable limits. Bioremediation using certain hydrophytic plants can be used successfully to improve the quality of these waters. In this investigation, Lemna was grown in such Chromium contaminated system in vitro and the plant was found to be tolerant to a maximum Chromium concentrations of 60 mg/L. It is also efficient in chromium uptake. The highest efficiency of 91.67% was observed at a concentration of 10 mg/L in 50 hours after which the plant showed partial chlorosis but continued to complete its life cycle. Bacteria isolated from the rhizosphere water of this plant also showed tolerance to a maximum of 120mg/L of chromium concentration though its efficiency in removing chromium remained comparatively lower than the plant at around

65% for all different concentrations up to 50mg/L in 12 hours. Hence they together can serve as potential bioremediator for Chromium pollution.

**Sub-Section: Environmental Pollution & Waste Management  
Vetiver Grass Technology in Waste Water and Effluent Treatment A Review**

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**Key words:** Vetiver grass, waste water and effluent treatment.

**ABSTRACT**

Application of the Vetiver Grass Technology (VGT) for wastewater treatment is an innovative nutrient removal technology and it is a green and environmentally friendly wastewater treatment technology as well as a natural recycling method. Most importantly it is believed to be a cost effective and more efficient system than current system in place which uses high energy consuming aerators. Clean water is becoming one of the scarcest and valuable resources in the twenty first century as its supply is finite and its traditional source is easily polluted by industries and population growth. Existing and traditional wastewater treatment methods are expensive and in most cases are either impractical or unsuitable for smaller communities and certain industries. The Vetiver System was first developed for soil and water conservation purposes but in the last few years its role has been extended into environmental protection field, particularly in the field of wastewater treatment and solid waste landfills. The paper reviews the application of vetiver grass in the effluent and waste water treatment.

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**Sub-Section: Environmental Pollution & Waste Management**  
**Assessment of Soil Quality Degradation Due to Leachate at Municipal Solid Waste Dumping Site - Mathuradaspora, Jaipur**

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*Key words: Municipal solid waste, leachate, heavy metals, soil degradation.*

**ABSTRACT**

A new menace of municipal solid waste is slowly but steadily gripping the world. The growing population world over has resulted in generation of huge amount of municipal solid waste. The lifestyle changes of human beings have added to the existing problem. In most of developing countries including India this MSW is dumped in open landfills. The present study at the municipal solid waste dumpsite of Mathuradaspora, Jaipur was done to understand the impact of MSW on the soil in and around the dumpsite area. The analysis of the four leachate and 10 soil samples was done. The results of leachate analysis shows high content of total dissolved solid (3200 - 4482 mg/l), chlorides (6122 - 6800 mg/l), fluoride (70 - 90.4 mg/l), sulphates (260.8 - 288.4 mg/l), nitrates (128.4 - 188.6 mg/l) and heavy metals such as copper (5.2 - 8.92 mg/l), zinc (16.40 - 26.80 mg/l), nickel (0.30 - 0.89 mg/l), lead (2.93 - 3.62 mg/l), iron (85.0 - 141.32 mg/l), chromium (0.51 - 0.88 mg/l), cadmium (0.09 to 0.17 mg/l). The results of soil analysis show chlorides (1330 - 1840 ppm), sulphates (8.1 - 14.4 ppm), nitrogen (322.8 to 432.5 kg/ha) etc and heavy metal content as Iron (2196 - 7759.37 ppm), copper (0 - 4.48 ppm), zinc (25.38 - 54.75 ppm), and nickel (6.62 - 25.46 ppm). The study reveals degradation of soil characteristics due to leachate seepage which may further percolate into the groundwater and surface water. This soil contamination will be harmful for human beings and natural ecosystem as these pollutants may enter the food chain. The MSW dumping should be managed properly to avoid such hazards. The policy of reduce, recycle and reuse is to be adopted to keep our environment pollution free.

*Section VII: Environmental Sciences*

**Sub-Section: Environmental Management & Socio- Economic**

*Environmental Studies for Conservation of Khandagiri Cave Complex, Bhubaneswar, Odisha*

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**Key words:** Environment, Conservation, Weathering, Seepage

**ABSTRACT**

Khandagiri Cave Complex is the archaeological marvel located within Bhubaneswar City. The low hill range is honey-combed with caves of early-historic period. The caves are excavated in gritty sandstones belonging to Upper Gondwanas. Various agent of weathering have brought about gradual deterioration in the rock mass quality, causing serious deleterious impact on the sculptures and inscriptions inside the caves and their environs. Unstable slopes and seepage are the two major cause of concern while applying conservation measures. Different measures for conservation of caves have been suggested.

**Sub-Section: Environmental Pollution & Waste Management**  
**STUDIES ON THE WATER QUALITY INDEX OF RIVER MAHANADI**  
**AT SONEPUR, ODISHA**

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**Key words:** Water quality index, river, Mahanadi, Sonepur.

**ABSTRACT**

Water Quality Index based on Physico-chemical parameters of River Mahanadi at Sonepur, District, Subarnapur during 15<sup>th</sup> April to 15<sup>th</sup> July 2011. An important index CCME WQI was applied to find out the suitability of water for protection of aquatic life at three different study stations (S<sub>1</sub>, S<sub>2</sub>& S<sub>3</sub>, S<sub>1</sub> - Sindhoi, S<sub>2</sub> - Binka, S<sub>3</sub> - Sonepur). The index ranges between a minimum of 38 at S<sub>3</sub> and maximum of 58 at S<sub>1</sub> study stations. At S<sub>2</sub> and S<sub>3</sub> were



rated as poor where the water quality is almost endangered, the conditions usually deviate from natural levels. At S<sub>1</sub> the index value of 58 are categorized as marginal where in water quality is frequently threatened and conditions often deviate from desirable levels. However, at all the study stations, the water is quite suitable to support aquatic life.

**Sub-Section: Environmental Pollution & Waste Management**  
**A Study of the Fluoride Levels of Various Drinking**  
**Water Source of Agra City, India**

**Ashish Kumar and Azad Kumar**

*Chemistry Department, Agra College, Agra*

*Key words: Fluoride, drinking water, fluorosis, bottle water.*

**ABSTRACT**

This paper presents a comprehensive evaluation and comparison of the Fluoride content of various drinking water sources of Agra city. As the excess of fluoride can cause dental fluorosis but on the other hand its lack can results in dental caries. Ten samples of bottled water were purchased from local markets. Four samples of different R.Q systems output waters being used, two samples of tap water from different locations were collected in clean sterile bottles while four ground water samples were taken from borewells from four locations in different parts of city.

Agra is situated on the banks of Yamuna river known for its barkish water, also the south-west side of city lies near fluoride rich area of Rajasthan. Therefore, the use of bottled water and domestic RO systems as source of drinking water is gaining momentum day by day. A number of domestic RO systems are available in city. Therefore it is desirable to independently monitor the quality of these water sources. These facts make this study even more relevant. It is observed that the fluoride levels in bottled water is below recommended limits (0.07-0.35 mg/l), therefore, it is not effective in preventing dental carries whereas in ground water fluoride levels are much higher.

**The detailed results and tables shall be presented  
and discussed at the conference meeting.**

**Sub-Section:** Environmental Pollution & Waste Management

*Water Quality status of Pakhal Lake in Warangal District, Andhra Pradesh India*

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**Key words:** Physicochemical, forest.

**ABSTRACT**

Pakhal Lake is situated about 70 km from Warangal city. This huge manmade lake is enveloped by forested hills. The lake has great historical importance constructed in 1243 AD of Ganapathy Deva. It is located between Latitude  $17^{\circ} 42'_{1/2}$  and  $18^{\circ} 10'$  North between Longitude  $79^{\circ} 55'$  East. Set around the lake is spread over an area of 900 sq km. The forests include mixed dry deciduous type with Teak and its associates like Thiruman, Maddi, Tuniki Bamboo etc. The climate is usually hot around the year the temperature often reaches  $46^{\circ}\text{C}$  during summer. The principal rainfall is from South West monsoon. The annual average rainfall is about 1500mm. A study was carried out on Pakhal lake to assess the impact of anthropogenic events sewage, agricultural runoff pollution on the water quality of the tank Physico chemical parameters such as temperature, electrical conductivity, DO, BOD, COD total hardness, Total Alkalinity, chloride, calcium and magnesium, sulphate, phosphate, nitrate and organic matter were observed The coli form bacteria were found to be high on the banks of the tank. All these parameters are within the permissible limits hence it can be recommended for drinking and irrigation purpose.

**Sub-Section: Environmental Pollution & Waste Management  
Concentration and Distribution of Trace Metals in Respirable Particulate  
Matter (PM<sub>10</sub>) of Different Locations of Jharia Coalfield, India**

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**Key words:** Respirable particulate matter, trace metals, AAS, respiratory diseases.

**ABSTRACT**

Air borne particulate matter were collected on EPM 2000 filter paper during 2008-2009, to measure the respirable particulate matter (PM<sub>10</sub>) and toxic metal concentration in Jharia coalfield of Dhanbad region. 24 hourly average concentrations of respirable particulate matter (PM<sub>10</sub>) were determined at regular intervals for different seasons at fifteen monitoring stations. This region covers several coal mining/industrial areas, residential, commercial and mixed use areas. The annual average PM<sub>10</sub> concentration varies from 59-339 µg/m<sup>3</sup> thereby exceeding the respective standards set for the coal mining area (2000) and the Indian national ambient air quality standard (NAAQS,2009) protocol at most of the coal mining area. During winter the PM<sub>10</sub> concentration were recorded higher at several stations. The elemental concentrations of the particulate matter were determined by using Atomic Absorption spectrophotometer (AAS) coupled with graphite furnace. Which yield the trace metal concentration on an average basis in the following decreasing order, Fe>Cu>Zn>Mn>Cr>Cd>Pb>Ni. Among all trace metals Pb, Cd and Cu representing higher enrichment factor. There are several negative implication occurs in coal mining area hence, it can be said that mining is one of the most dangerous occupations in the world, not only in terms of injuries/accidents but also from the human health point of view viz., cancer and respiratory diseases (silicosis, asbestosis and pneumoconiosis).

**Sub-Section: Environmental Pollution & Waste Management**

Study on fluorosis and its connection with drinking water quality in some villages of

**Amas Block, District Gaya, Bihar**

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*Department of Environmental Sciences, A. N. College, Patna*

**Key words:** Amas block villages- Prevalence of dental and skeletal fluorosis- Natural fluoridation of drinking water sources-Mitigation measures.

**ABSTRACT**

Fluorine (in the form of fluoride) is a potent trace element which, when accumulates in human body above permissible limit, has serious health complications. Fluoride can reach human body through natural sources- water and soil and also through food stuffs, toothpaste and even air (mostly from phosphate fertilizers and burning of fluoride containing fuels). However, drinking water is the most common source of fluoride intake, at least for rural

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population belonging to lower strata of society. Throughout many parts of the world, high concentration of fluoride occurring naturally in ground water have caused widespread fluorosis- a serious bone disease among local population.

The present socio-scientific study reports survey on health status of the people and physico-chemical analysis of drinking water in several villages of Amas block of Gaya district, Bihar. Dental and skeletal deformities have been observed to be widely prevalent among the inhabitants of Bhoop Nagar village. But in adjoining villages of Bhoop Nagar health problems of the kind were not observed. The study showed fluoride content in all the drinking water sources in Bhoop Nagar village to be much above the maximum permissible limit. But in adjoining villages the fluoride content in the drinking water from different sources was found to be within permissible limit.

**Sub-Section: Environmental Pollution & Waste Management  
Medical Waste Management at M.G.M.Hospital, Warangal**

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**Key words:** Medical waste management, incineration, land disposal, collection, transportation.

**ABSTRACT**

This study examined the medical waste management practices of M.G.M.Hospital, Warangal. The results of this study revealed that both general and medical wastes are generated in the hospital. M.G.M.Hospital does not quantify medical waste. Segregation of medical wastes into infectious medical waste and non-infectious medical waste is not conducted according to definite rules and standards. The hospital does not label infectious waste with Biohazard symbol. Wheeled trolleys are used for on-site transportation of waste from the points of production (different wards) to the temporary storage area. Staff is responsible for collecting medical waste. The results of this study indicated that off-site transportation of the hospital waste is undertaken by a private waste management company. Waste is transported daily and small pickups are mainly used for transporting the waste to an off-site area for treatment and disposal. The final disposal is done by the private company.

The main treatment method used in the final disposal of infectious waste is incineration. Non-infectious waste is disposed of using land disposal method. The hospital does not recycle nor provide training for staff members on the health and environmental effects of infectious waste. The study showed that there are no policies and guidelines regarding the recycling of medical waste products. There are number of problems the hospital faces in terms of collection and disposal of waste, intermingling of hazardous wastes with domestic waste in the hospital sometimes, failure to quantify the waste generated in reliable records, lack of use of coloured bags by limiting the bags to only one colour for all waste, and there is no committee responsible for monitoring the medical waste. From the results of this study, it is obvious that medical waste management is not practiced according to the World Health Organization's (WHO's) recommended standards. It is imperative for significant investment in the proper management of medical waste in order to reduce the health risk it poses.

**Sub-Section: Environmental Pollution & Waste Management**

Studies on Degradation of Nylon 66 by Fungus *Trametes Versicolor*

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**Key words:** - Nylon 66 degradation, fungus *Trametes versicolor*.

**ABSTRACT**

A study of nylon 66 polymer degradation by fungus *Trametes versicolor* has been carried out using I.R. spectroscopy and mechanical techniques. The nylon 66 sheet was exposed to fungus as sole source of nitrogen. The degradation was studied in with medium and without medium (distilled water). More growth of fungal colony was developed in minimal media that resulted in substantial degradation via crack within sixty days. The groove that weakening and breaking of polyamide bond have been confirmed by weak I.R. band. Results are discussed in paper.

**Sub-Section: Environmental Pollution & Waste Management  
Sustainable Biogas Production and Compost from  
Hostel Food-waste by Anaerobic Digestion**

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**Key words:** Anaerobic digestion, hostel waste, solid phase,  
methanogenic bacteria, biogas/bioenergy

**ABSTRACT**

'Biogas' production from 'Hostel Food wastes' (total solids 65.5%, moisture content 45.5%, volatile solids 18.4%, pH, 6.2 to 6.7%) was undertaken. Food wastes such as, discarded vegetables, other bio-wastes and cooked food items of total solid concentrations of 40% and 50% which were added to anaerobic digester containing cowdung slurry and were inoculated to pre-digested bio-reactor containing food wastes collected from Boys Hostel of Shridevi Institute of Engineering & Technology, Tumkur. An average amount of food waste of 225 kg/day, production of Biogas starts after four weeks. Two groups of bacteria isolated from the digester. These were the acid formers (*Bacillus subtilis*, *pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli*) and the methane formers (*Methanobacterium* sp and *Methanococcus* sp.). The process of methanogenesis includes hydrolysis, acidogenesis / acetogenesis and methanogenesis. Methane is the main component of biogas (50-70%). Other component includes CO<sub>2</sub> (30-40%) and traces of H<sub>2</sub>S and H<sub>2</sub>O vapour. Temperature of 32.4 °C was the optimum for the production of biogas (225kg/day). Food wastes were fermented for 45 days. The recovery level for biogas was 45% with the calorific value of 4700kcal/M<sup>3</sup> and compost-25%. The results of this study suggest that hostel food wastes can be used for biogas production and as bio-fertilizers.

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**Sub-Section: Environmental Pollution & Waste Management  
Removal of Lead from Paint Effluent using**

**Rice Husk and Water Hyacinth as an Adsorbent**

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**Key words:** Lead adsorption, low cost adsorbent, atomic adsorption spectrophotometer.

**ABSTRACT**

Paint effluent is one of the serious threats to the environment as it contains sufficient amount of lead. Lead causes behavioral problem, learning disabilities, seizures, hearing and digestive problem, neurological defects. Damage to central nervous system (CNS) is a common feature particularly in children.

In this project, investigation was undertaken to remove lead from paint effluent using naturally occurring, low cost and eco friendly adsorbents like water hyacinth and rice husk. Both the adsorbents are found to be highly efficient in removing lead from aqueous solution and paint effluent as well. The main parameters influencing metal ion sorption were investigated in batch process: contact time, adsorbent dosage, initial metal ion concentration and adsorbent nature. The study reveals that the maximum percent of lead removal was attained at 60 minute of contact time in case of rice husk and in case of water hyacinth when left overnight. The study related to adsorption vis-à-vis removal of lead was monitored by measuring the concentration of solutions by Atomic Absorption Spectrophotometer. The study also established the validity of Freundlich isotherm.

**Sub-Section: Environmental Pollution & Waste Management**  
**Grain size and geochemical analysis of the sediments of Brahmaputra River**  
**and five of its tributaries**

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**Key words:** Brahmaputra, tributaries, sediments, grain size, geochemistry.

**ABSTRACT**

Major ions composition ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{N}^+$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ), heavy metals (Cd, Cu, Fe, Pb), Total organic carbon (TOC) and the grain size distribution of bank sediments in the Brahmaputra and five of its tributaries have been studied to understand the geochemistry of the sediments and contribution of the tributaries to the main channel. River sediments were sampled at four locations in the Brahmaputra River at Siang, Dibrugarh, Sivasagar and Tezpur and five of its tributaries at Dikhow, Disang, Dhansire, Jiabharali and Burhidihing. Some differences were found between the main channel and the tributaries which may be attributed to their origin. The results show that the Brahmaputra samples are slightly more alkaline than the tributaries. Fe was found to be in much higher concentration than other heavy metals and showed a positive correlation with the total organic carbon. The grain size analysis shows that the south bank tributaries had more silt-clay fraction than the north bank tributaries. The greater concentration of heavy metals in some tributaries shows the association of smaller grain size fractions (silt-clay) of the sediments with heavy metals due to greater surface area to volume ratio.

**Sub-Section: Environmental Pollution & Waste Management**  
**TANGIBLE SOLUTION TO WATER CRISIS - A STUDY ON**  
**GREY WATER TREATMENT**

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**Key words:** Grey water, urbanization, recycling



**ABSTRACT**

The process of rapid industrialization, substantial increase in population, rampant urbanization etc, has exerted tremendous pressure on all natural resources in general on water. Grey water treatment and its reuse are becoming more exigent with the increase in demand for fresh water in the urban areas. This work is to quantify the total amount of grey water generated in study area and to propose a simple design suitable for grey water reuse. By using this technique we have achieved 60-70% treatment efficiency. This being a pilot study in particular area, the results can be data based and simulated for water management in larger township.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Contrasting effects of nutrient input on carbon and nutrient dynamics in Indian dry tropical forest and savanna ecosystems**

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**Key words:** Savanna ecosystems, ecotone, biomass, organic matter.

**ABSTRACT**

Present study aims to understand the impact nutrient (N and P) input on carbon and nutrient changes in soil and plant components of forest and savanna ecosystems in Indian dry tropical region. Nutrient addition significantly increased aboveground plant biomass of herbs in these ecosystems. The fine root biomass responded positively to N addition with greater proportions in upper soil depth, whereas, P addition had little effect. The N and P additions altered C allocation in vegetation and soil in these ecosystems. Ammonification was dominant over nitrification in the forest and ecotone while the reverse was true in the savanna. Available nutrient status, N- mineralization rate and microbial biomass (C, N and P) were significantly affected by nutrient additions. Savanna ecosystem soil responded more rapidly to nutrient addition than the forest and ecotone. However, the responses were retained for a longer period in the forest and ecotone soils than in the savanna. Addition of N significantly increased the proportion of macroaggregates in forest and ecotone soils, whereas the same input decreased the proportion considerably in the savanna. Besides, N addition

also altered the biological and chemical qualities of soil aggregates. The effect of P addition on soil aggregate stability was marginal. In the current scenario of N loading, continued soil N loading in forest may lead to increased macroaggregates with associated microbial biomass C and N and greater aggregate stability. In contrast, the extensively distributed savannas may show over all reverse trends leading to nutrient loss and reduction in its carrying capacity. This may affect the C sequestration potential of these ecosystems. We conclude that when either N or P are added to tropical forest and savanna ecosystems the soil and plants attributes are affected differently depending on the amount and the quality of organic matter present in the soil. Contrary to the general belief, N addition seems to have more powerful control on the C and nutrient dynamics than P addition in these dry tropical ecosystems.

**Sub-Section: Environmental Pollution & Waste Management  
A Critical Perspective to Approach Sustainable Pollution Control and  
Management of Environment of Bhubaneswar: An Empirical Research**

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**Key words:** Pollution, environmental pollution control.

**ABSTRACT**

The study was undertaken with a humble purpose to analyze the criticalities in monitoring and controlling the pollution occurring in the society, which can be otherwise managed. The study was empirical; based on logical reasoning and a questionnaire survey. This research has provided an understanding on the significant attributes that are essential in achieving excellence in sustaining environmental pollution control. The ideas evolved in the findings shall help to add substantial value to the corporations, organizations, Government, regulatory bodies, society and individuals to curtail the adverse affect of environmental pollution by ensuring pollution control management for a better environment.

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**Sub-Section: Environmental Pollution & Waste Management**  
**Detection and isolation of pathogenic bacteria and their respective**  
**bacteriophages from river Yamuna**

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**Key words:** Pathogenic bacteria, River Yamuna, Multiple Tube Fermentation Test.

**ABSTRACT**

This study was conducted to detect and isolate the pathogenic bacteria and their respective bacteriophages from River Yamuna. Pathogens selected for this study were E.coli, Pseudomonas aeruginosa, Salmonella typhii, Shigella sp, Staphylococcus aureus, and Vibrio cholera. Samples were collected from six different sites of River Yamuna., Multiple Tube Fermentation Test were performed to enumerate the count of pathogens and their respective phages. Preliminary data suggests the presence of these pathogens as well as their respective bacteriophages in River Yamuna. This study gives comparative data about the microbial population and their respective bacteriophage in the River Yamuna.

**Sub-Section: Environmental Pollution & Waste Management**  
**WASTE WATER TREATMENT USING ECO**  
**FRIENDLY OXIDISING AGENT Fe (VI)**

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**Key words:** Fe (VI), pollutants, waste water.

**ABSTRACT**

Ferrate (Fe (VI)) is a potential water treatment chemical due to its dual functions as an oxidant and a subsequent coagulant/precipitant as ferric hydroxide. Hence, an application of Fe (VI) to wastewater could achieve both oxidative elimination of various micro pollutants and Reduction in the COD, BOD, Total hard ness, Chloride, Fluoride can be achieved.

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The aim of this study was to assess the potential of Fe(VI) to oxidize selected micro pollutants and remove phosphate during enhanced treatment of municipal wastewater in a single treatment step. The waste water from pond in K.R Puram, Bangalore is treated with powerful eco-friendly oxidizing agent Fe(VI){0.005mg/L} , the parameters such as, COD, BOD,TSS, total hardness, chloride, phosphate, ammonia, cyanide etc. are measured before and after treatment. The reduction in the COD, BOD, Total hardness, Phosphate, ammonia, cyanides are observed.

**Sub-Section: Toxicology & Bioremediation**  
**Chromium Tolerance and its Toxic Implication in a**

**Floating Hydrophyte, Pistia stratiotes**

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*Puja Majumder, anindita Banerjee\**

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**Key words:** Chromium; Cr(VI); toxicity; tannery effluent; Pistia; tolerance; total phenol concentration; tannin; chelators; Hogland; Aerenchyma; Lithocyst; xylem; cortical cells.

**ABSTRACT**

Chromium (VI) [Cr(VI)] is very commonly discharged as a tannery effluent in the adjoining water bodies which is a common habitat for different floating hydrophytes. The average concentration of Cr in such waters ranges between 2-3 ppm. Pistia grown under such conditions in the laboratory showed remarkable tolerance to chromium with moderate to high signs of toxicity (e.g. extensive chlorosis). These plants are effective in removal of chromium with an efficiency of 26.7% and a crop of plants can survive upto 6-7 days with some major biochemical changes like an effective increase in total phenol concentration (by 45.5% on going from 0.5ppm to 3ppm). This rise in phenol begins after an initial drop. These phenolic compounds may include tannin that can act as effective chelators of Cr (VI). The apparent yellowing of these plants is due to loss of chlorophyll and these chlorotic lesions are less in plants grown in Hogland solution. Anatomical preparation of leaves of control and Cr treated (4 ppm) plants showed disruption of the Aerenchyma, dislocation of

the Lichocyst and disoriented vascular tissue. Roots do not exhibit any major changes but xylem tissues were modified and cortical cells got disrupted in the treated ones. Thus, it can be suggested that Pistia can be used for phytoremediation of waters polluted with Cr.

**Sub-Section: Toxicology & Bioremediation**  
**Toxicity of Mercuric Chloride on Behaviour and**

**Survival of Fresh Water Teleost *Anabas testudineus***

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**Key words:** Mercuric chloride, LC50, behavioural changes, anabas testudineus.

**ABSTRACT**

The objective of this work was to examine the toxicological effects of a major heavy metal pollutant mercuric chloride (HgCl<sub>2</sub>), in fresh water climbing perch, *Anabas testudineus*(Bloch). Static bioassays were conducted in the laboratory for 96 hours to determine the median lethal concentrations(LC50) of HgCl<sub>2</sub> to *A. testudineus*. the LC50 values and their 95% confidence limits for different exposure time were calculated by using computer software ' Probit Analysis'. The LC50 for 24,48,72 and 96 h obtained in this study were 6.01,3.2,1.8 and 0.96 ppm respectively. 10% mortality at 96 h occurred in 0.18 ppm of Hgcl<sub>2</sub> whereas 15,85,90 and 95 percent mortality were observed in 0.25,3.69,5.08 and 8.13 ppm, respectively. When *Anabas testudineus* was exposed to Hgcl<sub>2</sub> for 96 h fish exhibited a series of abnormal behavioural responses such as erratic movement, rapid movement of operculum, secretion of excessive mucus, jumping out of the test media, lateral swimming, loss of equilibrium etc. Finally the fish were found dead at the bottom of the aquarium with their mouth wide open. Based on the results of this study, it is concluded that Hgcl<sub>2</sub> is highly toxic to fresh water edible fish *Anabas testudineus* and it can even affect the nervous system of the fish.

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**Sub-Section: Toxicology & Bioremediation**  
**Utilization of Fly Ash as a Carrier in Biofertilizer**  
**And Biopesticide Formulation**

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**Key words:** Bioformulation, fly ash, talc, charcoal, Azotobacter chroococcum and Trichoderma viride, ANOVA test.

**ABSTRACT**

Bio-formulations with the use of fly ash as a carrier have been found as a very effective, inexpensive, low maintenance and environmental friendly technique. Using fly ash as carrier in bioformulation could mitigate the environmental crisis of fly ash disposal to some extent and increasing its utilization. This paper assesses the performance of fly ash generated from Chandrapura Thermal Power Station (CTPS) area of Bokaro District by examining the physico-chemical properties. The fly ash of this region has a potential for growth of leguminous plant in various trials. In our experiment fly ash alone and in combination with lignite and talc was tested to explore its possible use as carrier for Azotobacter chroococcum (nitrogen fixing bacteria) and Trichoderma viride (opportunistic avirulent plant symbionts) formulations. The objective of the present study was to develop fly-ash based bio-formulation of selected microbes and to evaluate shelf-life of these formulations through cfu count and statistical analysis. The result showed the decline in cfu count in all the three carrier combination in both the Azotobacter chroococcum and Trichoderma viride and the shelf life of both the formulations was found to be better at  $28 \pm 2$  °C when compared to room temperature. Fly-ash based bio-fertilizer and bio-pesticide formulations showed slightly better results compared to routine talc or lignite formulations. This paper includes an outline of social and environmental reasons for solid waste utilization, and explores the idea of use of hazardous waste as an environmental friendly bio fertilizer and biopesticide.

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**Sub-Section: Toxicology & Bioremediation**

**Size Dominated Tolerance Level of Estuarine Diatom to Arsenic Toxicity**

**Chumki Choudhury**

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**Key words:** Diatoms, cell size, Arsenic (III & V), mangrove.

**ABSTRACT**

This study reports the extent of arsenic (III) & (V) tolerance of estuarine diatom in relation to cell size. Large size *Coscinodiscus radiatus* showed their lower values of maximum growth rate and inhibition constant (0.7489 - 1.1917 d<sup>-1</sup>, 159 - 1250 for As (V) and 0.9787 - 1.0808 d<sup>-1</sup>, 578 - 1459 for As(V) than that for small size *Skeletonema cf. coscatum* (1.0881 - 1.3089 d<sup>-1</sup>, 1910 - 3063 for As (V) and 0.8326 - 0.9363 d<sup>-1</sup>, 3003 - 5342 for As (III)). Inter-species differences in As tolerance was explained using negative relationships between inhibition constant and biovolume.

**Sub-Section: Toxicology & Bioremediation**

**Transport and Transfer of Heavy Metals from Deep Bottom Sediments to Commercial Edible Fishes from Nagarjuna Sagar Dam of Andhra Pradesh**

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*Keywords: Nagarjuna Sagar dam, heavy metals, ICP-OES, Below Detectable Limit (BDL).*

**ABSTRACT**

India has places like Nagarjuna Sagar dam which are influenced by naturally occurring radionuclides and heavy metals deposits. The concentrations of heavy metals (Zinc, Cadmium, and Cobalt) in water, sediment and fish samples collected from Nagarjuna Sagar dam were analyzed using Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES). Among three metals, Cadmium and Copper were detected in water as near to Below Detectable Limit (BDL) but Zinc was present above the permissible

limit. The level of Zinc in sediment and fish samples was present above the permissible limit. In *Labeo rohita*, and *Anguilla rostrata*, the accumulation of heavy metals was in the order  $Zn > Cd > Co$ , and in *Labeo calbasu*, the sequence is  $Zn > Co > Cd$ . Our results shows that the heavy metals concentrations is in the order sediment > fish > water.

**Sub-Section: Toxicology & Bioremediation**  
**Heavy Metal Reduction of a Pond Using Aquatic Macrophytes and the impact of these metals on the chlorophyll and biomass content of macrophytes**

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**Key words:** Khirgali pond, macrophytes, phytoremediation, chlorophyll, biomass.

**ABSTRACT**

Heavy metals (Cu, Zn, Fe, Pb, Cd, and Mn) were analysed from Khirgali pond water, Faizabad. These metals were found to be beyond the permissible limit. In order to reduce the heavy metal concentration of pond water, five Aquatic minima and *Phragmites karka* were utilized under laboratory condition. Among five macrophytes *Phragmites karka* appears to be a suitable plant for the phytoremediation of metal polluted waste water, which proved as potential accumulators of metals after 28 days exposure. The contaminants (heavy metals) of pond water decreased chlorophyll content and biomass of aquatic macrophytes (*Lemna minor*, *Potamogeton pectinatus*, *Vallisneria spirales*, *Typha minima* and *Phragmites karka*) following exposure of pond water for different intervals (7,14,21 and 28 days).

**Sub-Section: Toxicology & Bioremediation**  
**Effects of benzo[a]pyrene on postnatal brain development in rat**

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**Key words:** Polycyclic aromatic hydrocarbons (PAHs), benzo(a)pyrene (B[a]P), lipid peroxidation, behavioral deficits



**ABSTRACT**

Prenatal exposure to polycyclic aromatic hydrocarbons, (PAHs) like Benzo(a)pyrene (B[a]P), a carcinogen found in cigarette smoke causes neurobehavioral changes. The postnatal effect of single intracisternally administered B [a] P on levels of lipid peroxidation in rat brain was studied. After four weeks, enzymes like SOD, catalase, GSH, MDA and ROS in frontal cortex and hippocampus of brain were detected. Significantly higher MDA, lower levels of SOD and GSH were observed in B[a]P-treated groups compared to control in hippocampus. It is suggested that polycyclic aromatic hydrocarbons could induce biomembrane injury, and have more serious effect on brain causing behavioral deficits.

**Sub-Section: Toxicology & Bioremediation**

**The Mobility of Some Nutrient Metal Ions as Affected by Heavy Metals like Pb, Cd, Cr & Ni In Presence of added Soil Organic Matter in an Illitic Soil**

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**Key words:** Heavy metals, illitic soil, mobility, nutrient metals, soil organic matter.

**ABSTRACT**

The mobilities of some nutrient metals such as Fe, Zn, Mn & Cu have been investigated in an illitic fine sandy loam soil as affected by some toxic heavy metals (Pb, Cd, Cr, and Ni) in the presence of added organic matters using Soil Thin Layer Chromatography (Soil TLC). The Soil Organic Matter (SOM) was extracted from the sample soil and the humic acid (HA) was obtained by acidification process and purified. The Heavy metals like Pb, Cd, Cr, and Ni were added to the soil in presence of these SOM and HA fractions to study their effects on the mobility of nutrient metal ions in the soil. It was observed that the presence of SOM decreases the mobility of metal ions in soil while HA addition increases the same. However, an addition of the heavy metals as above into the soil with SOM again shows an increased mobility of all the metals except in the case of Cd

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which decreases the mobility of all the nutrients. The results so obtained have been explained on the basis of metal ion interactions with soil colloids and their physic-chemical properties in the soil solutions.

**Sub-Section: Toxicology & Bioremediation**  
**Seasonal Variation of Some Heavy Metals in**  
**Surface Waters of River Tawi, Jammu (J & K)**

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**Key words:** River Tawi, Physico-chemical parameters, heavy metals, standard deviation (SD), coefficient of variation (CV), ANOVA test, Correlation coefficient matrix.

**ABSTRACT**

In the present study, heavy metals (Pb, Cu, Fe, Zn and Hg) were analyzed seasonally in the surface waters of river Tawi, Jammu, J & K. The samples were collected from three different stations for a period of three years. The results obtained were statistically analyzed using standard deviation (SD), coefficient of variation (CV), ANOVA test and correlation coefficient matrix. The heavy metal contamination of the river was found to occur due to a high degree of anthropogenic stress.

**Sub-Section: Toxicology & Bioremediation**

**Effect of Heavy Metal Pollutants on Water Quality of Lake Chilika**

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**Key words:** Water quality, nutrients, Chilika lake, heavy metal.

**ABSTRACT**

The Chilika lagoon on the Orissa coast is a natural brackish water lagoon of marine origin and has been designated as a Ramsar site since 1981. The lake is presently showing symptoms of environmental degradation. Concentration of all elements i.e. Mn, Mg, Ni, Cu,

Zn, Cu, Pb and Cr have increased in the water. The heavy metals like Pb, Cd, Mn, Ni, Zn and Co are also present. Metal concentration in the sediment indicates an increase in the pollutant content due to movement of fertilizers, agricultural water, prawn cultivation and motor boat operations. An immediate action should be taken by the authorities for the protection of the lagoon from further pollution.

### **Sub-Section: Toxicology & Bioremediation**

#### **Isolation and Characterisation of Heavy Metal Tolerant Bacteria from Contaminated Lentic Ecosystem In The Vicinity Of Sponge-Iron Plant**

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*Damayantee Das*, *Avika Roy*, *Pramit Bhattacharjee*, *Arup Kumar Mitra*#  
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**Key words:** Bioremediation, *Bacillus firmus*, *Bacillus cereus*, iron uptake.

#### **ABSTRACT**

The study was undertaken in Andagpur about 2 kms from Durgapur township. Many sponge iron plants are located in Andagpur. Two water samples A and B were collected from sites 10m and 250m away from the sponge iron plant respectively. The iron, chromium, lead content in these water samples were measured by Atomic Absorption Spectrophotometer. Sample A had 410.6ppm iron, 5.4ppm lead, 0.9 ppm chromium while sample B had 2.7ppm iron, 0.2ppm lead, 0.4ppm chromium. There was a reduction in the metal content with the increase in distance from the sponge iron plant. Amongst the three heavy metals, concentration of iron was the maximum. Three different colonies (1, 2 and 4) were isolated from water sample B and one colony (3) was isolated from water sample A by dilution plate method and the colony characteristics were determined. All the four colonies were tested for tolerance to iron and all of them were found to be iron tolerant. The uptake of iron was also determined at concentrations in which the bacteria showed maximum growth. Iron uptake was maximum for colonies 3 and 4. Colony 3 took up 94.4% of the supplied iron while colony 4 took up 98.21% of the supplied iron. Hence colony 3 and colony 4 were subjected to 16SrDNA analysis and these organisms were found to be *Bacillus cereus* strain BPH33 and *Bacillus*

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firmus strain IARI-CS66 respectively. Hence these organisms can be effectively used in reducing the dissemination of iron in the aquatic ecosystem and minimize the toxic implications to other organisms leading to bioremediation.

**Sub-Section: Toxicology & Bioremediation**  
**Histo-Toxicity of Cadmium on the Stomach and Small**  
**Intestine of Swiss Albino Mice *Mus musculus***

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*Bhubaneswar- 751022, Odisha, India*

**Key words:** Cadmium chloride, serosa, musculature, submucosa, mucosa, Brunner's glands and Crypts of Liberkuhn.

**ABSTRACT**

This study was carried out to investigate the effect of oral administration of cadmium chloride on the histomorphology of the stomach and small intestine of Swiss albino mice. The results revealed severe histopathological effects on the tissues of both stomach and small intestine. There was marked atrophy of musculature, and disintegration of sub-mucosal and mucosal tissues, distortion of villi with disintegration of mucosal epithelial cells characterized by cytoplasmic vacuolization, nuclear pycnosis and nuclear fragmentation. A significant damage in the Brunner's gland and crypts of Liberkuhn was also observed.



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**VI**

**ABSTRACT OF  
POSTER PRESENTATION**



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**Sub-Section: Agriculture, Energy & Geology**  
**Energy and Climate Security - A Developing Country Perspective**

**B Sudhakara Reddy and Hippu Salk Kristle Nathan\***  
*Indira Gandhi Institute of Development Research, Mumbai, India*

**Key words:** Energy-climate nexus, energy-security index, climate-security indicators.

**ABSTRACT**

The imperative for energy and climate security is paramount for global, national and internal stability and development. In this context, the present study develops a framework for energy and climate security considering India as a case study. First, it analyses the state of energy deprivation of developing countries. Then it presents climate dilemma concerning the developing countries. The paper evaluates energy security of India through some indicators of supply and demand security and also proposes measures to assess climate security. These measures are instrumental in tracking the energy and climate performances of the country. The paper concludes with a policy framework for integration of energy and climate security.

**Sub-Section: Agriculture, Energy & Geology**  
**Studies on extraction and chemical analysis of sugarcane wax from press mud of sugar factories from Kolhapur district**

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**Key words:** - Sugarcane, press mud, wax, iodine value.

**ABSTRACT**

Press mud is a rejected waste material of sugarcane industries which causes unwanted problem of pollution to the surroundings of sugar mills. The present study deals with development of method for isolation and analysis of wax from press mud waste of the sugar



industries from Kolhapur district. The crude wax is extracted by using Toluene and Benzene as a non Polar Solvent and Acetone and Methanol as polar solvent and pure wax is obtained by treating with isopropyl alcohol. The physico-chemical characterization was carried out for isolated microwax. The yield of wax was found from Polar solvents was more as compared to non Polar Solvents. The colour of crude wax was brownish green while the pure wax was light yellow in colour. The acid value and saponification value of the wax extracted using polar solvents was high as compared to wax extracted using non polar solvents. The C: N ratio of the press mud increased after extraction of wax. The results are discussed.

**Sub-Section: Agriculture, Energy & Geology**  
**Successional Growth Pattern of (Non-Heterocystous) Blue Green Algae in the Paddy Fields of Rae Bareli (U.P)**

**Chandra Bhan and Narendra Mohan**

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**Key words:** - Successional growth pattern, non-heterocystous BGA, paddy fields, Raebareli.

**ABSTRACT**

In the present investigation authors studied at high temperature and high humidity the growth of Non- heterocystous unicellular forms of genus viz. Aphanocapsa, Aphanothece, Chroococcus, Gloeocapsa, Gloeotheca, Microcoleus, Merismopedia. When heavy rains occur growth of filamentous Non-heterocystous forms of the genus viz. Lyngbya, Oscillatoria, Phormidium, Schizothrix and Plectonema. The growth of blue green algal forms were present and to the paddy nursery beds and ready for plantations, The forms viz. Aphanocapsa koordersii, A. montana, Aphanothece naegelli, A. pallida, Chroococcus cohaerens, C. gomantii, C. limneticus, C. minutus, Gloeocapsa calcarea, Microcoleus acutissimus, M. Chthonoplastes, M. sociatus, Porphyrosiphon notarisii, Phormidium tennue, Lyngbya magnifica, L. laxespiralis, L. major, L. putealis, L. spiralis, L. princeps, L. annae, L. amphibia, L. acuta, L. subbrevis, Oscillatoria laete-virens appear in

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the month of June and July as a dominant and common forms. The growth of BGA present at the time of harvest and after harvesting viz. *Aphanocapsa grevillei*, *A. littoralis*, *Aphanothece castagnei*, *A. pallida*, *A. naegelli*, *Chroococcus gomantii*, *C. limneticus*, *Gloeocapsa atrata*, *Microcystis acutissimus*, *M. chthonoplastes*, *M. sociatus*, *Porphyrosiphon notarisii*, *Phormidium tenue*, *Lyngbya martensiana*, *L. spiralis*, *Oscillatoria acuta*, *O. annae*, *O. subbrevis*, and *O. vizagapatensis*. These forms tolerate low temperature 20-32°C. The forms *Aphanothece naegellii*, *A. pallida*, *Chroococcus gomantii*, *C. limneticus*, *Gloeocapsa atrata*, *Microcoleus acutissimus*, *M. chthonoplastes*, *M. sociatus*, *Porphyrosiphon notarisii*, *Phormidium tenue*, *Lyngbya spiralis*, *O. annae*, *O. subbrevis*, *O. vizagapatensis* have very wide range of temperature tolerance tendency.

**Sub-Section: Agriculture, Energy & Geology**  
**INCIDENCE OF PARASITISM ON *Helicoverpa armigera* LARVAE**  
**COLLECTED FROM TOMATO CROP PLOTS IN MAWIONGSUN**  
**VILLAGE**

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**Keywords:** *Helicoverpa armigera*, natural enemies, parasitoids, Tachinid fly, Meghalaya

**ABSTRACT**

Although *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) is often considered the most serious insect pest in the world, there are several natural enemies both parasitoids and predators which have the potential to restrict its population below the economic injury level. This paper reports the incidence of parasitism on *H. armigera* larvae collected from the tomato fields situated in the village of Mawiong Sun in East Khasi Hills District of Meghalaya. The mean level of parasitism was found to be 14.4%. However, out of the total cases of parasitism during the period of study, 91% of parasitism of host larvae was due to a dipteran species belonging to the Tachinidae. From the study it may be concluded that the major parasitoid attacking the *H. armigera* larvae in the study area is a Tachinid fly.

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**Sub-Section: Agriculture, Energy & Geology**

**Petrographic Study of Assam Coal: An X-Ray Scattering Analysis**

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**Key words:** Coal, Lekhapani, X-ray.

**ABSTRACT**

Coal sample collected from Lekhapani area of Assam was studied using XRD. Random layered structural values for mean lamellae diameter (La) and crystalline size dimension (Lc) were found to be 22.33 and 8.4A respectively. The position of y-band was found to be 4.18A. The average number of atoms and no. of layers as determined by X-ray method were found to be 23 and 2 respectively.

**Sub-Section: Agriculture, Energy & Geology**

**Comparison of Nitrogen and Phosphorus Content of Seasonal Vegetables  
Cultivated with Sewage Water of Chinapukur and  
River Water of Tarakeswar**

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*Key words: Chinapukur, Tarakeswar, agricultural water, vegetables.*

**ABSTRACT**

For the purpose of the present study, two sites were selected; one, Chinapukur (a place near Ghatakpur), where sewage water is used for cultivation, and the other, Tarakeswar where the river water of the Damodaur is used for cultivation of vegetables.

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Water and vegetables were collected from the above places during two seasons, viz. winter and summer.

Nitrogen (NO<sub>3</sub>-N, NH<sub>4</sub>-N) & Phosphorus (PO<sub>4</sub>-P) content of agricultural water and vegetables were estimated. All estimations were replicated twice for each sample of water and vegetables. Results indicate that NH<sub>4</sub>-N content of vegetables in winter was more in Chinapukur than in Tarakeswar. In general, the PO<sub>4</sub>-P content was high in Chinapukur in both the seasons as compared to that in Tarakeswar, but generally the PO<sub>4</sub>-P content was high in summer.

**Sub-Section: Agriculture, Energy & Geology**  
**A Baseline Study of Dietary Intake of Natural Radionuclide's In High Background Radiation Area's (Hbra's) South Coast of Tamilnadu, India**

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**Key words:** HBRA's, Market Basket Study, Duplicate Diet Study.

**ABSTRACT**

South Coast of Tamil Nadu has rich deposits of monazite, a major constituent of thorium and other rare earth elements and referred as high background radiation areas (HBRA's). People living in HBRA's region are expected to receive significant amount of radiation via intake of food crops grown in HBRA's and accumulated in the tissues causing health problems. To construct a baseline study of radionuclide's concentration in the diet consumed by the people living in HBRA's, Market basket studies (MBS) and Duplicate diet studies (DDS) were adopted for diet sample collection of crops grown in HBRA's. The concentration of radionuclides in the food samples were analyzed by radiochemical separation and gamma spectrometry. Totally 184 families were surveyed and recruited for diet sample collection, and the market basket studies were done in 2 local markets from the study area. The ground radiometric survey was compared with previous work done for the classification of villages and the results shows the highest level of radionuclides in the Manavalakurichi area and medium level in the surrounding regions.

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**Sub-Section: Agriculture, Energy & Geology**

**Pipe Distribution Network for Irrigation - an Alternative to Flow Irrigation**

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*Key words: Open Channel Irrigation, conservation of water, pipe distribution network, overall project efficiency.*

**ABSTRACT**

The human population is increasing at an alarming rate. Available resources including water and food are falling short in coping up with the increasing need of mankind. To increase food production from agriculture, irrigation is one of the tools to conserve water and utilize it for agriculture production. Irrigation of agricultural land is done using various methods such as flow through open channel, lift irrigation, and drip irrigation etc. Conventionally on almost all command area of irrigation projects in India, the water for irrigation is supplied through a network of turnout, sub minor, distributory, branch canal and main canal. Here, almost 50 % of water is lost during the storage and distribution. There are many disadvantages of the conventional system of irrigation in their design and overall project efficiency (OPE) of the conventional system is obviously low and ranges between 41 to 48 % only. Actual OPE, which is only 20-35 % in most irrigation projects. To improve the overall project efficiency of a project, it is essential to overcome various constraints which are responsible for the low efficiency.

The Pipe Distribution Network (PDN) for irrigation purpose is one of the best solutions for substantially improving the design and actual OPE. Pipe Distribution Network (PDN) is the technique of irrigating the command area through a network of HDPE pipes under gravity flow in place of open channels. This paper describes the essential requirement for PDN implementation, general installation guide lines for PDN and planning and design principles of PDN. The paper also discusses about the advantage and scope of PDN, improvement in the OPE by adopting PDN, and compares the percentage increase in efficiency of the project and other parameters for an illustrated project of Nagthana-2 in Amravati District of Maharashtra.

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**Sub-Section: Agriculture, Energy & Geology  
Energy Conservation, Pollution Control and Zero  
Maintenance Thorough Green Buildings**

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**Key words:** Green building, energy, pollution control.

**ABSTRACT**

Green building is the term that refers to designing and building structures that are environmentally sound and follow the tenets of sustainability. Such buildings consume less energy, are durable and can be recycled. The construction, maintenance and demolition of buildings consume a tremendous amount of energy and resources. Building green is important to the protection of ecosystems, to maintain safe air and water quality, and to conserve renewable and nonrenewable natural resources. Energy efficiency and resource conservation also play a vital role. Green building is an immediate, measurable, and cost-effective solution to the complex and interrelated issues of climate change, energy dependence, and human health. The energy crises of the 1970's spawned research into green building, with the development of new glazing technologies and solar designs, as well as the development of natural cooling, ventilation and daylight systems. Many private sector and government funded demonstration projects were built at this time and in the decades that followed. Worldwide, the building and construction industry consumes more fossil fuels and natural resources than any other human activity.

The cost of green buildings is generally overestimated. The additional cost for incorporating green design will be only 5 to 6% of the total cost. This will be offset by the reduced costs of operation and maintenance. Cost of lighting, heating/cooling, water supplied will be much less than that for the conventional buildings. With the costs of cement and steel sky-rocketing, green buildings will prove to be cost effective. The Energy Conservation Building Code (ECBC), launched on 28th June 2007, is a document that specifies the energy performance, requirements for all commercial buildings that are to be constructed in India. The concept of green building minimises environmental degradation. In India, there are many green buildings like the new Shamshabad Airport in Hyderabad, TATA Energy Research Institute, Gwal Pahadi, Gujarat Energy Development Agency (GEDA), Medicity in

Hyderabad etc.

Practitioners of green building often seek to achieve not only ecological but aesthetic harmony between a structure and its surrounding natural and built environment, although the appearance and style of sustainable buildings is not necessarily distinguishable from their less sustainable counterparts. This paper deliberates upon the aforementioned issues of Green buildings.

**Sub-Section: Agriculture, Energy & Geology  
Fermentation performances of *Pichia stipitis* on  
hot water pretreated corn stover**

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**Key words:** Corn stover, hot water treatment, hydrolysate, *Pichia stipitis*.

**ABSTRACT**

Corn stover, an agricultural byproduct has the potential to produce lignocellulosic ethanol due to its widespread availability, abundance and relatively low cost as raw materials. The hydrolysate from hot water pretreated corn stover at 10% (w/v) loading rate was fermented to ethanol using different strains of *Pichia stipitis* for a period of 72h. The hot water pretreatment reduces cellulose crystallinity and increase the total soluble sugar recovery by 9.98 times over untreated corn stover. The ethanol production from pretreated corn stover hydrolysate by *P. stipitis* strains peaked at 48h and thereafter reduced, suggesting the importance of detoxification in improvement of detoxification and fermentation of corn stover.

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**Sub-Section: Agriculture, Energy & Geology**  
**Water Hammer Damage to an Irrigation-Cum-Hydro**  
**Power Water Conducting System**

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*Key words: Water hammer, hytran, hydraulic transient, Peizometric head.*

**ABSTRACT**

A detailed study of the causes behind the damage of an irrigation-cum-hydro power water conducting system was undertaken. Hydraulic transient in the system due to sudden opening of the irrigation outlet was analyzed using HYRAN software. It was found that negative pressure develops in the water conducting system which may have damaged the conducting system. Based on the analysis, it is suggested to provide a valve on the hydro-power conducting line at the bifurcation of the water conducting system to avoid negative pressure in the system and thereby to safeguard the system from the collapse due to negative pressure.

**Sub-Section: Agriculture, Energy & Geology**  
**Studies on Effect on Brewery Waste Water Sludge (BWS)**  
**on Morphology, Yield of Chilly Plant.**

**N. Ramya, G. L Supriya, Dr. T. Srinivas and Dr. K. Aruna Lakshmi**

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**Keywords:** BWS, COD, BOD, fertilizer, compost, chilly

**ABSTRACT**

In an effort to increase yields from a limited area, farmers tend to indiscriminately use more chemical fertilizers and pesticides. Brewery waste water sludge (BWS) is the



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sludge generated from brewing industry with high organic loading in terms of COD and BOD. The BWS can be directly applied to the soil for the agricultural purposes or it can be composted before utilizing for plant growth. A potted experiment was conducted to evaluate the potential of BWS on different soil chemical properties and growth of chilly plant. Sun dried BWS was mixed with river sand in different ratios. At the end of the experiment, considerable changes were found in the yield of the plant, as well as significant changes were in soil properties.

**Sub-Section: Agriculture, Energy & Geology  
Topography and Irrigation**

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**Key words:** Topography, irrigation, successful agriculture.

**ABSTRACT**

The influence of topography in irrigation source selection is quite extensive and intense. Canal, well irrigation (dug well and tube well), river lift irrigation, ponds, each has individual topographic limitation in their expansion. The topographic configurations strongly determine the relevance and success of irrigation sources. As time and quantity of water availability are prime objectives to promote successful agriculture, the source selection needs to be more accommodating for a particular topography so as to optimize efficacy.

**Sub-Section: Agriculture, Energy & Geology**  
**Changes in Soil and Plant Parameters as a Response to Inoculation  
of Endogeic Earthworms and Incorporation of Organic  
Matter in Tea Agroecosystems Of Southern India.**

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**Key words:** Tea, soils, endogeic earthworms, pruning materials, macrofauna.

**ABSTRACT**

A study was undertaken in the degraded soils of tea agroecosystems of southern India. Selected endogeic earthworms were inoculated along with high and low quality organic matter. Principal component analysis (PCA) showed significant changes in soil macrofauna abundance in the first year and second year. Biplot multivariate analysis result exhibited significant difference between macrofauna population of earthworm inoculated plots vs conventional plots. Average production of made tea (yield ha<sup>-1</sup> yr<sup>-1</sup> in kg) was 2987±164.3 in conventional plots and 3022±187.2 in earthworm inoculated plots. Made tea quality (total liquor colour, brightness index, TF:TR ratio etc.) also changed significantly after earthworm inoculation.

**Sub-Section: Agriculture, Energy & Geology**  
**Dynamics of Fungal Population Associated With Decomposing Sugarcane  
Trash under Different Environmental Conditions**

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*Key words: Decomposition, sugarcane trash, fungal population.*

**ABSTRACT**

The present communication deals with the quantitative variations in the fungal

populations associated with decomposing sugarcane trash under different environmental conditions. The experiments were performed in two cities viz., Delhi and Meerut, having different climatic conditions. As the decomposition progressed, changes in the number of species colonizing the trash exhibited some degrees of variations. The number of species isolated at the terminal stages of decay was lower than that in the beginning. In general, the number of species remained constant in early stages of decomposition and, thereafter, showed an increase but finally decreased during the last stages of decomposition. There was an increase in the fungal population per gm dry litter on 30th day as compared to that in the beginning. At Delhi, the population was found to decrease substantially on 90th day and steeply by 150th day. Thereafter, the population first increased by 210th day but later on came to the level of 150th day. Thus, overall, there was an increase in the beginning but a decrease was observed in the later phases of decomposition. At Meerut, however a regular increase was observed from 0 to 30th day and 30th to 90th day, perhaps due to more suitable environmental conditions since this part of the experiment was performed during rainy season. Fungi require a minimum water activity 'aw' for growth. Thus, the residues are initially colonized by those fungi which are capable of growing at low moisture contents. As a result of decomposition, the water activity 'aw' of residues is increased, which is suitable for the growth of many fungi. Moisture and moisture flow are now widely recognized as key factors in the biodegradation of waste refuses. Therefore, increase in fungal colonization takes place at least in the initial phases of decomposition. The sharp fall in the fungal population in the late phases is understandable because of rapid rate of decomposition and obvious decrease in nutrient availability.

### **Environmental Impact of opencast in SSSL-AP**

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**Key words:** EIA, opencast mining, ambient air quality, geo-friendly, waste water, over burden, biological-engineering.

**ABSTRACT**

Any development activity results in environmental degradation as it disturb the natural existing system. With growing population and planned economic growth for better standards of living, there will be greater demand for exploitation of minerals resources besides other natural resources, increasing environmental pressure with passage of time. The mining industry plan a vital role in the overall economy and industrial development of any country. Most of the Energy requirements in India (about 70%) are based on coal.

The Technology transferred in pursuit of Socio-Economic development has led to increase in Opencast Coal Mining with highly mechanized systems as the productivity is very high compared to underground mining.

In SCCL-AP, the increasing O.C. Mining results in environmental degradation in various sectors. Air is polluted with "suspended particulate matter" (SPM) and gaseous emission like SO<sub>x</sub> and NO<sub>x</sub>. The water resources are polluted due to acid mine drainage, heavy silting, greases, oil and other heavy metals. The O.C. results in Noise Pollution. The flora and fauna and wild life gets affected due to deforestation and changes in land use patterns.

**Sub-Section: Agriculture, Energy & Geology**

**Bioaccumulation of cadmium and their effects on biochemical constituents in water lettuce (*Pistia stratiotes* L.)**

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**Key words: Cadmium, *Pistia stratiotes*, biochemical constituents, phytoremediation.**

**ABSTRACT**

Present study was carried out to analyse the bioaccumulation capacity and biochemical responses of commonly grown water lettuce (*Pistia stratiotes* L.) exposed to various concentrations (0, 0.1, 10, 100 and 200  $\mu$ M) of cadmium. Plants exhibited visible symptoms of toxicity such as marginal chlorosis and necrosis of young leaves at 200  $\mu$ M

cadmium. The tissue concentration of cadmium increased with increase in cadmium concentration to a maximum of 855 µg/g dry weights in roots, and 490 µg/g dry weights in leaves at 200 µM cadmium concentrations. All the biochemical constituents (pigments and protein content) decreased with increase in cadmium concentrations above 0.1 µM. Maximum decrease in total chlorophyll, carotenoid and protein contents by 45, 39 and 73% was observed at 200 µM Cd.

The study concludes that *Pistia stratiotes* accumulated high content of Cd in their tissues, alters biochemical responses and exhibited visible symptoms of Cd toxicity. These findings may be helpful in phytoremedial approaches to minimize Cd level from surface water bodies.

**Sub-Section: Agriculture, Energy & Geology**  
**Bioethanol production from Agro wastes of Paddy**

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**Key words:** Bioethanol, biomass, paddy straw, paddy husk, cellulose.

**ABSTRACT**

Biomass materials are used since millennia for meeting myriad human needs including energy. Main sources of biomass energy are trees, crops and animal waste. Bioethanol produced from renewable biomass has received considerable attention in current years. There has been an increasing interest in utilizing alternative sources of energy. Paddy straw and Paddy husk are the basic raw material chosen for bioethanol production in present study because of their abundant availability as crops stovers and unutilizable agro wastes. Each type of this biomass having more than 60-70% cellulose appeared to be very suitable for bioethanol production. The pretreatment method followed in the present investigation is similar to that applied to other cellulosic biomass as the percentage of available cellulose free from lignin seal constitute crystalline cellulose and hemicellulose 68% percentage. The subsequent hydrolysis by both chemical and enzymatic methods following the standard method reported by many workers shows significant result in producing fermentable sugar within reasonable incubation period. However for standardization of the protocols use of

model sources of cellulase in view of commercial enzyme needs further investigation. With the limitation of time the procedure followed in the present investigation shows encouraging result ranging from 0.583mg/gm to 1.919mg/gm of fermentable sugar produced after 4 days incubation of reaction mixture in standard reaction, through enzymatic cellulolysis.

**Sub-Section: Agriculture, Energy & Geology**  
**Removal of Crystal Violet from Aqueous Solutions**  
**by Citric Acid Treated Rice Straw**

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**Key words:** Crystal violet, wastewater, effluents, Langmuir isotherm model, Rice straw.

**ABSTRACT**

Crystal Violet is a widely used, cationic synthetic dye, and because of various adverse properties any effluent streams containing the dye require treatment prior to discharge. The correct disposal of synthetic dye wastewater after proper treatment is difficult because of the dye properties and their resistance to degradation processes. Adsorption is often an effective, economical and useful process for the treatment of dye effluents. The potential use of rice straw, a plentiful waste agricultural product, to remove Crystal Violet from aqueous solution by a batch adsorption process was evaluated. Rice straw was transformed into an effective adsorbent material by treating with citric acid. During the treatment process, the effects of stirring rate, temperature, pH, initial dye concentration and sorbent dose were studied. The Langmuir isotherm model was a good representation of the equilibrium data. The mean free energy (E) estimated from the Dubinin-Radushkevich (D-R) model indicated that the main mechanism governing the sorption process was chemical ion-exchange. The kinetic data were shown to be represented by the pseudo-second-order model and the intraparticle diffusion model. Gibbs' free energy was spontaneous for all interactions, and the adsorption process exhibited endothermic enthalpy values. Results suggest that Citric acid treated Rice straw is a potential low-cost adsorbent for the removal of Crystal Violet from aqueous solution.

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**Sub-Section: Agriculture, Energy & Geology**  
**Characterisation and composting of**  
**biodegradable portion of Imphal city waste**

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**Key words:** City waste, biodegradable organic,  
cellulose degrading microorganisms, compost quality.

**ABSTRACT**

The biodegradable organic portion (BOP) of Imphal city waste was 36.5% of the total estimated quantity of 68.19MT generated daily. The pathogenic and beneficial microorganisms present in the waste were determined, and for its conversion into compost, search for efficient isolates of cellulose degrading microorganisms (CDMs) was made. A total of 46 CDMs were isolated from different organic materials and the efficiency of the isolates were determined on the basis of cellulase activity and C-CO<sub>2</sub> evolution. Cellulose activity of the isolates ranged from 0.0 to 2.94µM/ml/min, whereas C-CO<sub>2</sub> evolution ranged from 0.006 to 0.524 mg of C. Inoculation of efficient CDM isolates either alone or in combination with earthworms into BOP alone or in mixture with rice straw and cow dung resulted in efficient conversion of organic waste into compost. Initial uninoculated BOP contained 1.12X10<sup>9</sup> to 3.34X10<sup>9</sup> harmful and 1.24X10<sup>9</sup> to 1.53X10<sup>9</sup> beneficial bacteria. Better quality compost in terms of fineness, beneficial microbial load, reduction in pathogenic bacteria as well as nutrient contents was obtained from inoculated compost as compared to the initial mixture. The total N was significantly lower, whereas P and K content remained unchanged compared to their content in original BOP. Loss of N was to the extent of 31.66% to 46.3%. pH of the compost ranged from 8.1 to 9.3 and the high alkaline condition may be responsible for volatilisation loss during decomposition.

**Sub-Section: Agriculture, Energy & Geology**  
**Screening of Extracellular Keratinase Producing Bacteria from Poultry Farms of Ahmednagar (MS), India**

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**Key words:** Keratin, keratinolytic bacteria, keratinase, feather meal broth.

**ABSTRACT**

The aim of the current study was to isolate keratinolytic bacteria from the soil samples. Eight isolates were recovered. Out of the 8 isolates, 4 isolates showed proteolytic activity. Isolate Sanshu -VIII showed maximum proteolytic activity (zone of clearance on skimmed milk agar medium) and was used for further analysis. Protease and keratinase activity increased with time, but it decreased after day three. Isolate Sanshu-VIII showed high keratinase activity and optimum growth at 37o C and pH 7-9. By comparing with reference strains in Bergys Manual of systematic bacteriology, the morphological and biochemical characteristic of isolate Sanshu-VIII was similar to the characteristics of Bacillus.

**Sub-Section: Agriculture, Energy & Geology**  
**Identification and Characterization of an Arsenic Tolerant Bacteria from Arsenic Contaminated site in 24 Parganas (North)**

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**Key words:** Arsenic, bacteria, industrial sludge.



**ABSTRACT**

Arsenic is a common menace in the state of West Bengal particularly in the district of 24 Parganas (North) and (South), the major sources being geological in nature. Soil sample collected from one such particular location, "Baduria", was tested for the presence of arsenic (As), and the As content of the soil was 2.18 ppm. Seven different strains of bacteria were isolated by serial dilution and were also tested for As tolerance. On the basis of their tolerance, three organisms (C-3, C-4, C-7) showed remarkable percentage uptake of As (2.24%, 2%, 43% respectively). This organism was characterized and identified by 16s rRNA sequencing followed by BLAST and was found to be *Bacillus thuringiensis* strain-ZJOU-010 (Gene Bank Accession Number GU384894.1). On the basis of its As uptake ability it is suggested that the strain can be used in the designing a suitable protocol for the treatment of As contaminated sludge generated industrially from As treatment plant using alumina. This can give a new insight in microbial arsenic trapping with minimum toxic implications in the nature.

**Sub-Section: Agriculture, Energy & Geology**  
**Biofuels: A juncture of sustainability for Community,  
Technology and Environment**

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*Key words: Biofuels, community, environment, technology, sustainability.*

**ABSTRACT**

Demand for energy in the form of food and fuel, in the world, is increasing day by day, and in contrast, environment is deteriorating at a similar pace. It attracts the attention of whole world towards finding a multipoint solution for dealing with these dichotomous conditions. In this regard, biofuels can emerge as a key solution with multiple potentials.

As the production of biofuels is directly related to the growing of biofuel cash crops, it would be of great help of communities surviving on agriculture not only in monetary terms but in providing them a force of solidarity. Moreover, biofuels cannot be extracted without the help of advanced technology while its environment friendly nature is well recognized. So shifting the basis of economies to biofuels can provide the world a wise

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elucidation for energy requirements without compromising environment. This paper is an attempt to explore the multiple facets of using bio fuels and attempts to establish a network between community, technology and environment in the backdrop of biofuels.

**Sub-Section: Agriculture, Energy & Geology**  
**Initial Geomicrobiological Report on Syndai Cave Ecosystem, Jaintia Hills, Meghalaya: Some SEM Observations**

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**Key words:** Geomicrobiology, geobiology.

**ABSTRACT**

Geomicrobiological studies on Syndai Caves were undertaken with an aim to understand the mineral- microbe interactions. The results from scanning electron microscope studies are reported, which have geomicrobiological implications. SEM observations of speleothems and cave wall deposits prove the presence of fossil microbes (bacilli. Cocci, ovoid, tubular forms), hollow microbial tubes, microcrystalline fibre calcites, calcified filaments and biomineral structures, which could be interpreted as biogenic in origin. Further, in situ experiments are being undertaken to confirm the biogenicity of these deposits.

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**Sub-Section: Agriculture, Energy & Geology**

**SYNTHESIS AND CHARACTERIZATION OF BIODEGRADABLE  
PROSTHESES FROM AGRICULTURAL FEEDSTOCK  
FOR BETTER ENVIRONMENT**

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**Key words:** Prostheses, castor oil, Cloisite30B, polyurethane nanocomposites and Toluene Diisocyanate.

**ABSTRACT**

Ecofriendly biodegradable polyurethane nanocomposites from castor oil and Toluene Diisocyanate were prepared and characterised. Addition of filler, like organically-modified montmorillonite(Cloisite30B), enhances the thermal stability and hence, is thermally resistant to the daily activities, and improves all other properties. Even a small amount of clay addition has remarkable influence on the Polyurethane, thereby paving a new way for the usage of biodegradable PU in the fabrication of prostheses. Hence, enriched with the concept of using agricultural feedstock, it would enlighten the technology of Prosthetic -Orthotic science and empower the people with physical challenges with new and better prospects of living.

**Sub-Section: Agriculture, Energy & Geology**

**Soil Biological Quality and Heavy Metals in Raniganj Coalfield Area**

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**Key words:** Soil heavy metals, enzymes, respiration, coalfield.

**ABSTRACT**

Soil contamination by heavy metals not only affects the health of plant, animal, and humans, but it has a profound effect on soil micro-flora. To study the effect of heavy metals on soil microbial activity, forty soil samples were collected from different locations of Raniganj coalfield, and analysed for heavy metals and microbial activities. As, Be, Co, Cr, Cu, Mn, Ni, and Pb were enriched up to 2 times in the coalfield soils as compared to a control site. Soil dehydrogenase and fluorescein di acetate hydrolases (FDA) enzyme activities were significantly lower in coalfield soils, however, the soil respiration and phosphatase activities were higher.

**Sub-Section: Agriculture, Energy & Geology**  
**Remote Sensing and Geotechnical Information Technology**  
**--A Case Study on Kolleru Sanctuary**

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**Key words:** Remote sensing, GIS, computer, information.

**ABSTRACT**

Remote sensing means the process of acquiring information about any object without physically contacting it in anyway regardless of whether the observer is immediately adjacent to the object or millions of miles away. Remote sensing data basically consist of wavelength intensity information acquired by collecting the electromagnetic radiation leaving the object at specific wavelength and the measuring its intensity. To know the geographical information about art, science, engineering & technology, GIS system is used. GIS is a generic term denoting the use of computer to create and depict digital representation of the earth's space. GIS has its roots for the development of remote sensing, in the late 1960's and early 1970's, as a potentially cheap and effective source of earth observations. While many of techniques for processing remote sensing data are highly specialized, more general GIS techniques become important in order to combine information desired from remote sensing with other collateral information. GIS has many roots of evolution like map production process. The root of large scale data integration around a common data model & possibility storing large number of layers of information.

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**Sub-Section: Agriculture, Energy & Geology**

**Screening of stable photosynthetically efficient rice (*Oryza sativa* L.) under high CO<sub>2</sub> condition in open-top chambers**

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**Key words:** Net photosynthesis, rice, photosynthetic pigments, polyphenols, starch.

**ABSTRACT**

Global climatic change due to elevated CO<sub>2</sub> has posed a worldwide challenge on the food security on earth. Sixteen rice varieties of Orissa (Saria, Ladari, Annapurna, Lalat, Khandgiri, ORS-326, ORS-350, Safari, ORS-358, ORS-334, ORS-321, ORS-310, Swarna, Swarna sub-type 01, ORS-337, ORS-331) were tested for photosynthetic efficiency, pigment contents and related physiological parameters at elevated CO<sub>2</sub> level (470ppm, 660ppm) and ambient CO<sub>2</sub> (380ppm) condition in Open Top Chamber (OTC). Response of genotypes to elevated CO<sub>2</sub> differed significantly for P<sub>n</sub> ratio and photosynthetic pigments. Lalat, ORS-326, ORS-337 and Swarna showed decreased chlorophyll content under 660 ppm CO<sub>2</sub> at 45 d of treatment with a high photosynthetic efficiency and grain yield as compared to other varieties suggesting their potential agricultural use under expected global climate change in coming decades.

**Sub-Section: Agriculture, Energy & Geology**

**Impact of Higher Level of Iron in the Root Environment on Growth and Metabolism N Rice**

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**Key words:** Bronzing score, iron toxicity, *Oryza sativa*, physiological disorder and yield.

**ABSTRACT**

Iron toxicity is a major nutrient disorder affecting rice production of wetland rice in the irrigated and rain fed ecosystem worldwide. High concentration of ferrous iron in water logged acid soils is a constraint for higher rice production in Assam. Three rice (*Oryza sativa* -L) varieties- Mahsuri, Ranjit and Siyal Sali were grown in four different levels of Fe<sup>2+</sup> concentration, viz- Control, 100ppm, 200ppm and 300ppm. Iron at 300ppm in the medium was found to induce severe bronzing disorder in the variety Ranjit and Siyal Sali. Variety Mahsuri maintained higher leaf chlorophyll, total soluble protein, peroxidase and polyphenol oxidase at all the treatments. On the other hand, a significant yield in parameters was observed in Siyal Sali and Ranjit at higher iron concentration. Mahsuri can be considered as a suitable rice variety for growing under higher level of Fe<sup>2+</sup> concentration in the root environment.

**Sub-Section: Agriculture, Energy & Geology**

**Application of Remote Sensing Data in Land use and Land cover studies of Melkarandaiodai sub basin, Southern Tamil Nadu**

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**Key word:** Remote sensing, land use, land cover, image, management.

**ABSTRACT**

This paper attempts to study the land use and land cover change through remote sensing data in Melkarandaiodai sub basin, Southern Tamil Nadu. Land -use and land cover change is significant to a range of themes and issues central to the study of global environmental change. The alterations it effects on the surface of the earth hold major implications for sustainable development and livelihood systems, and also contributes to changes in the biogeochemical cycle efforts of the earth, affecting the atmospheric levels of greenhouse and other trace gases. Understanding the nature of land-use/ cover change and

its impacts requires the joint efforts of natural and social science because of the expertise of each in certain key facets of the topic. Remote sensing imagery has many applications in mapping land-use and land-cover, agriculture, soils mapping, forestry, city planning, archaeological investigations, military observation, and geomorphologic surveying, among other uses. Although the terms "land cover" and "land use" are sometimes used interchangeably, they are actually different. The percentage change in land use namely agricultural land, settlements, water bodies, dense forest, open forest and scrub land is calculated and represented. Melkarandaiodai sub basin covers Aruppukottai, Sattur, Virudhunager, Ettayapuram, and Vilathikulam and located at 90° 10' 47" to 90° 33' 9" N latitude and between 77° 58' 23" E to 78° 10' 15" E longitude and maximum elevation of 65m and minimum elevation of 40 mts. The difference of each land use between 2004 and 2006 for Sattur, Aruppukottai, Virudhunager, Ettayapuram, and Vilathikulam taluks are found out by subtracting the actual total area in sq. km under each land use in 2004 and tabulated as change in land use. The values of changes of all land uses thus obtained are summed up. The change in percentage is marked as negative if a particular land use has decreased from 2004 to 2006 and positive if a particular land use has increased.

**Sub-Section: Agriculture, Energy & Geology**  
**Storage Fungi for the Management of Aflatoxin**  
**Production in Sunflower Seeds**

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**Key words:** Aflatoxin, natural plants, sunflower seeds, management.

**ABSTRACT**

The antifungal activities of ethanolic extracts of some selected natural plants were evaluated against aflatoxin producing strains of *Aspergillus* in stored seeds of sunflower. On screening, the ethanolic extracts of different parts of 10 herbal plants were evaluated by adopting a poisoned food technique to assess the inhibitory effect of extracts for their

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antifungal activity against growth of test fungi. Among the tested plants, *Allium sativum*, *Azadiracta indica*, *Allium cepa*, *Vinca rosea*, *Curcuma longa* and *Eucalyptus globulus* showed gave significant results against *Aspergillus flavus*. Observations of the present study suggest the possible use of selected plant extracts as potential fungi toxicant in ecofriendly management of biodeterioration of storage seeds against storage fungi.

**Sub-Section: Agriculture, Energy & Geology**

**Studies on the Effect of Composted Poultry litter on Seed Germination and Biochemical Changes of *Capsicum annum***

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**Key words:** Composted poultry litter, fertilizer and seed germination.

**ABSTRACT**

Poultry development in the recent past has evidenced very fast development and at present in A.P. the total population of poultry is 193 million, and the litter from these birds is estimated at 17.70 lakh tons per year. This extensive amount of poultry litter can be efficiently used in solving the present agronomic problems and increasing soil fertility. Further the use of composted poultry litter as a source of fertilizer would mitigate the problem of poultry litter disposal. Composted poultry litter is being applied on land as an amendment to provide nutrients to plants, and also enhance the organic matter content and improve the physico-chemical properties of the cultivated soils. In the present study, quantitative changes in physical, chemical and microbial properties of composted poultry litter were studied. In order to understand the composting process and evaluate the suitability of composted poultry litter as a soil amendment to *Capsicum annum*, *C. annum* was planted and monitored for growth performance and yield. The effect of application of composted poultry litter on the seed germination and the biochemical properties of *Capsicum* plants are discussed.



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**Sub-Section: Agriculture, Energy & Geology**

*Texture and geochemistry of sediments from Delhi ridge on the Thar Desert margin*

*Yama Dixit\*, Sumi Handique*

**Key words:** Delhi, texture, sediments, geochemistry; Thar Desert.

**ABSTRACT**

Delhi has NE trending sub parallel ridges of quartzites and is covered by consolidated sediments. Thick piles of yellowish brown sediments occupy the local depression in quartzites of the Delhi ridges. The texture, mineralogy and chemistry, of Delhi ridge sediments are similar to loess deposits. Texturally, these are moderately sorted sandy silt, typical of loessic sediments. The calculated chemical index of alteration is  $69 + 1.98$ , indicating the provenance from chemically less weathered rocks. These sediments seem to be of glacial origin, formed by physical weathering of rocks by movement of glaciers and then selective physical sorting by wind.

**Sub-Section: Climate Change**

**Managing Soils for Enhancing carbon sequestration in Mitigating Climate change, sustaining crop productivity and ensuring better environment**

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**Key words:** Carbon sequestration, climate change, soil types, soil degradation, environment, crop productivity.

**ABSTRACT**

Soils play an important role in global carbon cycle and contribute substantial amount of carbon to the total atmospheric CO<sub>2</sub>. Although carbon emissions from agricultural activities contribute the enrichment of atmospheric CO<sub>2</sub>, carbon sequestration in agricultural soils, through the use of best management practices, can mitigate this trend. Soils are a major sink for CO<sub>2</sub> if managed judiciously to increase soil carbon, but if extensively tilled they are a major source of CO<sub>2</sub> into the atmosphere. The maintenance of soil organic carbon in

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agricultural soils is primarily governed by climate, particularly, annual precipitation and temperature, and cropping systems. The results from several long term fertilizer experiments conducted in different agro-ecological regions involving diversified cropping systems and soil types have shown that the imbalanced fertilizer use, particularly N alone, had a deleterious effect on soil productivity and health and the damaging effects in the absence of P and K fertilizers varied in the order. The results further revealed that soil type is one of the most important factor affecting fertilizer use efficiency and crop yields. Therefore, sustained efforts are needed to improve and maintain this most important natural resource base -the soil through judicious integration of mineral fertilizers, organic and green manures, crop residues and bio-fertilizers so that it nourishes intensive cropping without being irreversibly damaged in the process. Development of site-specific integrated plant nutrient supply (IPNS) and management strategy is therefore, a viable option for enhancing nutrient use efficiency organic carbon status and sustaining the productivity of cropping systems. Thus carbon sequestration in soils i.e., increasing soil organic carbon in agricultural lands through proper management practices provides several environmental benefits in general and sustainability of agriculture in particular. It was also assessed for the first time that continuous adoption of 100% NPK + FYM @ 15 t/ha in maize-wheat-cowpea cropping system in semi-arid subtropical India might sequester 1.83 Tg C/year which corresponds to about 1% of the fossil fuel emissions by India. The study demonstrates that IPNS is an approach ecologically, socially and economically viable and environmentally un-hazardous.

**Sub-Section: Climate Change**  
**Climate Change: Conservation strategies of Bhitarkanika**  
**Mangrove Ecosystem Services**

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**Key words:** Climate change, coastal ecosystem, mangroves, conservation.

**ABSTRACT**

There are many reasons why it is critical that we act to preserve the fragile coastal ecosystem of the Orissan Coast found at Bhitarkanika. Not only is the natural wonder of the sanctuary worth protecting of its own right, but also it provides critical cultural and economic services to the people of the region as well as the people of Orissa and India in general. In fact, Bhitarkanika is a habitat of global importance.

Of the approximately ninety species of mangroves in the world, Bhitarkanika harbors about sixty-two of them. It is also home to over 215 species of migratory birds, which are critical to ecosystems far removed (and part of the reason why Bhitarkanika is listed as a Ramsar site) and an amazing 8 species of kingfisher. Fish and crab species too are abundant, as are reptiles. These include the marvelous estuarine crocodile, which can grow to be between seven and eight meters in length and for which Bhitarkanika serves as a sanctuary and the Olive Ridley Sea Turtle, which makes its annual migration to these sandy shores to lay its eggs. It is the largest turtle-nesting site in the world. Bhitarkanika is also the hatching ground for many fish and shrimp species, critical both to coral and marine ecosystems and commercial fishery. Rare estuarine dolphins also inhabit the murky waters. These intelligent mammals are a risk due to motorboat traffic and noise pollution in rivers around the world, and Bhitarkanika host several species.

**Sub-Section: Climate Change  
Overview and Analysis of Climate Change on Oceans  
and Collected Case Studies**

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**Key words:** Socio-economic impacts, livelihoods, climate change, oceans.

**ABSTRACT**

The potential impacts of climate change on coastal areas and islands are quite well known and get more documented. Their repercussions on people in terms of socio-economic impacts are also part of a growing body of literature, as are vulnerability assessments of regions or countries. However, when it comes to cultural consequences of climate change

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and adaptation strategies, especially with regards to indigenous communities, researchers are faced with a notable void. The oceans, which cover over 70% of Earth's surface, play important role in regulating climate and weather, through exchanges of water, gases and heat between the atmosphere and the oceans. They are a key part of the carbon cycle of our planet, and are believed to have absorbed about one-third of total anthropogenic CO<sub>2</sub> emissions until now. They contain more than 90% of the planet's living biomass and provide a living space 168 times larger than terrestrial habitats. The great wealth of marine of biodiversity provides livelihoods at or near sea level, often crowded into cities along the coasts (Hopkin, 2007) and important animal protein intakes to millions around the world. In order to give elements and priorities for further research, this paper will look at the known impacts of climate change on oceans and their repercussions on costal and island communities. It will then briefly summarise the regional projected impacts of climate change. Finally, two case studies on indigenous peoples in the Arctic and in Bangladesh will illustrate how ocean-related changes can impact on traditional ways of life, and possibly jeopardize the very existence of some community.

**Sub-Section: Climate Change  
Making Construction Projects Greener and Cleaner**

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**Key words:** Environment, waste management, construction, pollution.

**ABSTRACT**

Construction is one of the oldest activities involved in the civilization of mankind. The way construction work was undertaken during the ancient times possibly was more eco-friendly for various reasons. With the passage of time and improvement in technology, construction work became more and more complex and consequently started posing several challenges to environmental and safety & health aspects. In this paper an attempt has been made to study a few major construction projects and identify various construction-related environmental hazards and the steps that can be taken or already been to mitigate the adverse effects. During the study it was found that most of these steps are not difficult to implement and may be sustained without much investment and difficulty in execution. One approach

towards this is to focus on Reduce, Recycle and Reuse. These also help in cost reduction and achieve sustainability. These initiatives, taken to prevent environmental degradation and preserve natural resources, including health and hygiene of workers, may be emulated at other areas, considering the positive impacts towards greener and cleaner construction projects.

**Sub-Section: Climate Change  
Tsunami Warning System to Mobile**

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**Key words:** Tsunami, GSM.

**ABSTRACT**

The term tsunami originates from Japanese and means "harbour wave". It is a series of waves when a body of water, such as an ocean is rapidly displaced on a massive scale. Tsunamis cannot be prevented or precisely predicted, but there are many systems being developed to warn and save the people of regions with a high risk of tsunamis before the wave reaches land. Our paper focuses on the TSUNAMI WARNING SYSTEM TO MOBILE. This system warns subscribers of an impending tsunami, wherever they are, via a mobile text message. The tsunami alarm system picks up seismic signals from global stations and consolidates the information. If there is a danger of a tsunami, an alarm is sent out to subscribers via an SMS. The Global System for Mobile Communications (GSM) is the most popular standard used here for making calls such as text messaging. The ubiquity of the GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. The paper discusses about the reception and consolidation of the relevant information of tsunami by the satellite and the way in which this information is transmitted by the satellite and received by the mobile. This system is an efficient and a promising attempt to minimize destructions and save the lives of millions of people around the world.

**Sub-Section: Climate Change**  
**A Scientific Study of Climate Change of Odisha**

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**Key word:** Climate change

**ABSTRACT**

Climate is the description of the long-term pattern of weather in a particular area. In Odisha, an estimated 40 million tons of carbon dioxide is emitted to the atmosphere annually. Earlier Western Odisha was a known calamity hotspot but now the coastal areas are also experiencing heat waves.

Three main climatic controls such as topography, the urban morphology and the proximity to the sea affect the climate of Orissa. In last two decades, the increase in population in city areas is due to overall industrialization which resulted in shifting of population. The climate of Orissa state is characterized by hot summer and cold winter in the interior region and climate of the coastal region nearby Bay of Bengal is moist and equable. In recent past, more number of heat wave days is experienced even in Coastal Orissa during hot weather season and also in June till onset of monsoon. It is felt that the detected warming is not only due to the increase of greenhouse gases but also to urbanization and other possible climatic factors such as desertification. In all the cities, there is a trend of increase in the number of buildings and decrease in the vegetation covered area. The urban heat island effect is very important to the global change issue, both as an analogy and as an effect that has befuddled the interpretation of global temperature change. Significant urbanization effects have been noted in many cities.

Therefore, an attempt has been made to assess the climate change due to increasing CO<sub>2</sub> concentration, urbanization, solar activity etc. by the sequential version of the Mann-Kendall rank statistics. This method allows not only the detection of climate change but also the localization of the approximate beginning of an abrupt change. Among various techniques e.g. low pass filters, Cramer's test, the Mann-Kendall rank statistics and the spearman rank statistics, the Mann-Kendall rank statistic test seems to be the most appropriate

method for analyzing abrupt climatic changes in climatologically time series. In the test, the basic data set of surface air temperature including maximum and minimum temperature of annual, seasonal and also monthly in respect of Bhubaneswar, Cuttack, Balasore, Jharsuguda, Sambalpur, Gopalpur and Angul are utilized.

**Sub-Section: Climate Change**  
**Impact of Climate Change on Agricultural Production and Farming**  
**Community in a Semi Arid Agro Ecology in India**

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**Key words:** Vulnerability, climate change, community,  
common assets, traditional knowledge.

**ABSTRACT**

Vulnerability to climate change is primarily determined by three factors namely, Institutional factors (local knowledge, formal education, skills and role of local institutions etc.), Economic factors (health, labour, access to natural resources) and Environmental factors (lands, climate sensitivity and natural resources etc.). The marginally poor people bear the maximum brunt of climate related hazard due to poverty, lack of knowledge & adaptive skills, lack of information and access to capital assets. There is a strong relationship between behaviour of climatic variables and farm level net revenue.

A Tribal village named Kundai in Udaipur district of Rajasthan was selected for the study. The village (24°30' N and 74°08' E), is situated 80 Km away from Udaipur city, belongs to hot semi arid zone, received annual average rainfall about 574 mm over the last 40 years with very high year to year fluctuations. The production of major crops (rice, wheat, maize, sorghum, cotton, and sugar cane) varied widely in the region showing very strong relationship with performance of monsoon in the region. The lands in the village was found to be poorly fertile (low N, P, K status) and also poor in organic C content. The poorly fertile land along with widely fluctuating rainfall, high evaporation loss due to hot climate and severe scarcity of water makes farming as well as living very difficult. However, the difficulties of life due to natural as well as socio economic and developmental backwardness are not new to the tribal villagers. Over a period time they with their rich traditional knowledge and help form

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various NGOs and research organizations have learnt to utilize various adaptation measures. The most important fact is that the villagers have been maintaining utilizing the common assets like Water bank and Agri-Met lab for the betterment of the whole community even many years after the completion of a developmental project. This demonstrates that an integrated approach where Government, non government organizations, civil societies along with the community join hands the threats of climate change on the existence of the marginal communities can be overcome in a much efficient manner.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Vegetation Structure and diversity patterns of grassland Communities of north-eastern Uttar Pradesh, India**

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**Key words:** Grassland vegetation, community features, diversity attributes, North-Eastern U.P.

**ABSTRACT**

The grassland vegetation of north-eastern Uttar Pradesh showed the occurrence of over 300 species, and majority of them were annuals. The fraction representing different habitats and habits of total species content and the degree of commonness, rarity and aggregation were quantitatively measured. Of the total 43 families represented, Poaceae (11.8%), Fabaceae (11.2%), Asteraceae (9.9%), and Cyperaceae (7.2%) dominated in that order. Species such as *Phyla nodosa*, *Spilanthus acmella.*, *Trientema portulacastrum*, *Cyperus globosus*, *Desmodium triflorum*, *Oxalis corniculata*, *Euphorbia hirta*, showed much greater density, relative density and IVI, on their own as compared to the sum of their associates, The contribution of aggregating species like *Sonchus asper*, *Ruellia tuberosa*, *Fleurya interrupta*, *Cesulia coromandelica* towards Shannon diversity index and community biomass was also much greater as compared to those of associates. The interpretation of community organization in terms of resource share and niche space has been expressed in the form of dominance-diversity curve. Some of the rare species which formed the tail end of the curve were *Vitis sp.*, *Tribulus terrestris*, *Alocasia sp.*, *Clerodendron inerme*, *Cassia absus*, *Cleome rutidosperma*, and *Cyperus difformis*.



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**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Using bryophytes as a tool to cure European foulbrood disease of honey bee:  
an eco-friendly novel approach**

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**Key words:** Activity index, bryophytes, European foulbrood, honey bees.

**ABSTRACT**

Melissococcus plutonius, causal agent of European foul brood disease in honey bee is one of the most dangerous honey bee parasites. By now, various herbal and chemical drugs have been tried to control it. In the present study, the effects of different organic extracts of three different bryophytes and a standard drug (positive control) have been tried to control the bacterium in vitro by using agar disc diffusion and micro broth dilution method. All the tested extracts showed good antibacterial activities against the test pathogen. Acetone extract of *M. polymorpha* and chloroform extract of *D. undulatum* exhibited maximum activity (AI 15.51 and 15.56 mm respectively) comparable to that of standard drug.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Study On The Antipseudomonal Activity of Selected Medicinal Plants From  
Western Ghats To Multiple Drug Resistant *Pseudomonas aeruginosa*  
(MDRPA) Isolates of Clinical Origin**

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**Key words:** Multiple drug resistant *Pseudomonas aeruginosa*, Western Ghats.

### **ABSTRACT**

*Pseudomonas aeruginosa* is an epitome of nosocomial agents and efficacious antimicrobial options are severely limited due to its notorious drug resistance. Herein twelve medicinal plants from the Western Ghats are checked for their antipseudomonal potential. The study aimed at the assessment of the prevalence of Multiple Drug Resistant *Pseudomonas aeruginosa* (MDRPA) among patients as well as antipseudomonal potential of solvent extract of selected plants. Sensitivity test was done with antipseudomonal antibiotics viz., gentamicin, ciprofloxacin, amikacin, imipenem, ceftazidime, piperacillin + tazobactam, sulbactam+cefaperazone. Study proved that all the isolates were MDR underscoring the prevalence of MDRPA in clinical isolates. Among the plants studied extract of *Desmodium gangeticum* (L.) DC *Pseudarthria viscida* (L.) Wight & Arn. *Terminalia chebula* Retz., *Stereospermum chelonoides* (L.f.) DC. extended significant activity highlighting the Western Ghats as a rich repository of medicinal plants with antipseudomonal principles.

### **Sub-Section: Ecology, Ecosystem and Biodiversity** **Microbial abundance and soil characteristics of three different ecosystems in Central Himalayan region**

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University of Delhi, Delhi-110 007.*

**Key words:** Microbial abundance, soil organic matter, pH, Moisture content.

### **ABSTRACT**

During the present study microbial abundance and soil characters were studied in three different ecosystems; along the river's catchment area. Microbial abundances were estimated by isolating microbes on PDA (fungi) and NA (bacteria) medium and incubated at 28 ( $\pm 2$ ) °C and 32 ( $\pm 2$ ) °C for 5-7 days. CFU and MPN values were used for fungal and bacterial colony estimation, respectively. Soil pH, moisture contents and organic matter were analyzed by using standard methods. Soils were acidic and moisture contents ranges from 11.57 % to 38.46 %. Maximum organic matter (5.5354 %) and fungal population was estimated in forest soil while minimum organic matter (1.9806 %) and higher number of

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bacterial population was recorded in barren land.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**A STUDY ON THE FLORISTIC AND FAUNAL DIVERSITY OF  
DAITARI HILL RANGES OF KEONJHAR DISTRICT IN ODISHA**

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**Key words:** Floristic, faunal, biodiversity, core zone, buffer zone, sustainable, Dendritic pattern

**ABSTRACT**

The year 2011 has been declared as the International Year of Forests. The world over, programmes and action plans have been launched to protect forests and increase the forest cover. Odisha is blessed with vast natural resources.

It is one of the few states of India having forest area more than 30% of the geographical area. Keonjhar district of Odisha is enriched with luxuriant forests, hill ranges and wide variety of biodiversity. Daitari hill ranges of Keonjhar district has a number of Iron ore mines with thick deciduous forest. This area is enriched with a large number of plant and animal species. Present paper deals with a preliminary survey of floristic and faunal diversity of Daitari hill ranges. About 31 plant species and 29 animal species have been identified in this area.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Trawl Fishing in West Bengal Offshore Against  
Sustainable Marine Environment**

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**Key words:** Trawl fishing: Marine ecosystem off West Bengal; Mangrove foodweb; Loss of species; Damage of marine foodchain; Sustainable marine environment.

**ABSTRACT**

Commercial fishing plays an important role in the economy of West Bengal as it provides a profitable source of employment and supplies an indispensable animal protein to Bengali diet. Major area of West Bengal coast covers "Sundarbans", the largest mangrove ecosystem and only mangrove tiger-land in the world declared as the world heritage Site (1989). It exhibits an excellent breeding and nursing ground of uncountable macro and micro-species of fish, prawn and other marine animal presenting together the largest foodweb of the world as a great marine ecology in West Bengal offshore area. Increasing population with growing demand of fish causes intensification of trawling by large number of commercial fishermen and big MNCs all along the offshore area of West Bengal. Modern bull trawlers use to drag bigger trawl nets through ocean bottom while chasing bottom dweller species of fish. This action is very likely to have destroyed under-sea habitat of many macro-species belonging to the first and second tropic levels of marine food chain. This paper highlights a case study of Shankarpur-Digha fishing zone in coastal West Bengal showing the extent of trawling causing great loss to a number of marine species. This paper recommends for a proper Environmental Management Plan to implement restrictions on trawl netting, proper substitution of trawl with trammels nets, ban on night and monsoon trawling, on boat release of all discarded species into ocean, etc. only these effective measures can ensure conservative use of prospective marine resources toward sustainable development of littoral and infra littoral habitat of West Bengal.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Seasonal Variation of Dissolved Methane Dynamics in the Tropical Mangrove Dominated Estuary, NE Coast of Bay of Bengal, India**

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**Keywords:** Dissolved methane, Sundarban, mangrove.

**ABSTRACT**

Seasonal variation of dissolved methane was measured from June 2011 to August 2011 in the Sundarban mangrove ecosystem. Dissolved methane concentrations varied between 33 and 125 nM in surface water and between 85.872 to 385.17 in nM in pore water. Its concentrations were found maximum (90.16nM) during the phytoplankton bloom period

in the post-monsoon in contrast to minimum concentration (46.1nM) found during the pre-monsoon period when its microbial oxidation (0.433 to 1.678 nM L<sup>-1</sup>hr<sup>-1</sup>) attained maximum rate.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Studies on the benthic population of two fresh water Lakes of Motihari**

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**Key words:** Freshwater lakes, benthic fauna, bio-indicator, correlation.

**ABSTRACT**

Benthic organisms form an important functional constituent of a water body. As such the study of benthic population of two freshwater lakes of Motihari in relation to some ecological parameters was carried out in year 2010. It revealed marked fluctuation in the species composition including 29 genera. Among them 7 belonged to Insecta, 5 each to Oligochaeta, Pelecypoda and Gastropoda and 3 to Ostracoda. Leeches and branchiopods were represented only by 2 genera each. Oligochaetes were found dominant throughout the year, whereas the chironomids exhibited their peak during winter. Molluscs were observed as the third highest benthos. The abundance of benthic organisms were found positively correlated with temperature, alkalinity, nature of soil and growth of vegetation.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Role of Bioinoculants in the Growth and Development of *Jatropha curcas***

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**Key words:** *Jatropha curcas*, *Azospirillum*, *Pseudomonas*, VAM fungi.

**ABSTRACT**

*Jatropha curcas* is very popular biofuel plant species which is an alternative source of Biodiesel. Microbes play very vital role in the nutrient acquisition from the soil to the plants, particularly phosphorus which acts as limiting elements for plant growth. Therefore, looking to the importance of microbes in phosphate solubilization and nutrient uptake, efficiency of microbial flora including AM fungi, *Azospirillum*, *Pseudomonas* collected from different places has been studied. As for as VAM is concerned, *Glomus mosseae* was recorded to be the most abundant in all the samples followed by *Acaulospora*, *Gigaspora* and *Sclerocystis*. Potential of these microbes were investigated in field and nursery trials and significant results were observed. Amongst all the 10 treatments given to the plants in nursery trials, VAM discovered to be most efficient in phosphate uptake followed by *Pseudomonas* and mixed inoculants. Efficiency was recorded in terms of total phosphate solubilization or the enzyme released. The microbial inoculants showed significant result both in nursery and plantations. Treatments revealed better nutrient status than control. Growth and collar diameter, leaf phosphorus, protein content of all the plant having treatment was measured in field and nursery and a significant variation was recorded amongst all the treatments. Single super phosphate enhanced the growth at the most. This showed persistent effect of microbe. In this treatment 3 plants showed flowering while two plants showed single fruit. Although single super phosphate exhibited significant height and collar diameter but flowering and fruiting could not be induced where as microbial inoculants significantly enhanced the growth and collar diameter of *Jatropha curcas* plants as compared with untreated (Control) plants.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

Primary Productivity of Gambhiri River, Chittorgarh, Rajasthan

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**Key words:** Productivity, physico-chemical, Gambhiri river, GPP, NPP, eutrophication.

**ABSTRACT**

Primary production studies are of paramount interest in understanding the effect of pollution on system's efficiency. High rates of production both in natural and cultural ecosystems occur when physico-chemical factors are favorable. Pollution of water in the long run leads to reduction in primary productivity. A survey of Gambhiri River was undertaken for primary productivity and physico-chemical parameters of the river Chittorgarh from September 2009 to August 2010. The study indicated that primary productivity of river was high (GPP 1.92 to 6.36 gC/m<sup>3</sup>/day and NPP 0.72 to 4.92 gC/m<sup>3</sup>/day). This indicates that the river was in eutrophic category. This productivity was supported by high phosphate (0.12 to 2.8 mg/l) and nitrate (13.2 to 25.8 mg/l) content in river water.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**A brief study on Eco-tourism Potentiality of Sunderban, West Bengal**

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**Key words:** Ecotourism, tourist interest, socio-economic development of local people.

**ABSTRACT**

Sunderban is the largest delta in the world, it is a world heritage site declared by the UNESCO for its natural richness. Every year number of tourist visits the Area. In this study the potentiality of ecotourism in Sunderban was observed. From this study it is seen that local people as well as the outside tourist both are interested about ecotourism. They also have the idea that ecotourism can have in the development of socio-economic condition of the local people and it also help to conserve the ecology of that area.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Simultaneous determination of Guanine, Hypoxanthine**  
**and Xanthine in mangrove plant DNA using Reverse Phase High**  
**Performance Liquid Chromatography**

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**Key words:** Xanthine, hypoxanthine, mangrove, RP-HPLC.

**ABSTRACT**

DNA damage in mangrove plants is thought to be caused by the occurrence of several carcinogens like NO<sub>x</sub> in the atmosphere and arsenic, antimony, chromium, polyaromatic hydrocarbon etc in the sediment of Sundarban mangrove experiment. A high performance liquid chromatographic method has been developed for the simultaneous determination of hypoxanthine (Hx), Xanthine (Xa) and Guanine (Gu) in mangrove DNA. Quantative separation in the order of Guanine, Hypoxanthine and Xanthine were obtained on ODS hypersil column using mobile phase containing 1% CAN in acetic acid (50mM) ammonium acetate (85mM) and 0.5% methanol at 0.5 ml min<sup>-1</sup> flow rate.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Immobilization and Optimization of Process Parameters**  
**Enhancing the Activity of Urease Enzyme**

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**Key words:** Enzyme activity, immobilization, urease, rice husk.

**ABSTRACT**

Studies on immobilized enzyme activity and optimization of process parameters were carried out in laboratory to determine the enhanced activity of urease enzyme adsorbed on to different adsorbents such as seed powders of Pouteria sapota, Tamarindus indica,



Citrus limmonium, Citrus aurantium, and rice husk. The other resource materials like pieces of mud and plastic were also used as adsorbent for immobilization. The present study was mainly directed to investigate the best suitable adsorbent from the available resource materials for immobilization studies; interestingly it was observed that the maximum immobilization of the urease enzyme was found to be on rice husk compared to those chosen. The process parameters like pH, temperature, substrate concentration enhancing the activity of the mobilized enzyme were also studied.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Effects of Stone Crushing Industry on Forest Vegetation**

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**Keywords:** Air pollution, foliar parameters, Madhuca indica, Shorea robusta, suspended particulate matter, stone crushing,

**ABSTRACT**

Gradual and alarming encroachment of the forest area by the quarrying and crushing activities of the naturally occurring stones. The aim of this study was to evaluate the effect of stone crushing industry on representative tree species of the forests. Measurement of SPM and gaseous pollutants in ambient air was done. The deposition of dust particles on leaf surface including blockage was monitored to evaluate the effect of stone crushing industry on representative tree species of the forests. Measurement of SPM and gaseous pollutants in ambient air was done. Heavy deposition of dust particles on leaf surface including blockage of stomata was noted. Decrease in amount of chlorophyll and total carbohydrate indicated reduction of photosynthesis. Reduction in protein synthesis was also noted.

**Sub-Section: Ecology, Ecosystem and Biodiversity  
On Wetland that have been Encroached upon  
for Human Inhabitation in Kurukshetra, India**

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**Key words:** - Wetlands, perennial rainy water, road side puddles, pond land filling, commercial and residential construction, highway reconstruction

**ABSTRACT**

"Ramsar Convention" regarding wetlands has forever settled the issue of nurturing wetlands as they are better biodiversity cradles, in addition to being natural systems for fast and larger food production. Contrary to this, everywhere in India, Haryana is no exception, ponds, Talabs, Jheels, Lakes; Perennial roadside rainwater puddles are being land-filled followed by encroachment for construction of houses, business establishments, road widening, beatification etc. It must be understood that wetlands of whatever hue, serve as pools for harvesting run-off rainy water and also as habitat for supporting a wide spectrum of biodiversity. In addition, wetlands are machines for producing food for man in the shape fish, shrimps, mollusks and vegetables like Kamal-Kakdi, Trapas. Above all, wetlands recharge our underground aquifers which provide us water for irrigation and drinking. In this paper environmental issues wetlands related to Kurukshetra have been elaborated to highlight the need to stop encroachment of wetlands. If trees are the lungs of air, then wetlands are the springs that support human life in a multi-cornered approach.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Morphodynamics And Sedimentation History Of Two**  
**Estuaries Along The Northern Odisha Coast**

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**Key words:** Estuary, beach ridges, tidal flats, Subarnarekha, Budhabalanga.

**ABSTRACT**

Estuaries and the lands surrounding them are places of transition from land to sea and freshwater to salt water. Study of the landform units and sedimentary structures around an estuary provide a clue to the present and past sedimentation processes. The knowledge of sediment transport processes is the prerequisite for any effective coastal zone management plan. In the present paper, we describe the morphodynamics and sedimentation history near the estuaries of two northernmost rivers of Odisha namely Subarnarekha and Budhabalanga. Digha (21°41'N latitude and 87°31' E longitude) and Chandipur (21°27'N latitude and 87°01' E longitude) are two well-known beaches near the estuary head of these rivers. The two estuaries display contrasting geomorphic features. The Subarnarekha estuary is characterised by a dominantly sandy cusped shaped delta. Its environment is controlled by waves and littoral drift. Cycles of beach ridges and barrier bars indicate seaward shifting of the shoreline. The wide intertidal flat at Chandipur has dampened the wave activity at the Budhabalanga estuary where the effects of tidal action are more visible. In absence of heavy load of fluvial sediments, the sea is progressively drowning the river mouth here.

*Section VII: Environmental Sciences*

**Sub-Section: Ecology, Ecosystem and Biodiversity  
Values and Present Status of Wetlands along Coastal Odisha**

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**Key words:** Coastal Odisha, wetland, geomorphology, weed, wildlife.

**ABSTRACT**

Specific geomorphological setup and presence of the major river systems create a natural conducive condition for the formation of wetland ecosystems of diversified type along the entire coastal Odisha. Wetlands of coastal Odisha exhibit manifold significance on multiple aspects. The potency of these ecosystems includes auto-nutrient recycling, provide shelter to varieties of wildlife, extend protection from natural calamities, recharge ground-water, act as hub for economic activities, historical heritage, tourism potentiality, aesthetic value, etc. Such dynamic systems distributed along different geographical regions along coastal Odisha are in the process of quick degradation and likely to be extinct soon because of negligence, ignorance, encroachment, erratic exploitation, siltation, weed infestation, etc. To conserve these ecosystems for future generations, preparation of a comprehensive agenda is highly essential from which human being, wildlife and total coastal Odisha can be benefited to a great extent.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Co-culture studies on biodegradation of hydrocarbons (petrol, diesel, engine oil) by isolated *Pseudomonas aureginosa* and *Aspergillus* spp.**

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**Key words:** Hydrocarbon degradation, co-culture studies, *Pseudomonas aureginosa*, *Aspergillus*, capillary sequence.

**ABSTRACT**

Hydrocarbons are potent atmospheric pollutants. Oil spills is release of hydrocarbons like petrol, diesel and oil in to environment due to human activity. In present study four oil contaminated soil samples were collected from different locations in Visakhapatnam mainly Iron ore dump yards (beside the auto garage) and Hindustan petroleum corporation limited(HPCL). In these samples five strains of bacteria (*Proteus vulgaris*, *E.coli*, *Enterobacter* spp, *Pseudomonas* spp, *Staphylococcus* spp ) and three fungul strain ( *Aspergillus* spp ) were isolated and bacterial strains were identified with reference to Bergey's manual. Among these isolates Psudomonas aereginosa and one *Aspergillus* spp were selected based on hydrocarbons (petrol, diesel, engine oil) degradation. Identification of Psudomonas aereginosa was confirmed by capillary sequence. The degradation efficiency of petrol (57%), diesel (28%) and engine oil (10%) was obtained using Psudomonas aereginosa at 37 0C for 7 days. The degradation efficiency of petrol (56.6%), diesel (28%) and engine oil (10%) was obtained using *Aspergillus* spp at 37 0C for 7 days. In co-culture studies both the cultures Psudomonas aereginosa and *Aspergillus* spp, the degradation efficiency was increased i.e., petrol (81%) desiel (41%) engine oil (8.7%) at 37 0C for 6 days. The details of the results will be discussed during the presentation.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Ethanobotanical potential of Eulophia species with**  
**reference to reproductive biotechnology**

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*Dr. A.G.D.Bendale Mahila Mahavidyalaya, Jalgaon, M.S. India\**

**Keywords:** Phytosomes, reproductive biotechnology, fertility, Eulophia species.

**ABSTRACT**

A survey on different species Eulopia was conducted with respect to vernacular name, part used, active ingredients and possible therapeutic remedies. About 30 species were native of India including 4 of them found in Maharashtra state viz., E. herbacia, E. nuda, E. ochreata and E. ramatacia. Three species found in Khandesh region of Maharashtra state. About 16 E. species having Ethanobotanical potential are used by various ethnic groups viz., Bhill, Garasia, Gujjar, Kathodi, Korkus, Koyas, Pawara, Tadvi and Vanjari of various states of India. Mostly underground parts of these species are used as medicine. Tubrous root/rhizomes of 11 species are rich in bioactive substances like Eulophiol, Nudol, Bitasitosterol, Ephemiranphol and Fimbriol. These constituents would be used as phytosomes to have better efficacy as therapeutic drugs. It is well recorded that these species are used in some ayurvedic formulations. The present study also reviewed that the above tribal people use these plants in various ailments with respect to fertility. Such folk claims need proper formulation, investigation and its validation through scientific experimentation.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Natural Dyes: A step towards the healthy environment**

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**Key words:** Dyeing, medicinal, Azadirachta indica, ecofriendly.

**ABSTRACT**

Dyeing is a process of imparting color to a textile material. It is a major component in the manufacturing of value-added textiles. The plant based formulations have been proved biologically more compatible with human system and less toxic. So there is need to explore the possibility of extracting the natural dyes from the part of medicinal plants which are being utilized or not being utilized for medicinal purpose. Thus in view to fulfill the above stated demand, an attempt has been made in present study to explore the use of eco-friendly natural dye from the dry leaves of Neem (*Azadirachta indica*) on protein (Silk & Wool) and cellulosic (Rayon & Jute) fabrics. In present study, protein and cellulosic fabric sample were dyed from the powder of dry Neem leaves in three medium i.e. acidic, alkaline and aqueous with maintaining pH i.e. 6, 8, 10, time 45, 60, & 90 mins and concentration of dye 2% for light and 5% for dark shade. After selection of best sample according to medium, pH, time and concentration, mordanting was done. Tests for color fastness to light, washing, perspiration and crocking were carried out. Different colors were obtained from Neem leaves and their fastness test showed that Neem leaves can be used successfully for dyeing. It will be very effective utilization of it and beneficial from the commercial point of view.

*Section VII: Environmental Sciences*

**Sub-Section: Ecology, Ecosystem and Biodiversity**

*Impact of tourism on eco-complexity of Melghat forest, Dist. Amravati,  
Maharashtra, India*

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**Key words:** Melghat forest, eco-tourism, biodiversity, eco-complexity, tourism impact on forest.

**ABSTRACT**

Melghat forest, is located in Amravati district of Maharashtra, forms a part of Satpuda hill ranges. It is a type of tropical dry deciduous forest possessing diversity of wildlife and vegetation. Melghat forest has distinct beauty in Satpuda hill ranges with hill station like Chikhaldara. Being only hill station in Vidarbha region of Maharashtra state, number of tourists visits this natural area during June to January from surrounding districts. Their activities are directly related with water reservoirs, wildlife, and vegetation of the environment. Impacts of tourism on wildlife are mixed one. Tourist behavior is one of the most crucial factors that affect the wildlife directly and indirectly in a number of ways. Various produces like forest floor biomass, edible fruits, gum, dyes, spices and more importantly, medicinal plants are exploited from Melghat forest by tourists. Unorganized and carelessly conducted botanical excursions in Melghat forest has led to mass uprooting of wild plants, thereby adversely affecting the wildlife populations in the area.

The present paper is an attempt to find out the impact of increasing tourist number and tourism related activities in Melghat forest which would disturb eco-complexity of the region. The study also suggests few recommendations to minimise tourist impact on natural resources and conservation of biodiversity of the Melghat forest emphasising the concept of eco-tourism.



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**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Forest biodiversity in sustaining tribal livelihood-A study in Central  
Narmada region in Madhya Pradesh, India**

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*Madhya Pradesh, India.*

**Key words:** Forest biodiversity, tribal livelihood, Madhya Pradesh.

**ABSTRACT**

Forests are climax communities supporting the complete ecosystem. Forests have been the source of livelihood since ages. Forests are the major source of timber and construction material to world over and India. Central Narmada region has tropical dry deciduous and moist tropical forest, with Teak (*Tectona grandis*) as dominant species. There are several forest sanctuaries and Pachmarhi Biosphere Reserve in this region. Several tribal communities like 'Bhil', 'Bhilala', 'Gond' and 'Korku' live in this region. Forests occupy the central position in their life and economy. They have a holistic relationship with their land and forests. Tribal life is profoundly affected by whatever happens to the forest. Forest represents for them a whole way of life; a home; a culture, worship, food and wherewithal; employment and income. The present study was under taken in five villages, 'Khjuri' and 'Chatarkota' village of Rehti Forest range and 'Khatpura', 'Khandabad' and 'Yaarnagar' of Budni Forest range in Madhya Pradesh. The data was collected through open ended discussions in repeated visits, on dependence of the rural people on forest for food (including hunting and fishing), fodder, fuel wood, medicine, utensils, furniture, construction and other economic needs. 389 people of village were randomly selected and information was gathered through oral discussions. The present paper reports the services which forest provide in sustaining the life of tribal folk. The forest provide 80% food 90% fodder, 70% fuel wood, 40% timber, 90% medicinal herbs and 90% Non Timber Forest Produce (NTFP) in the form of leaves for making beedi and paper plates, Gums, dyes, tanning materials, bamboo and other woods in sustaining the cottage industries.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Use of Ethno Medicine in Health Management in Some Tribes of Assam**  
**Rezina Ahmed**

**Key words:** Health management, ethnic group.

**ABSTRACT**

Many species are available in N.E. region which are used by common people for remedial measures of various ailments, but their full potential have not yet been explored scientifically. These species may prove to be of ample medical potential if subjected to chemical analysis, pharmacological studies, clinical trials. This information may be used for adopting the proper healthcare measures by the policy makers and may provide lead in the development of new drugs in drug research centre.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Isolation and Characterization of Mycorrhiza from Soil and Their**  
**Sapplication for Seedlings of Triticum spp.**

**Rohit Ashok Joshi (membership no. STM248)**

**Key words:** Mycorrhiza, Triticum, biofertiliser.

**ABSTRACT**

In this study we have isolated three different types of Mycorrhiza by using soil and root nodules of Glycin max, Arachis hypogea, Cajanus cajan, Cicer arietinum plants. The morphological and biochemical characteristic of these isolated Mycorrhiza were systematically investigated. Among these Arbuscular Mycorrhiza was observed in major proportion in soil as well as on the surface of root nodule. The optimization of cultural conditions for these Mycorrhiza were studied in detail. Finally Arbuscular-Vesicular mycorrhiza ( Ectomycorrhiza, Endomycorrhiza & Ericoid Mycorrhiza) Mycorrhiza were applied for seed germination as well as on the growth of Triticum species were studied. The results suggest that supplementation of Arbuscular Mycorrhiza induces the plant growth and this type of study will be useful for the development of Biofertiliser for production of wheat.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Evaluation of Water Quality Status of Rivers near Temples of Mysore District**

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**Key words:** DO, TDS, coliform, temple, water quality.

**ABSTRACT**

A study has been carried out to assess the water quality of River near temples of Mysore district. 28 water samples from seven temples were collected and analysed for physico-chemical parameters and microbiological water quality. The data of various physicochemical parameters of different water samples indicated that all the water samples were under permissible standards except water samples of Srikanteshwara temple and Sangum showed less dissolved oxygen than the prescribed limit. The microbiological water quality of all the water samples indicated that water samples of some sampling stations are quite unfit for drinking purpose because of the presence of total coliform.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Eurya japonica Thunb. and Ficus auriculata Lour. : A study on their relative importance as medicinal plants**

**Rosalind Thingbaijam**

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Department of Ecology and Environmental Science, Assam University, Silchar*

**Key words:** Antibacterial activity, antioxidant, DPPH, ethanolic extracts, Eurya japonica, Ficus auriculata, medicinal plants, phenolic and phytochemical screening.

**ABSTRACT**

Medicinal plants are of great importance to the health of individuals and the society.

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The medicinal value of the plants lies in some chemical substances that produce a definite physiological action on the human body. In this study we examined the phytochemical screening, antibacterial activities, antioxidant activities and phenolic content of the leaf of *Eurya japonica* Thunb. and *Ficus auriculata* Lour plant species. Phytochemical screening of these plants was performed for different constituents. Their antibacterial activities were tested using Gram positive bacteria: (*Staphylococcus aureus*) and Gram negative bacteria (*Escherichia coli*, *Klebsiella pneumonia* and *Pseudomonas* species) by disc diffusion method. Their antioxidant activities were studied by 2, 2-Diphenyl- 1-picryl hydrazyl radical (DPPH) method and phenolic content was examined by using Follin-ceocalteau reagent. The study revealed the relative importance of these plants as medicinal plant. Further studies on the isolation and characterization of the compound from *Eurya japonica* and *Ficus auriculata*, responsible for the observed properties are in progress.

**Sub-Section: Ecology, Ecosystem and Biodiversity  
Phytodiversity of Rajasthan (India) Under Threat**

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**Key words:** IUCN Red List, vulnerable, rare, endangered, extinct in wild.

**ABSTRACT**

The present paper gives an account of the decreasing floral diversity in state of Rajasthan. The study has identified 52 plant species which are facing the threat of disappearance. Out of 52 plant, maximum plants are herbs (26), followed by shrubs (8) and under shrubs (8). Out of 52 species 32 fall under the category of Rare/very rare, 11 as Vulnerable, with each 8 plant falling as Endangered, while 1 plant identified as 'Extinct in wild'. The paper throws light on IUCN species programme, under which series of IUCN Red List of Threatened Species are produced by countries. The aim of the study is to convey the urgency of conservation issues to the public and policy makers. Few common conservational steps could be-protection of natural habitat from human interference, collection and introduction of live plants in botanical/experimental gardens, or protection

of plants in areas having similar habitats and climatic conditions, propagation and multiplication through seeds and other techniques should be taken up. The study has revealed that there are certain plants whose plant part are consumed indiscriminately for edible and other household purposes, such over exploitation should be discouraged by the natives and there should be commercial cultivation of such economic plants.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Insect herbivory on mangrove leaves in Parangipettai mangrove environment: effects on biomass and mineral content**

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**Key words:** mangrove, defoliation, *Avicennia* sp, *Rhizophora* sp, herbivory, canopy.

**ABSTRACT**

The study deals with estimation of insect herbivory on the attached leaves of two mangrove species *Avicennia* species (Forsk.) and *Rhizophora* species in a mangrove habitat of the Parangipettai Vellar estuary. A greater proportion of the leaves were affected by herbivory in varying degrees of consumption by insects and mostly less than 15% of the leaf area was consumed. A vertical zonation of herbivory was observed with an increasing trend from upper to lower canopy. Moreover, such leaves are susceptible to greater loss in the event of repeated insect damage, due to higher concentrations. The overall estimate of herbivory in mangroves revealed that insects consumed as much as 20% of the foliage with an average value of  $15.83 \pm 2.58\%$ . Damage in *Rhizophora* species was exceptionally low (0.1%). Bulk minerals trapped in the folivores pathway was about 2.5 kg N and 80 g P/ha in *Avicennia* species stands. Leaf grazing brings a significant accumulation of organic matter and minerals by importing compounds from other tissues of the plant.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**PHYSICO-CHEMICAL PROPERTIES IN SURFICIAL SEDIMENTS ALONG KKM LAKE: RELATIONSHIPS WITH PHYSICAL-CHEMICAL CHARACTERISTICS**

**S. N. Bramha<sup>\*1</sup>, A. K. Mohanty<sup>1</sup>, K. K. Satpathy<sup>1</sup>, M. K. Samantara<sup>1</sup>,  
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**Key words:** Physico-chemical, organic matter, grain size, correlation, lake sediment.

**ABSTRACT**

Surface sediments from a shallow brackish Kokilamedu Lake, is situated within the DAE campus at Indira Gandhi Center for Atomic Research (IGCAR), Kalpakkam and has no anthropogenic disturbances. This environment is conducive for a variety of fishes and other aquatic and terrestrial fauna that inhabit the rich flora in and around the lake. The lake is shallower at the northern part than the southern part and sediment water content followed water column depth trend. Analysis of surface sediment revealed that it is basically silty-sand in nature. Sediment of northern section of the lake is sand dominated in contrast to relatively high silt and clay containing sediment of the southern section. The organic matter concentrations were relatively high in sediment containing higher silt and clay fraction. Calcium carbonate (CaCO<sub>3</sub>) showed relatively higher values towards northern part. All the nutrients such as: NO<sub>3</sub>-N, NH<sub>4</sub>-N, TN, IP and TP showed decreasing trend from southern to northern section of the lake. Correlation analysis showed that all the nutrients were positively correlated with silt and clay as well as with organic carbon. Organic carbon distribution is controlled by mud fraction of the sediment.

**Sub-Section: Ecology, Ecosystem and Biodiversity**

**Taxonomic diversity and ecology of understorey vegetation in *Mesua ferrea* forest of Malyagiri hill range, Eastern Ghats, India**

**\*S.C Sahu<sup>1</sup>, N.K. Dhal<sup>1</sup> and R.C. Mohanty<sup>2</sup>**

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**Key words:** Taxonomic diversity; ecology; understorey vegetation; Malyagiri hill range

**ABSTRACT**

The understorey layer is a critical component of forest ecosystems typically supporting the vast majority of total ecosystem floristic diversity and providing habitat elements to associated wildlife species. The forest herbs, which play a vital role for the rural people in terms of curing various ailments through medicinal herbs, edible leafy vegetables and fodder for animals have been hardly studied from floristic point of view. Taxonomic and ecological information on the forest floor species are very rare in Eastern Ghats of India. In the present study we have made a floristic account of the herb species in semi evergreen forest of Malyagiri hill range, Eastern Ghats of Odisha and also studied some ecological aspects regarding their distribution, dominance etc. A total of 52 species belonging to 46 genera and 30 families has been recorded from the typical *Mesua ferrea* forest which is one of the rare semi evergreen forests in India. In terms of taxonomic diversity, Rubiaceae (5 species), Asteraceae (4 species), Acanthaceae (4 species), Zingiberaceae (4 species) and Araceae (4 species) were the five dominant families in the sampling forest types. It is hope that this study will boost researchers, scientists, ecologists, and conservation managers to further study the different ecological factors functioning in the ecosystem and formulating eco-friendly conservation policies.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Coastal Rural Lands Need Conservation of Herbal Medicinal Plants**

**Sabita Bala Pradhan**

*S.J.M., Naugaonhat, Jagatsinghpur*

**Key words:** Coastal land, conservation, herbal medicines, restoration, rural.

**ABSTRACT**

The herbal medicines are prepared either from the whole or parts of the plant, or from their secretory products. Naugaon block of Jagatsinghpur district are endowed with many valuable herbal medicinal plants, which have been serving the rural people since long. Due to climate change and natural disasters like super-cyclones and high flood, the coastal rural agricultural lands are shrinking and innumerable species of medicinal plants are threatened with extinction. To meet this challenge, the coastal rural lands require urgent attention.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Use of 'Chir' Pine Needles As an Alternate Source of Industrial Bio Fuel**  
**Reduces Environmental Pollution**

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**Key words:** - Bio fuel, Forest fires, chir pine.

**ABSTRACT**

The needles of 'Chir' Pine (*Pinus roxburghii*) are a major source of forest fires. The removal of pine needles is a cumbersome and costly process. A practical and profitable use was devised for these needles. Since these needles, have a high calorific value they could be alternatively used as a part bio fuel in the furnaces of the cement, paper and 'kathha' industry. A case study reveals that local people earned Rs 150 for each quintal of pine needles collected. The industry, in turn, managed to cut its fuel costs drastically using these needles in briquetted form with certain additives. A drastic reduction in forest fires was further observed in the



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sensitive forests due to cleaning up of these needles.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Ethno Medicinal Plants of Dumka district, Jharkhand**

**Saurabh Dutta and Prasanjit Mukherjee\***

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**Key words:** Ethno-medicine, horopaths, Paharia, ethno-botanical.

**ABSTRACT**

The present paper is the outcome of ethno botanical investigation of selected blocks of Dumka districts. Utility of plants by the human beings has been known from pre-historic period right from the evolution of human life and culture. Man and culture has been associated and influenced with nature since time immemorial. During pre-historic period man live in forests in peace, harmony and security with the surrounding environment having firm faith on nature and was totally dependent on nature, flora and fauna for his subsistence and livelihood.

The indigenous folk inhabitants are well aquatinted with these plants and are using it for treatment of various diseases of human beings. The people those who involved in practicing or treating various ailments are called Horopaths. The therapeutic information, method of drug preparation, application, doses, & other related information's were recorded through conducting interview with tribal, herbal medicine practitioners Horopaths, Paharias & other knowledgeable persons of the locality. The plants used as medicine by these people are enlisted for further studies.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Status of Macrophytes in the Arraia Chaur of Begusarai District, Bihar**

**Shivani Garg**

*L. N. M University, Darbhanga*

**Key words:** Wetlands (Chaur), ecosystems, panktons, phytoplanktons, macrophytes, submerged, emergent.

### **ABSTRACT**

Wetlands are one of the most productive ecosystems, comparable to tropical evergreen forests in the biosphere and play a significant role in the ecological sustainability of a region. Chaur support a rich variety of biotic communities such as macrophytes, planktons, and macroinvertebrates and so on. The abundance and dominance of these macrophytes varies from season to season in the same chaur. Macrophytes form an important element of the aquatic environment manufacturing and producing food for aquatic heterotrophic communities and contribute significantly to the total primary production and accelerate eutrophication. The study of macrophytes in the chaur of North Bihar is still wanting. Therefore this study was taken up. A rich variety of macrophytes were found from Arraia chaur including submerged, free-floating and emergent. The growth was lower in monsoons and higher level in winters.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Ecology and Zooplankton Diversity of Chikkadevaraya Canal,**

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**Key words:** Zooplankton, physico-chemical, biological indicator, rotifers.

### **ABSTRACT**

Plankton diversity and physico-chemical parameters are an important criterion for evaluating the suitability of water for irrigation and drinking purposes. In this study we tried to assess zooplankton species richness, diversity and evenness to predict the state of Chickadevarayana canal water of Cauvery River according to physico-chemical parameters. A total of 51 taxa were recorded; 22 rotifers, 5 copepods, 6 cladocerans, 1 ostracoda and 17 protozoans. The water samples were analyzed for temperature, pH, electrical conductivity, alkalinity, hardness, dissolved oxygen, phosphate, sulphate and nitrate. The occurrence of *Asplanchna herricki*, *Lacrymaria* sp, *Brachionus pala* and *Monostyla lunaris* showed highest similarity of occurrence reaching above 90%. The study revealed that species like *Monostyla*

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sp., *Lepadella* sp., *Leydigia* sp., *Keratella* sp., *Branchionus* sp. and *Cypris* sp. can be considered to be biological indicator for eutrophication.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Vertical Distribution of Cultural Microbial Community With Relation to Enzyme Activity and Nutrients Status in the Oxygen Starved Soil of the Sunderban Mangrove Forest, India**

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**Keywords:** Dehydrogenase, urease,  $\beta$ -D glucosidase, phosphatase enzymes, phosphorus solubilising bacteria (PSB), cellulose degrading bacteria (CBD), nitrifying bacteria, free living nitrogen fixing bacteria, fungi.

**ABSTRACT**

Culturable microbial population, activities of dehydrogenase, urease,  $\beta$ -D glucosidase, phosphatase enzymes and CO<sub>2</sub> emissions were generally higher in soil surface and decreased with increase in depth. Vertical distribution of sulfate reducing bacteria showed reverse profile. Emission of CO<sub>2</sub> from soil surface was maximum in monsoon season (1.2 mg m<sup>-2</sup>s<sup>-1</sup>) and minimum (0.95 mgm<sup>-2</sup>s<sup>-1</sup>) was found during post monsoon. CO<sub>2</sub> emission and dehydrogenase activity did not correlate with microbial population. Present study revealed that soil temperature, moisture, organic-C, total-N and available -P content appeared to be the most important factors that regulate the microbial population as well as enzyme activity.

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**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Nitrogen Dynamics in a Tropical Estuary: Linking Observation  
to the Abundance of Cyanobacteria**

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*Keywords: Nitrogen cycle, system metabolism, Mahanadi, India*

**ABSTRACT**

This study reports the seasonal variation of dissolved inorganic nitrogen in relation to the relative abundance of cyanobacteria in the Mahanadi estuary. Cyanobacterial colonies and filaments were found to comprise 4.4% of the total phytoplankton cells ( $6.4 \times 10^5$  cells L<sup>-1</sup>) during the post monsoon when N:P ratio of nutrient loading was 0.7. The difference between nitrogen fixation and denitrification (nfix-denit) showed denitrification during pre-monsoon, while nitrogen fixation was found during monsoon and post- monsoon. Inputs of locally produced autochthonous organic carbon from surface to bottom water could shift the process from nitrification to denitrification during pre-monsoon stimulating N<sub>2</sub>O production in bottom water.

**Sub-Section: Ecology, Ecosystem and Biodiversity**  
**Studies on Biodiversity and Seasonal Fluctuations of Ciliates  
(Polymenophorea) in Nath Sagar Paithan District, Aurangabad**

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**Key words:** Ciliates, Nath Sagar reservoir, Paithan (M.S.), India.

**ABSTRACT**

Paithan is located at latitude 19°53 N and longitude 75.25 E. The Nath Sagar is a reservoir created behind Paithan dam. The reservoir has submerged 35,000 hectares of land having a catchment area of 21.750 Sq.Km., with a gross storage capacity of 2909 M Cum.

The existing water supply to Aurangabad is supplemented by this reservoir.

Present study is stretched over a period of one year, so as to record the species composition of ciliates. It is an attempt to correlate the seasonal fluctuations in population density of ciliates with some selected physico-chemical parameter's. The parameters studied were: temperature atmospheric and water, humidity, rainfall, pH, D.O., acidity, alkalinity, hardness, nitrogen, sulphate, chloride, phosphate and solids. The different species recorded from this major group of ciliates, polymenophorea were Halteria grandinella, Euplotes affinis, Eupotes patella and Oxytricha fallax. The seasonal fluctuations in population density is discussed in relation to the physico-chemical parameters studied during October 2009 to September 2010.

It was concluded that ciliates density have important role for seprobic condition of the Jayakwadi Dam. Therefore, it can be recommended to determine more effective parameters for densities of ciliates and management policies must be taken and programmed in order to improve ecological conditions of this dam.

**Sub-Section: Environmental Pollution & Waste Management**  
**Studies on Sewage treatment by Duckweed (*Lemna minor*) based technology**

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*Key words: BOD, COD, TSS, duckweed, eco-system, waste water.*

**ABSTRACT**

Duckweeds are distinctive group of diminutive, monocotyledonous aquatic plants and ability to rapid vegetative reproduction to form genetically uniform clones, easy handling and high sensitivity to organic and inorganic substances. For the present study, we used a novel plant *Lemna minor* for the study of laboratory scale in reduction of influent parameters measured included biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite, ammonia, TSS, sulphate, phosphate and Chloride under different detention time at days 10, 12, 15, 20 and 30. Huge reduction in pH, BOD, COD, TSS, Total Nitrogen and Phosphate values were observed and reduction values of the said parameters further

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increased with corresponding increase in detention time. However, the reduction in sulphate and chloride were not so pronounced. Chlorophyll and dry matter were suppressed by waste water observed at 30th day of exposure. Our findings demonstrated that duckweed can be used as a fast, inexpensive, highly sensitive and receptive model plant system for the study of water pollutants, could serve as an alternative choice for the study of some toxic chemicals present in the pollutants suppressed biomass production, metabolic activities and appeared visible symptoms of toxicity.

**Sub-Section: Environmental Pollution & Waste Management**  
**TRENDS OF ATMOSPHERIC COARSE AND FINE PARTICLES AT**  
**SELECTED SITES IN BRASS-CITY MORADABAD (U.P.)**

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**Key word:** Air pollution, SPM, RSPM, vehicular pollution.

**ABSTRACT**

The atmospheric particulates (coarse >10  $\mu$  and fine <10  $\mu$ ) were collected by Respirable Dust Sampler (RDS-APM460NL Envirotech, New Delhi) in the city of Moradabad and the results are presented for one year duration from 31st May 2010 to 30st April 2011. Two sampling stations were selected i.e. Buddha Bazaar (SI) and Police Training Center (SII) for commercial and residential area respectively. Monthly and seasonal values were also observed and it was noted that the concentration of RSPM and SPM unusually high in the month of May and lowest in the month of July. Regarding the seasonal variation highest concentration was recorded in the dry season and lowest in monsoon season. Comparatively the concentration was high in the Buddha Bazaar (Commercial) may be due to a number of vehicles ply on the road and nearby railway station.

**Sub-Section: Environmental Pollution & Waste Management**  
**Study of DOAS as an Analytical Tool for Effective Air Pollution Management**

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**Key words:** DOAS, photochemical pollution and air pollution.

**ABSTRACT**

In this paper, the DOAS (Differential Optical Absorption Spectroscopy) technique has been developed into one of the practical high performance techniques, based on the U V- visible molecular absorption of atmospheric gases. DOAS is a spectroscopic technique well suited for a simultaneous detection of many atmospheric trace gases including the criteria compounds, NO<sub>2</sub>, SO<sub>2</sub> and O<sub>3</sub>. Furthermore, the DOAS technique is based on the optical absorption of gases over long path lengths ranging from some one hundreds of meters up to several kilometers long. Thus the DOAS values in the case of non-folded optical paths, give in general pollutant concentrations averaged over relatively large distances, thus avoiding large local perturbations that can be observed in point measurements. In the case of photo-smog events, the DOAS system provides an ideal database for comparison with results obtained from a mesoscale eulerian air quality model as the spatial resolution is comparable between model and measurement, and the time resolution of measurement is short enough for useful comparison. Such models are at this point scientifically the most relevant tools to predict the impact of different air pollution abatement strategies on air pollution event.

**Sub-Section: Environmental Pollution & Waste Management**

**Analysis of the Ganges water pre and post immersion of Idols and Its effect on the water microbial flora**

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**Key words:** Durga Puja, MPN test, coliforms, IMViC test, metal uptake, coli phages.

**ABSTRACT**

There is a huge controversy regarding the use of Lead (Pb) containing paints of idols. Kolkata suffers the most because of the festive season in the month of September-October every year and the Ganges water get heavily contaminated with Pb post immersion of idols. This investigation was undertaken to see the effect on Ganges water due to Pb and associated pollution. The water in general in the pre and post immersion phase shows pH 5.816 and 5.696; Electro-conductivity 480.9 ohm-1 and 342.2 ohm-1; Dissolved Oxygen

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8.2 ppm and 7.0 ppm. It was observed that the Pb concentration increase approximately 10 folds from 0.005 to 0.05 ppm due to idol immersion. Along with that the coliform load increase from 900/100ml to 1600/100ml. The coliform population includes *Escherichia* spp and *Enterobacter* spp. *Escherichia* spp was easily differentiated from and *Enterobacter* spp by IMViC test and Urease production test. Simultaneously the tolerance to Pb was tested in-vitro where *Escherichia* spp. exhibited tolerance to 5ppm with an uptake of 1.8% Pb from the surrounding media, whereas the *Enterobacter* spp did not grow at all in that concentration. The Ganges water contains high level of coli phages, which inhibit the growth of coliforms. For the attachment of the coli phages, they require specific receptor into the cell membrane of the coliforms. Thus during high concentration of Pb there might be a change in those receptors that inhibit the binding of phages and induces the growth of coliforms. Moreover in high Pb concentration the expression level of the gene *znt A* in *Escherichia* spp. is more that may produce higher amount of protein s which might help the organism to incorporate Pb from the surrounding.

**Sub-Section: Environmental Pollution & Waste Management  
Studies on Seasonal Variation in Some Physico-Chemical Parameters  
of River Ramganga at Bareilly**

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**Key words:** Ramganga river, water quality, physico-chemical parameters.

**ABSTRACT**

The present analysis is an attempt to investigate the impact of effluents discharged through industrial wastes and sewage into Ramganga and to observe the change in the quality of water during different seasons of the year. Some physico-chemical parameters like temperature, pH, colour, turbidity, DO, BOD, COD and Total Alkalinity were studied and the Site II was found much polluted due to merging of a polluted tributary Deorania. Here DO was 2.33 mg/l and BOD was 4.36 mg/l .



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**Sub-Section: Environmental Pollution & Waste Management  
Utilization of Discarded Fruit Peels for Dyeing of  
Textiles to Sustain Healthy Environment**

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**Key words:** Mordants, effluents, K/S value, crocking, light fastness,  
wash fastness, laundrometer.

**ABSTRACT**

Nature has gifted us with more than 500 color giving plants, fruits and flowers. There are many fruits and vegetables whose outer covering or peel is un-edible and so is discarded. In this study an attempt was made to extract dyes from selected fruit peels and then dyeing of protein and cellulosic fabrics was done. Series of experiments were conducted to optimize different variables of dyeing. Range of colours was developed on the fabric samples without and with mordant treatment. Evaluation for colour fastness to light, washing and crocking properties was done and results were satisfactory. The study indicated that discarded peels can prove to be good source for dyeing textile material. Its commercial potential may be explored.

**Sub-Section: Environmental Pollution & Waste Management  
Pollution induced Pseudomonas Leaf spot Disease  
in Sand binders along Chennai Coast**

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**Key words:** Sand binders, leaf spot diseases, Pseudomonas,  
suspended particulate matters, metal uptake.

**ABSTRACT**

The entire stretch of the Golden beach, a popular resort about 25 kms from Chennai is well protected by sand binders like Ipomoea biloba. Rapid mushrooming of resorts and leisure parks along sea coast has resulted in the pollution of the sea beach. Incidence of the leaf spot disease was observed to be three times higher at a distance of 5 meters from the park in comparison to the distance of 10 meters. The infected leaves were collected and the pathogen isolated was found to be gram negative rod. On the basis of IMViC and other biochemical tests the pathogen was inferred to be of the genus Pseudomonas. Metal contamination was estimated to be in the ratio 18:19 (Iron: Chromium). The pathogen was highly tolerant to iron and less to chromium. Time- dependent heavy metal uptake was higher in case of iron compared to that of chromium. The incidence of such leaf spot disease can be used as bioindicators for anthropogenic activity related pollution.

**Sub-Section: Environmental Pollution & Waste Management  
Pollution Control in Legal Medicine Work Environment**

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**Key words:** Chemical, biological, autopsy, drug abuse, effluents.

**ABSTRACT**

The present communication delineates the occupational and environmental hazards and risks associated in autopsy and Forensic toxicological examination. Various chemical and biochemical samples are always analyzed in the morgue of forensic medicine department and forensic toxicology laboratories. The autopsy specimens, including tissues, organs, fluids and medications are examined for the presence and quantity of drugs and/or poisons that may have contributed to the cause of death. The Post Mortem and Toxicology examinations have exposed to a wide variety of infectious agents, including blood borne and aerosolized pathogens - viruses, and Mycobacterium tuberculosis etc. Most of the time the dead body coming for autopsy have no past medical records or if at all present, contains inadequate information. Special information worth mentioning is information of drug abuse, prostitution, different occupations with history are at high risk of acquiring infections which have long latent period of clinical manifestation of the disease, but are potential source of infections, such as HIV, tuberculosis etc. So risk from these bodies is also unknown and hidden. Toxicology odor is perhaps the most common problem associated with analysis and testing which pervades at every corner of the lab and area. Similarly blood, semens, swabs, corrosives, oils and other hazardous chemicals are very dangerous and harmful for handling and storage without proper preventive steps. Analysis of autopsy and Lab waste and effluents reveal the extent of risk hazard and observes the levels of risk about the continuous exposure to the toxic environment. The necessity of strategic planning modules is urgent to mitigate the pollution limit and control the safety points. It requires an extensive study of the concerned EIA for a safety in the work environment, for good governance and quality service.

**Sub-Section: Environmental Pollution & Waste Management**  
**Alkaline pretreatment of organic fraction of municipal**  
**solid waste at Varanasi, India**

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**Key words:** Alkaline pretreatment, Varanasi, anaerobic digestion, MSW management.

**ABSTRACT**

Present piece of work deals with the effect of alkaline pretreatment on organic fraction of municipal solid waste (OFMSW), collected from five different locations of Varanasi, India. The sample was treated with 0.1, 0.2 and 0.5 % of Ca(OH)<sub>2</sub>, separately. The several parameters, viz., COD, biogas production, TS, VS, TKN, TOC were measured during the experiment and it was observed that there was an enhancement in the rate of anaerobic digestion (AD) and biogas production with the alkali pretreatment. Maximum biogas yield was observed for the sample treated with 0.2 % of Ca(OH)<sub>2</sub>. Thus alkaline pretreatment of OFMSW can be an effective method for AD used in MSW management.

**Sub-Section: Environmental Pollution & Waste Management**  
**Effect of treated dairy effluent on the height and yield**  
**of Zea mays (L.) and Brassica campestris**

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*Key words: Zea mays, Brassica campestris, dairy effluent, height, yield.*

**ABSTRACT**

A comparative study on suitability and effect of dairy effluent for irrigation at different concentrations (10, 25, 50 & 100%) was carried out. Effluent sample was collected from Central Dairy; Mawiong (Shillong) India and physico-chemical parameters of these samples were analyzed. The seed varieties of Zea mays (RCM 1-3) and Brassica campestris (M-27) were selected and irrigated with effluent. During the growing period it was found that the dairy effluent did not show any inhibitory effect on height and yield of test plants. The maximum height in maize was found at 25% while yield was maximum at 50% whereas the maximum height of rapeseed was found at 50% of the treated effluent respectively and yield of rapeseed was maximum under control.

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**Sub-Section: Environmental Pollution & Waste Management  
Water Quality Index (W.Q.I.) of Heranj Lake Dist. Kheda - Gujarat**

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**Key words:** - Heranj Lake, physico-chemical parameters, water quality index, drinking water quality.

**ABSTRACT**

The present study calculates the Water Quality Index (W.Q.I.) of Heranj Lake and assesses the impact of industries, agriculture and human activities. Physico - chemical parameters were monitored for the calculation of W.Q.I. for the rainy, winter and summer seasons. The parameters namely PH, Total hardness, TDS, Calcium, Chloride, Nitrate, Sulphate and DO values were within the permissible limits. But total alkalinities and magnesium values were exceeding the permissible limits as prescribed by Indian Standards. However, the W.Q.I. values in the present investigation were reported to be less than 90 (71.07, 69.28, 88.33) for different season indicating that the water quality is poor and not totally safe for human consumption.

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**Sub-Section: Environmental Pollution & Waste Management**

*Phytorid Treatment for Reuse of Waste Water*

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**Key words:** Phytorid treatment, waste water, treatment and management.

**ABSTRACT**

Functionality of sewage treatment plant in India is a big complex issue. The quantum of wastewater generation is increasing significantly. But in the absence of proper measure for its treatment and management, the existing fresh water reserves are being polluted. To solve such a large magnitude of the problem, a natural method "Phytorid Technology" is developed which is highly efficient and structured. The technology relies upon physical, chemical and biological mechanism to treat wastewater. The system is based on use of specific plants normally found in natural wetlands (*Canna indica*, *Typha latifolia* etc) with filtration and treatment capability. Treated water can be used for gardening, horticulture, as flush water in toilets, ground water recharging etc. In this way we can save and conserve fresh water for drinking and cooking purposes. The technology is eco - friendly and it has potential to reduce the strain on the ensuing fresh water crisis which is looming large in different parts of world including our country and the state of Bihar.

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**Sub-Section: Environmental Pollution & Waste Management**  
**Road Traffic Noise: A case study for an Indian Intermediate city**

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**Key words:** Road traffic noise, pollution, community response, noise descriptors, Cuttack.

**ABSTRACT**

The road traffic noise environment in the silver city of Cuttack, one of the important cities of eastern India, commercial and judicial capital of Orissa, in terms of standard noise indices are worked out in the present study. Noise Pollution is analysed in 17 different squares (road sections) during four different specified times (7-10 AM, 11AM-2 PM, 3-6 PM and 7-10 PM) to assess the level of noise pollution of the city. The sources of noise at the studied sites are predominantly attributable to vehicular traffic. Taking the tolerated noise level of 70 dB (A) during the day time on the main roads as standard for United Kingdom and many other European countries, in absence of regulation regarding permissible level for road traffic noise in India, the noise levels of all the 17 squares are found to be beyond the permissible limit during day time. Noise descriptors such as L10, L50, L90, Leq, TNI (Traffic Noise Index), NPL (Noise Pollution Level) and NC (Noise climate) are assessed to reveal the extent of noise pollution due to heavy traffic in this city. Leq (equivalent noise levels) values range from 91.8 to 103.2 dB; 88.4 to 100.4 dB; 94.3 to 104.5 dB and 94.1 to 104.2 dB during 7-10 AM, 11AM-2 PM, 3-6 PM and 7-10 PM respectively. NPL values of all 17 monitored sites range from 100.1 to 125.9; 110.9 to 127.6; 111.7 to 130.1 and 110.1 to 136.1 dB, while TNI values range from 122.3 to 157.5; 130 to 158.6; 117.3 to 158.4 and 113.1 to 170.2 dB during 7-10 AM, 11AM-2 PM, 3-6 PM and 7-10 PM respectively. Even the minimum NPL and TNI values are more than 100 dB. These high and distressing values of Noise Pollution Level (NPL) and Traffic Noise Index (TNI) clearly demonstrate that the extent of noise pollution in the studied crowded squares is alarming. A systematic

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comparison between TNI and Leq noise levels for all selected locations reveal that the TNI values are much more than respective Leq levels. This simply demonstrate that although the noise levels during any period of the day are generally constant but the presence of single - event noise is sufficient to affect the values of different noise percentile levels and consequently the TNI. Analysis of variance (F-test) is also computed for investigated squares at the peak hour i.e. 7-10 PM to infer the level of significance. The observed value of F (0.95) is less than the tabulated values and is not significant at both 5% and 1% levels of significance. Thus, it explicitly demonstrates that the noise levels of different squares do not differ significantly at their peak hours.

**Sub-Section: Environmental Pollution & Waste Management  
Food Contamination and Water Pollution In Relation To Health Hazards**

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**Key words:** Diseases, water pollution, food safety, health hazard, world health organization, water pollution.

**ABSTRACT**

This article explain with the extent of water resources, sources and causes of water pollution, impact of water pollution on human health, water borne and food borne diseases, food contamination and human health, and challenges, development and future perspectives of food safety. Water is the main constituent of human body, and it is about 80 percent by weight. Moreover, it is a medium for all metabolic activities. Thus, water is very essential for running the machine of life. In any aquatic body, presence of foreign particle/substance beyond permissible limit causes pollution that subsequently leads to health hazard to the human being or animals using such polluted water. The increased concentration of pesticides, metals and heavy metals, nutrient enrichment, synthetic organics, chemicals, chlorinated solvents causes several kinds of diseases in humans. Water borne diseases are transmitted through water and they are mainly bacterial (typhoid, cholera, parathyroid fever bacillary dysentery), viral (infectious hepatitis/jaundice, poliomyelitis) and protozoal (amoebic dysentery). The contamination of food is strongly linked with quality of water used eight



for drinking/cooking purpose or for irrigation of crop field. The polluted water causes contamination of food that leads to food-borne diseases. Salmonellosis and campylobacteriosis are common and widespread food-borne diseases caused by bacterium *Salmonella* and *Campylobacter*, respectively. *E.coli*. causes enterohaemorrhagic and listeriosis. Persistent Organic Pollutants (POPs) and heavy metals contaminate food to a great extent and they have severe adverse effects on human health. It is felt that accelerate rate of contamination of food has create challenge for food safety. The safety of food needs to be assessed considering health benefits and implication. The World Health Organization (WHO) policies to promote the safety of food cover the entire food chain from production to consumption

**Sub-Section: Environmental Pollution & Waste Management**  
**Time to Re-evaluate the Hydrological status of potable water**

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**Key words:** Cyanobacteria, potable water, biomass, phytoplanktonic.

**ABSTRACT**

Planktonic and bloom forming Cyanobacteria have many implications in potable water bodies by their allelopathic behavior as well as in forming toxic substances. They are primary producer in aquatic ecosystem often result into large amount of biomass. It is important to determine cyanobacterial toxins (microcystin MC) content in complicated matrices such as potable water. In the present study method of screening, clean-up, identification and qualitative analysis of microcystin, nutrient/ nutrient transport, and their interaction with phytoplankton were described. In order to know the biodiversity of phytoplanktonic and bloom forming cyanobacteria, water sample were collected from potable water sources at Allahabad city. The hydrological scale i.e. solids (TDS, TS, TSS,), hardness, negative oxygen value, BOD, COD, chloride, residual chlorine, ammonia, N, P and N/P ratio and bacterial load were higher in the all selected site and bathing side also. The amounts of nutrient were dynamically influenced with time periods, water availability and their flow. This paper has two major conclusions. First, the critical deficit in basic water supply and sewage treatment infrastructure have increased the risk of exposure to infectious and algae toxins. Second, the lack of coordination between environmental and public health objectives, a complex and fragmented system to manage water resources, and the general treatment of

water as a common property resource mean that the water quality and quantity problems observed as well as the health threats.

**Sub-Section: Environmental Pollution & Waste Management**  
**Response of soil enzymes and respiration to coal contamination**

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**Key words:** Soil quality, enzymes, respiration, coal contamination.

**ABSTRACT**

Soil microbial parameters are the important indicators of soil quality. To find out the soil microbial performances near coal-based industries, samples were collected from open cast coal mine, thermal power plant and coal washery near Ranchi, Jharkhand and analysed for soil enzymes and respiration. Dehydrogenase, fluorescein di acetate hydrolase, phenol oxidase, peroxidase and catalase activities were higher in coal contaminated soils, probably attributable to the presence of high organic content, as evinced from high SOC values. Oxidative stress enzymes like catalase, peroxidase and phenol oxidase also increased, which shows the presence of pollutants. Respiration values were high in washery soil.

**Sub-Section: Environmental Pollution & Waste Management**  
**Fresh Water Algae and water Quality of Samaspur Lake at Raebareli District, (U.P.)**

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**Key words:** Water quality, phytoplanktons, Samaspur Lake.

**ABSTRACT**

Water samples from Samaspur Lake Raebareli were collected from Nov.2008 to March 2010 at monthly intervals and analyses for studying various physico-chemical parameters viz. Temperature, pH, total solids alkalinity, total hardness, DO, BOD, chlorides, phosphates, sulphates, nitrates etc. and Biological parameters viz. algal diversity. The water quality of Samaspur Lake and its effects on algal population and their succession was investigated. The magnitude of water pollution was low in rainy session and high in other session, because of the discharge of effluents from city, industries, domestic sewage and agrochemicals. Significant levels of ammonical nitrogen, organic nitrogen, nitrate nitrogen and Nitrite nitrogen and metals Ca, Mg, K, Fe, and Zn were detected. The algal picture of rainy session revealed the presence of Oscillatoaria, Pediastrum, Scenedesmus, Merismopedia, Chlamydomonas, Volvox, Navicula, Synedra, Anabaena. Nostoc, Oscillatoria, Navicua, Nitzschia, Lyngbya occurred. The continuous presence of Oscillatoria and Phormidium was recorded. Mentioned Phytoplanktonic growth indicate that Nitzschia were the indicator of putrid water, scenedesmus and Euglena species of sufficient nitrogen and Blue-green Algae for ammonical and organic nitrogen.

The growth of Anabaena constricta, Merismopedia punctata, Oscillatoria perornata, Oscillatoria subbrevis and Phormidium corium is favored by low dissolved solids, nitrate and Phosphate. The high percentage abundance of Oscillatoria chalybea and Phormidium corium, was favored by very high content of ammonical nitrogen and organic nitrogen. The low constant was also responsible in enhancing the abundant growth of Oscillatoria perornata and O.subrevis was recorded with very Dissolved oxygen, low Oxygen content in water accelerate the growth of blue green algae. The favorable factors for BGA were low nitrogen and phosphate in water. The low turbidit favourable for the development of a large number of chlorococcales ( Pediastrum simplex, Scenedesmus hystrix, S.obliquis, s.dimorphus f. tortus, S.quadricauda var. longispina, Chlorella, Oocystis to the adequate sun light in deeper layer of water. The growth of Chlamydomonas conferta was high at low temperature, high dissolved solids, sulphate, Ammonical nitrogen and organic nitrogen. Cyclotella, Gomphonema, melosira variances, navicula sps. Nitzschia linearis N. vermicularis, S. offinis and S.ulna var.amphirhynchus constituted the bulk of diatom. These results indicated that high amount of dissolved solid, chloride and calcium, sulphate, phosphate, ammonical nitrogen and organic nitrogen favored the better growth of diatoms.

**Sub-Section: Environmental Pollution & Waste Management  
Study on Vehicular Exhaust Gas Pollution in Patna, Bihar**

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**Key words:** Automobiles, vehicular pollution, fuel-adulteration, automobile exhaust.

**ABSTRACT**

There is no specific data available regarding the vehicular emission gas pollution and the fuel consumption by the vehicles playing in the Patna city, Bihar. The impact of vehicular emissions due to increasing trend in the number of vehicles proliferates the problems more. In the present investigation vehicular monitoring of exhaust gas emission was done to know its pollution intensity particularly the levels of CO (carbon monoxide) and HC (hydrocarbons) by multigas analyzer. In addition to these harmful emissions, both carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>) readings were also estimated which provide additional information on what's going on inside the combustion. "Ideal" combustion produces large amounts of CO<sub>2</sub> and H<sub>2</sub>O (water vapour). O<sub>2</sub> readings provide a good indication of a lean running engine, since O<sub>2</sub> increases with leaner air / fuel mixtures. Approximately 50% vehicles emitting more than 1% CO level was investigated where as 75% vehicles exceed EURO - II or BHARAT - II level in the context of hydrocarbons.

**Sub-Section: Environmental Pollution & Waste Management  
Physicochemical parameters of water from Ukkalgaon,  
Taluka Shrirampur, District Ahmednagar**

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**Key words:** pH, total hardness, chlorides, sulphates, TDS, copper, magnesium, sodium, potassium and calcium.

**ABSTRACT**

This paper presents quality of water samples from Ukkalgaon in order to find out the magnitude of water pollution. The natural quality of ground water tends to be degraded by human activities and excessive irrigation. Some sampling points were selected for the study. The parameters studied were pH, Total hardness, chlorides, sulphates, Turbidity, TDS, total alkalinity, iron, copper, magnesium, sodium, potassium and calcium. The ion concentrations were expressed in mg/L. The cations and anions must be equal to maintain the quality of water. Cations such as Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup> and K<sup>+</sup> are present in ground water in the form of hardness and salinity. The major ions responsible to maintain the quality of ground water are carbonate, bicarbonate, chloride, sulphates, nitrates, phosphates and fluoride. Physico-chemical parameters of water from Ukkalgaon of Ahmednagar district were studied.

**Sub-Section: Environmental Pollution & Waste Management**

**A cost effective alternative approach for municipal wastewater treatment system based on comparison of existing technologies in Indian cities**

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**Key words:** Wastewater, nutrient, facultative pond, treatment efficiency, algae.

**ABSTRACT**

The present study aims to frame an alternative treatment option for urban cities like Bangalore by a comparative assessment of the treatment efficiencies of conventional treatment systems, facultative pond based systems and manmade lake systems based on physico-chemical and biological parameters. Key wastewater treatment parameters were analysed and total annual cost for operation of waste stabilization pond and conventional systems were calculated. The study reveals that manmade lake systems performed well in under higher organic load with an COD/BOD removal efficiency of 70%, TN removal efficiency

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of 73% and TP removal efficiency of 22%, however the facultative pond based systems were very effective in Suspended solid(SS) removal upto 80%, COD/BOD removal upto 70%. The conventional systems were good in terms of SS removal of 88%, COD/BOD removal of 74% and 63% respectively, but were highly ineffective in nutrient removal. The treatment efficiency study presses a need for an efficient algal capture mechanism to free the final treated effluent from algal BOD and solids and use algal biomass as energy alternatives. A new method for evaluating treatment efficiencies was devised called nutrient integrated efficiency (NIE) based on physical, chemical and biological factors. Based on these efficiencies and cost of organic matter and nutrient removal for various sewage treatment options, the best results were obtained for the lake and facultative algal pond based systems which would be highly effective in Indian context and pave a way for sustainable wastewater treatment with resource recovery.

**Sub-Section: Environmental Pollution & Waste Management  
Assessment of Trace Metals Pollution in Underground**

**Drinking Water**

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**Key words:** Trace metal, underground water, toxicity, ICP-AES technique.

**ABSTRACT**

The level of pollution in the natural environment especially aquatic environment has been of great concern to the scientists, environmentalists and engineers because of its toxic nature and other adverse effects on human beings and other living creatures. Water also known as 'blue gold' is the life for all living beings, yet over one billion people across the world are deprived of safe drinking water. The underground drinking water contamination is sometimes of geogenic origin and mostly it is due to different kinds of anthropogenic activities of human beings. Ground water is the principal source of drinking water in our country and indispensable source of our life. The problem of ground water quality is acute. Ground water pollution is much more difficult to abate than surface pollution because ground

water can move great distances through unseen aquifers. Trace metals and their toxicity is the concern of present due to their natural abundance by virtue of their universal usage. Several adverse reports on metal exposure and toxicity have made human beings more conscious all over the world. Five different trace metals in underground drinking water at five different sites at Moradabad, India were estimated for pre monsoon period as well as after onset of monsoon. Trace metals namely lead, cadmium, chromium, manganese and iron were estimated by ICP-AES technique and the data was compared with the water quality standard prescribed W.H.O. The underground water is found to be excessively contaminated with iron, moderately contaminated with chromium and manganese at all the sites and contaminated with lead metal at a few sites during monsoon. The underground contamination is increased after the onset of monsoon. The present study suggests that people exposed to water of contaminated sites are prone to health hazards of metal toxicity and water quality management is needed in the study area.

**Sub-Section: Environmental Pollution & Waste Management**  
**Improvement of bio-hydrogen production and**  
**intensification of biogas from kitchen waste**

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**Key words:** Biohydrogen, kitchen waste, slurry, *Bacillus funiculus*, *Bacillus licheniformis*.

**ABSTRACT**

The production of biogas, from starch-rich kitchen waste from the Sathyabama University mess, Chennai, was investigated in a laboratory scale using the simple single-state digester of 1-liter working volume. The digesters were fed on a batch basis with the slurry of cow dung (inoculum) and kitchen waste (substrate) at ambient temperature (29-31°C) for 5 days. Biogas containing 32% hydrogen content could be achieved cow dung (50%) and kitchen waste (50%) with effluent from the using simple single-state digesters. The maximum efficiency of hydrogen bio-production in the digester at pH of 5.0-6.0, temperature of  $32 \pm 3$  °C. The amount of the gas produced was calculated by water displacement method using a mini-digester and also effective composition of the slurry where which maximum productivity of bio-hydrogen was also identified. The organisms

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were submitted to NCBI and following accession numbers JF682389- *Bacillus licheniformis* HRNT01 JF683611 - *Bacillus funiculus* HRNT02 were assigned.

**Sub-Section: Environmental Pollution & Waste Management  
Studies on Hydro Biology of the Coastal Fishery Belt Of West Bengal**

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**Key words:** Fishery, biological, oxygen, conservation, pollutant, water quality.

**ABSTRACT**

The objective of this study was to carry out a comparative study of the specific water quality parameters to understand the quality of water utilized in fishery and biological propagation and conservation aspects in four spots namely the Digha (D), Shankarpur (S), Mandarmoni (M) and Junput(J) coastal regions. The Total Dissolved Solids (mg/l) from the four locations of sampling were Shankarpur (37116.0), Digha (50024.0), Mandarmoni (37212.0) Junput(37448.0). Total Suspended Solids (mg/l) were found as Shankarpur (198.0), Digha (318.0), Mandarmoni (406.0) Junput (103.0). The pH at 29°C was ranged as 7.78, 7.90, 8.52 and 8.26 respectively. Total Hardness (mg/l) was found to be 5742.8(S), 5821.2(D), 5681.3(M) and 5724.3(J). The Biological oxygen demand (mg/l) was found as 1405.0(S), 820.0(D), 70.0(M) and 765.0(J). The chemical oxygen demand was found as 4070.56(S), 2805.92(D), 237.12(M) and 4125.0(J). The results were compared and discussed in detail.

**Sub-Section: Environmental Pollution & Waste Management  
Electrocoagulation induced dye removal from synthetic dye  
waste solutions by gravitational settling**

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**Key words:** Electrocoagulation, dye removal, Fe electrode, gravitational settling.



### **ABSTRACT**

Electrocoagulation is currently being evaluated as a pre-treatment step for the dye removal from the wastewater generated in the dye industry. This process requires use of separate electrocoagulation and settling unit operations. In the present work the electrogenerated colloidal particles are shown to adsorb the dye molecules as they grow into flocculants and settle down in the reactor itself. A simple electrochemical cell set-up that allows electrocoagulation at the top of the cell and facilitates gravitational settling and removal of the supernatant liquid is described. The influence of dye concentration, pH, current density, electrolysis time and salt concentration on the settling and colour removal efficiencies using Fe electrode are reported. The nature of the dye molecules (Amido Black 10B, Eosine Yellow and Methyl violet) and their mixtures on settling rates are also discussed. At an optimum current density of 16.84 mA/cm<sup>2</sup> and electrolysis time 1 hour, at pH of 8 the synthetic waste solution containing 100 mg of dye in 2% NaCl solution was found to settle in 60 minutes with complete colour removal. This paper also highlights the problems that need to be addressed for further improvement in the process.

#### **Sub-Section: Environmental Pollution & Waste Management Adsorption of Dye Benzoazurin-G (organic contaminants) by an adsorbent derived from Eichhornia (water weeds)**

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**Key words:** Adsorption, Eichhornia, adsorption isotherms, adsorption kinetics.

### **ABSTRACT**

The industries produce highly colored large volume of waste water, which is one of the major environmental problems. Such dye effluent is toxic and difficult to remove by conventional waste water treatment methods. Adsorption has evolved into one of the most effective physical processes for removal of dyes. The most commonly used adsorbent for dye removal is activated carbon, because of its capability for efficiently adsorbing a broad range of different types of adsorbate. The aim of present work is to study the effectiveness

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of the adsorbent to removal of synthetic dye from textile waste water using low cost adsorbents prepared from Eichhcornia. The adsorption of Dye Benzoazurin-G in aqueous solution on various low cost adsorbents was analyzed. The adsorption of dyes by activated charcoal obtained from plant material (Eichhcornia) was studied and was found to be very effective at pH 8. The effect of various parameters such as contact time, adsorbent dosage, initial dye concentration and pH has been studied. Adsorption of dye Benzoazurin-G is highly pH dependent and the results indicate that the maximum removal (93.6%) took place at dose 8gm/l in the pH range of 8 and initial concentration of 40 ppm. Kinetic experiments reveal that the dilute dye solution reached equilibrium within 105 min. The adsorbent capacity was also studied the dye adsorption followed both the Langmuir and Freundlich equation isotherms. Comprehensive characterization of parameters indicates that AC-E to be an excellent material for adsorption of dye Benzoazurin-G to treat wastewater containing low concentration of the dye.

**Sub-Section: Environmental Pollution & Waste Management**  
**Adsorption Studies of Zn (II) Ions from wastewater using**  
**Calotropis procera as an adsorbent**

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**Key words:** Wastewaters, adsorption isotherms, Calotropis procera

**ABSTRACT**

Increased industrialization and human activities have impacted on the environment through disposal waste containing heavy metals<sup>1</sup>. The presence of heavy metals in the environment can be detrimental to a variety of living species<sup>7</sup>. Metals can be distinguished from other toxic pollutants, because these are non biodegradable, may undergo transformation, and can have a large environmental, public health, and economic impact<sup>2</sup>. The presence of toxic heavy metal contaminants in aqueous streams, arising from the discharge of untreated metal containing effluents into water bodies, is one of the most important environmental issues<sup>4</sup>. Zinc is an essential mineral, but too much is not beneficial. Symptoms of zinc toxicity include nausea/vomiting, fever, cough, diarrhea, fatigue, neuropathy and dehydration. Adsorption technique is one of the most important technologies

for the treatment of polluted water from zinc 3, but seeking for the low-cost adsorbent is the target of this study. Removal of zinc was studied using adsorbent prepared from poly vinyl activated charcoal of calotropis procera leaves (PVAC-CP). Batch adsorption experiments were performed by varying adsorbent dose, pH of the metal ion solution and contact time. Adsorption of zinc is highly pH dependent and the results indicate that the maximum removal (85.8%) took place at dose 15gm/l in the pH range of 6 and initial concentration of 60 ppm. Kinetic experiments reveal that the dilute zinc solution reached equilibrium within 105 min. the adsorbent capacity was also studied the zinc adsorption followed both the Langmuir<sup>5</sup> and Freundlich<sup>6</sup> equation isotherms. Comprehensive characterization of parameters indicates that PVAC-CP to be an excellent material for adsorption of zinc ion to treat wastewater containing low concentration of the metal.

**Sub-Section: Environmental Pollution & Waste Management**  
**Green alternatives to chlorine and chlorinated solvents**  
**to cope the water pollution**

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**Key words:** Water pollution, green chemistry, organochlorine, etc.

**ABSTRACT**

One of the major causes of water crisis is water pollution. Addressing the problem is very difficult because of finite resources of fresh water and increasing water demand of escalating population contaminating water with more pollutants. Water pollutants are; persistent organic pollutants including drugs, pesticides, dyes, gasoline compounds and organochlorines etc. All these are coming out mainly from agricultural sources, industrial effluents and effluents from domestic & waste water treatment plants. Many of these pollutants undergo reactive decay over long period of time in water. One of such class of notorious chemicals is chlorine and chlorinated hydrocarbons. Most of the chlorine-pollutants are due to use of chlorine as disinfectants/ oxidants in water treatment plants and chlorinated solvents used in industries. Thus the chlorine and chlorinated compounds are becoming major threat to water sustainability. Green chemistry has come out with a set of alternatives of chlorine and chlorinated products to provide eco-friendly, clean chemical technologies and processes as remedial for water pollution.

**Sub-Section: Environmental Pollution & Waste Management**  
**Effect of Atlas Cycles Industry Effluent on Pharmacognosy**  
**of *Boerhaavia diffusa* Linn. Used as Blood Purifier**

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**Key words:** Pharmacognosy, *Boerhaavia diffusa*, effluent analysis.

**ABSTRACT**

*Boerhaavia diffusa* Linn. belongs to the family Nyctaginaceae, is commonly known as punarava found throughout plains in India. Plant contains quinolizidine alkaloids, sitosterol, ursolic acid, punarnavine etc. The leaves are used in dyspepsia and tumors. In this study the various pharmacognostical parameters were carried out with plant powder/parts to find out the impact of industrial effluent (Atlas Cycles Industry, Ghaziabad). The effluent was analysed for colour, pH, TS, TDS, TSS, BOD, COD, heavy metals, etc.). Morphological characters of stem and leaves (colour, apex, base, margin, texture, etc.), parameters of surface layer (stomata, stomatal index, palisade ratio, trichomes, epidermal cells and their cuticularization etc.), secondary xylem and secondary phloem were observed decreasing in plants collected from polluted area. The anatomical characters like chlorenchyma, endodermis and pericycle were absent in stem and in leaves presence of collenchyma, single layer of palisade and one vascular bundle in midrib were observed in polluted plant samples. Preliminary colour reaction tests showed degree of change in polluted plant samples. TLC observations indicated less number of spots in polluted plant samples. The comparative pharmacognostic studies are carried out of the plant with a view to check the substandard quality of drug and adulteration to lay down correct botanical identification for its value as a crude drug.

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**Sub-Section: Environmental Pollution & Waste Management  
Variability in Aerosol Radiative Forcing over Delhi  
in pre-monsoon and post monsoon seasons**

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**Key words:** Aerosol, radiative forcing.

**ABSTRACT**

Radiative forcing by aerosol particles can be an important contributor to climate change but the magnitude, as well as the sign of the forcing effect, is highly uncertain [IPCC, 2001]. Aerosol radiative forcing is an area of keen scientific interest because it is an important parameter in understanding the perturbations that drive the climate system. The radiative effects of aerosols are conventionally broken down conceptually with terminology that distinguishes the mechanism by which the influence of the aerosol is manifested [Schafer et al., 2008]. Aerosol radiative forcing (ARF) were deduced from OPAC (optical properties of aerosol and clouds) model and Santa Barbara DISORT Atmospheric Radiative Transfer (SBDART) model using ground based Microtops -sunphotometer data for the year 2008 and 2009 in the shortwave wavelength range (0.3 - 3.0  $\mu$ m). We find that over Delhi there is a large negative average forcing at the surface  $-65.8 \text{ W/m}^2$  whereas average forcing at the TOA was  $22.6 \text{ W/m}^2$  during pre-monsoon and  $-67.10 \text{ W/m}^2$  at the surface and  $0.465 \text{ W/m}^2$  at TOA in post monsoon season. As a result we consider that aerosol particles caused a cooling effect at the surface.

**Sub-Section: Environmental Pollution & Waste Management  
Microbial Bio-Degradation of Polyethylenes**

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**Key words:** Microbial biodegradation, polyethylene, spectroscopic studies.

### **ABSTRACT**

In recent years, there has been a marked increase in interest in biodegradable materials for use in packaging, agriculture, medicine & other areas. The purpose of this study was to investigate the biodegradation of disposable polyethylene films by consortia of soil microorganisms. Significant morphological & structural changes on biologically treated polyethylene film samples were observed. Biodegradation of polyethylene by microbial strains contribute to our understanding of the process & the factors affecting polyethylene biodegradation. Biodegradation of polyethylene films were observed microscopically, X-ray analysis & NMR studies. From our experimental study, it was realized that polyethylene films may be biodegradable.

#### **Sub-Section: Environmental Pollution & Waste Management Determination of Calcium Speciation of Three Stations of River Mandakini at Chitrakoot Using Ryzner Stability Index**

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**Key words:** Calcium speciation, River Mandakini, Ryzner stability index, scaling tendency, corrosive tendency, saturation tendency.

### **ABSTRACT**

In the present study, calcium speciation i.e. scales or corrosive or saturation at different stations of river Mandakini at Chitrakoot was determined by Ryzner stability index. 03 water samples were collected in each month during March, 2010 to Feb, 2011 from the selected sampling sites viz. Sati Anusuiya, Jankikund and Ramghat of River Mandakini. The parameters investigated were temperature, TDS, calcium hardness, alkalinity and pH. The standard methods for examination of water and wastewater (APHA-AWWA) were followed to analyse the above parameters. The results of the above analysis were fitted in Ryzner stability index in order to determine calcium speciation. Scaling tendency was noticed to dominate at Sati Anisuiya station of river Mandakini in more months during the study

period indicating the rich area of limestone as well as other calcium containing minerals while corrosive tendency was noticed to dominate at Ramghat station of River Mandakini in more months during the study period containing more pollutants which come through the large no. of small and big drains joining at its spots of river Mandakini. Obviously water quality was not fit for drinking as well as other uses of consumers due to high extent of calcium minerals as well as other corrosive burning pollutants.

**Sub-Section: Environmental Pollution & Waste Management  
Water Quality Status of Korba District, C.G. India**

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**Key words:** Physico-chemical, metallic elements, SD, SE, and WQI.

**ABSTRACT**

In blue planet safe water is only 1% as surface water and ground water, resting 99% water sources are contaminated owing to over exploitation for human development. Keeping this in view we have taken super investigation of WQPs in the highly polluted area of Chhatisgarh, Korba district. We have collected fifty four water samples in stoppered polythene and glass bottles during the month of July 2009 to Dec. 2009 on monthly basis from nine selected site of study area. The sampling locations are designated started from BK1 to BK9 orderly. Water samples were subjected for physicochemical and metallic element analysis as per IS procedure. The analytical results were compared with standard value stipulated by ter monitoring agency: BIS and WHO and evaluated by statistical parameters viz. mean, SD, SE, %CV, and WQI. 210 correlations were established for different variable parameters. 140 positive significant while 66 negative relations. High degree of positive correlation coefficient was observed between Fe and Al with r value +0.95. WQI calculated for all sampling sites results were covered from 1184.32 to 12,390.65 indicate water sources having high loading of different pollutants. % CV was noted high for  $\text{PO}_4^{3-}$  (190.30), Al (167.8), Fe (170.6) and Hg (165.8), indicated of high variation in these qualities for different locations.

**Sub-Section: Environmental Pollution & Waste Management**  
**Aerobic composting of organic municipal solid waste**  
**employing indigenous microbial strains**

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**Key words:** Composting, municipal solid waste, thermophilic phase,

**ABSTRACT**

Municipal solid wastes are treated by composting in India because of the disadvantages of enormous investment, long processing cycle and unstable products in a conventional composting treatment. In this study, aerobic turned windrows composting method, only a thermophilic phase within the process and further compared with a conventional composting run by assessing the indexes of pH, total organic carbon (TOC), total Kjeldahl nitrogen (TKN), C/N ratio, germination index (GI), specific oxygen uptake rate (SOUR), dissolved organic carbon (DOC) and dehydrogenase activity. After composting for 14 days, 16 days, 18 days and 19 days in the four CTC runs, respectively, mature compost products were obtained, with quality similar to or better than which had been stabilized for 35 days in run A. The products from the CTC runs also showed favorable stability in room temperature environment after the short-term composting at high temperature. The study suggested one of the ecofriendly method for rapid degradation and maturation of organic municipal solid wastes.

**Sub-Section: Environmental Pollution & Waste Management**  
**Trend and Status of Air Quality at three different monitoring**  
**stations in the Brass city of India**

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**Key words:** Air quality status, traffic density, commercial, particulate matter, pollution trend.



**ABSTRACT**

Over the last decades, the development of the Moradabad city, as an urban dense populated area, has elevated the risk of the atmospheric pollution which varies depending on the background of the location they originate from. The aim of this study is to determine the trend and status of air quality and their correlation with the meteorological factors in the Moradabad city. The data of four major air pollutants (SPM, RSPM, SO<sub>2</sub> and NO<sub>2</sub>) and heavy metals (Cu, Zn, Fe, Pb and Cr) were recorded at three different monitoring stations such as civil lines, Town hall and Mughalpura which are residential, Commercial and Industrial areas respectively. The major air pollution i.e. SPM, RSPM, SO<sub>2</sub> and NO<sub>2</sub> were monitored by Respirable Dust Sampler (RDS) 460 NL Envirotech New Delhi and heavy metals were analyzed by Inductively Coupled Plasma- Optical Emission Spectroscopy. The result shows that the concentrations of major pollutants are higher at commercial site which is due to influence of heavy traffic and nearby Railway station and heavy metals are higher at industrial site may be due to Brassware foundries.

**Sub-Section: Environmental Pollution & Waste Management**  
**Environmental Evaluation of Leaching Of Trace Elements from Fly Ash**  
**from Some Thermal Power Stations in Rajasthan**

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**Key word:** Fly ash, trace element, leaching studies, Open Column Percolation Experiments.

**ABSTRACT**

Coal occupies an important position in India. Combustion of coal to produce electricity produces large volume (>120 million tonnes) of coal ashes particularly fly ash which accumulate in on-site piles and ash ponds leading to serious environmental problems, particularly contamination of ground and surface waters due to leaching of trace elements. This study addresses the long-term leaching of trace elements from fly ash from some thermal power plants in Rajasthan. The aim of this work is to provide the basic scientific data for bulk utilization of fly ash and for reducing environmental pollution Environmental assessment

through open Column percolation experiments carried over eighteen months envisaged that fly ash is environmentally as there does not significant leaching of trace elements.

**Sub-Section: Environmental Pollution & Waste Management  
Status of Underground Drinking Water Pollution at Dhampur, Bijnor**

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**Key words:** Water pollution, physico-chemical, aquatic.

**ABSTRACT**

Water also known as blue gold, one of the most priceless gifts of Nature is also regarded as the life line on Earth, because evolution of life and development of human civilization could not have been possible without water. Water pollution has many causes and characteristics. Bijnor occupies the north-west corner of the Moradabad Division and is a roughly triangular stretch of country with its apex to the north. Dhampur city is a Tehsil and a municipal board in Bijnor district in the state of Uttar Pradesh, India. Dhampur is located at 29°19'N 78°31'E 29.32°N 78.52°E. Underground water sample at five different sites at Dhampur, Bijnor were collected and analyzed for different physico-chemical water quality parameters following standards methodology of sampling and estimation to assess underground water quality. The estimated values were compared with drinking water quality standards prescribed by W.H.O. Groundwater was found to be polluted with reference to most of the parameters studied, while it was moderately polluted with reference to other parameters. The present study suggests that people dependent on source of study area are prone to health hazards of polluted water and water quality management is urgently needed.

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**Sub-Section: Environmental Pollution & Waste Management**

**A Case Study on the Use of Recycled Materials ----IN HIGHWAY CONSTRUCTION**

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**Key words:** Waste, recycling, plastics, construction sector.

**ABSTRACT**

As the world population grows, the amount and type of waste being generated. Many of wastes produced today will remain in the environment for hundreds, perhaps thousands, of years. The creation of non-decaying waste materials, combined with growing population, has resulted in a waste disposal crisis. One solution to this crisis lies in recycling waste into useful products. Highway construction is a major sector in the construction industry, which requires a large quantity of materials to work upon.

The materials like plastics, polymers or fly ash are those wastes which became headache to destroy .Thus, consuming, such materials in construction sector is an environment -friendly act. This article summarizes current research on those waste materials that have shown promise as a substitute for conventional materials. The use of plastics and polymer products in road construction has already been started in India. Such acts in India were already been succeeding.

Current research was on those waste materials that have shown promise as a substitute for conventional materials. The use of plastics and polymer products in road construction has already been started in India. Such acts in India were already been succeeding.

**Sub-Section: Environmental Pollution & Waste Management  
Analysis of Ground Water Quality of Municipal  
Solid Waste Dumping Site at Jabalpur**

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**Key words:** Leachate, ecosystem, agriculture, landfill.

**ABSTRACT**

The term ground water is usually reserved for the sub surface water an increasingly important resource all over the world. Much of the current concern with regards to environmental quality is focused on water because of its important in maintaining the human health and our ecosystem. Fresh water is finite resource which is essential for agricultural, industry and even human existence, without fresh water of adequate quantity and quality, sustainable development will not be possible. Ground water contamination is a major concern in municipal solid waste landfill operations because of affects of landfill leachates and its potential health risks. Most of contaminated ground water has high level of BOD, COD, Chloride, Sodium, Potassium and Hardness. Therefore, the present investigation deals with assessment of ground water quality of Municipal Solid Waste dumping site of Jabalpur.

**Sub-Section: Environmental Pollution & Waste Management  
Effective degradation of Coir Industry Wastes through Optimisation of  
Cellulase Production using Filamentous fungi**

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**Key words:** Coir industry waste, degradation, *Aspergillus niger*, *Aspergillus fumigates*,  
*Trichoderma harizianum*, environmental management.

**ABSTRACT**

'Coir industry' is one of the important traditional cottage industries in India. It is a labor intensive and export oriented industry. It provides employment to over 50,000 workers all round the year 80% of the workers engages in the industry is women. The basic raw material of the industry is coconut husk, in the process of extraction of coir fiber from husk. Coir pith is a ligna cellulosic agro-residue, which is produced in enormous quantities as a by-product in coir industry in India. On survey, it was found that, the disposal of coir wastes like huge mountains have created serious problems and public health hazards and the surrounding environment has also been highly polluted. In addition, it was observed that the problems of huge dumps of Coir wastes are mainly due to the delay in biological degradation under natural conditions. Recent developments in microbial biotechnology yields new application for the enhancement of degradation process with selected filamentous fungi like *Aspergillus niger*, *Aspergillus fumigates* and *Trichoderma harizianum*. Coir pith wastes was subjected for degradation in association with saw dust for 'Solid state fermentation' using the above desired fungal organisms and the experiment was kept for 45 days incubation. After degradation, the enzyme 'Cellulase' was analyzed at different temperature and pH. The rate of enzyme production was high at 40°C temperature and pH 5 with the substrate concentration (5%) for *Aspergillus niger* and *Aspergillus fumigates*. Whereas, in case of *Trichoderma harizianum* the cellulose was significantly high at 32°C temperature with pH 6.5 with the substrate concentration (5%) and the same was decreased with increase in temperature. From the present study it could understand that, the high yield of Cellulase enzyme at optimized temperature and pH indicates the effective degradation of Coir industry wastes within the short period. Thus, the management of coir industry wastes has been considerably achieved through this biological approach. A standard protocol has to be developed further, to increase the speed of degradation reaction using different fungal organisms individually and synergistically.

**Sub-Section: Environmental Pollution & Waste Management**  
**Assessment of alpha radioactive pollutants from some soil samples**

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**Key words:** Radiation; radon; lung cancer; health.

**ABSTRACT**

The earth is radioactive since its creation. The radioactive elements such as uranium, radium and radon are present in the soil, air and water. Uranium is a radiotoxic element found in the trace quantities in almost all naturally occurring materials like soil, rock, sand, plants and water etc. Everyone is exposed to radon because it is present everywhere with varying concentrations. Radon and its progeny are well established as the lung carcinogenic. In addition to being the main source of continuous radiation exposure to human, soil acts as a medium of migration for transfer of radionuclides to the biological systems and hence, it is the basic indicator of radiological contamination in the environment. Moreover the soil radioactivity is usually important for the purpose of establishing baseline data for future radiation impact assessment, radiation protection and exploration. Radon is formed from the decay of radium which in turn is formed decay of uranium. Radon is responsible for the main natural radiation exposure for the human beings. The radon isotope Rn-222 has its half-life of 3.82 days that is long enough to allow it to migrate through the soil and enter the atmosphere, thus, reaching the human environment. Among many factor effecting the radon exhalation, one of the most important is radium content of the soil. For radon concentration and exhalation rate measurements from the soil samples "Canister technique" has been used. Fine quality of the samples up to 100- $\mu$ m grain size was obtained using a scientific sieve, each of the mass 100g, were kept in plastic cylindrical canisters. LR-115 plastic track detector was fixed on the bottom of the lid of each can with cello tape. The can is tightly closed from the top and sealed such that sensitive side of the detector always faced the specimen and is exposed freely to the emergent radon from the samples in the can so that it could record alpha particles resulting from the decay of radon in the remaining volume of the canister. After exposure for a stipulated period (about 100 days), the LR-115 films (SSNTDs) are chemically etched in 2.5N NaOH (sodium hydroxide) solution in an etching bath with a magnetic stirrer at a temperature of  $60\pm 10$ C for a period of 90 min for developing the tracks recorded and registered in the films. The tracks produced by the alpha particles were counted using the optical microscope at magnification of 400X. The work has been undertaken keeping in view the health hazard effects of the alpha radioactive radon in the environment.

**Sub-Section: Environmental Pollution & Waste Management  
Study on the Waste Water Treatment Alternative for  
Waste Water Disposal at Fatuha in Patna District**

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**Key words:** Fatuha city, domestic waste, industrial effluent, ground water.

**ABSTRACT**

Water is a basic natural resource. It is most precious asset on the earth. It has made the mother earth a unique planet in the universe, but it has been exploited, mistreated & contaminated to a greater extent. Toxic bacteria, chemicals & heavy metals routinely pollute natural water resources. This factor exposes people to long term health hazards such as liver damage, cancer fluorosis, arsenocosis and other dangerous diseases. Most of the water bodies are not safe for human consumption. The pond of Fatuha City in Patna District has been increasingly polluted from domestic waste and Industrial effluent. There is lack of provision of scientific ways of disposal of domestic and Industrial waste. There are two discharge points of the pond are as follows:-

- 1). From south of the Railway Station is domestic discharge point
- 2). From north of the Railway Station is Industrial discharge point

An experimental study has been undertaken for the determination of physicochemical properties of selected area. The analysis were carried out for the parameters namely :- Temp., pH, BOD, COD, Heavy Metals, Total Nitrogen, Nitrate, Oil & Grease Etc. The pH of the pond water is 7.6 which is slightly alkaline, TDS greater than 500 mg/l, COD concentration of pond water is 80 mg/l. The drinking water of industrial area having increasingly COD value that 100 mg/l, BOD is 36 mg/l, DO level was found to be low.

Pollutants like Phosphates, Sulphates, Sodium, Potassium, were also on higher side. It is concluded that the water of the research area is not fit for the human consumption. It is feared that the contaminated water through infiltration would contaminated the ground water, hence it would be fatal for the public health.

**Sub-Section: Environmental Pollution & Waste Management  
Issues Regarding Water Pollution to Benefit our Environment**

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**Key words:** Water, pollution, anthropogenic, contamination, untreated sewage.

**ABSTRACT**

Environmental pollution has many facets, and the resultant health risks include diseases in almost all organ systems. Water is a source of life, but when badly exploited it becomes a source of problems. Medical literature contains a very little evidence regarding the harmful effects of pollution in atmosphere. One of the major critical issues is water pollution. It is the leading worldwide cause of deaths and diseases and that it accounts for deaths of thousands of people daily.

Water is mainly polluted when it is impaired by anthropogenic contaminants. Water pollution is held responsible to a large extent for the frequent rates of deaths and illness, due to contamination of drinking water by untreated sewage in developing countries. The vast advancement in technology and development of industries, effects the environment due to release of hazardous chemicals.

Purpose of study on water pollution, is to analyse the four major issues regarding our environment are:

1. Water and industry - promoting cleaner industry with respect to water quality and the needs of other users.
2. Water and energy - assessing water's key role in energy production to meet rising energy demands.
3. Ensuring the knowledge base - so that water knowledge becomes more universally available.
4. Water and cities - recognizing the distinctive challenges of an increasingly urbanized world.

Water pollution is therefore direct or indirect introduction of substances into the water environment such as to harm living resources, effect human health by various infiltrative disorders and reduce water environment quality. By analyzing the above mentioned issues a solution is suggested that can reduce the adverse effects of water pollution.



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**Sub-Section: Environmental Pollution & Waste Management  
Ambient Air Quality of Nashik City in Maharashtra**

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**Key words:** SO<sub>2</sub>, NO<sub>x</sub>, particulate matter.

**ABSTRACT**

The objective of the work reported in the paper is to understand the air quality in Nashik city with reference to SO<sub>2</sub>, NO<sub>x</sub> and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>). In order to study the six areas namely Raviwar Karanja, Dwarka circle, CBS, Bytco point, Ambad and Satpurwere selected for the study, as they are heavy traffic and most crowded locations in the city. Air quality was monitored every month from June 2009 to July 2010. Result in above areas reveal that the level of SO<sub>2</sub> and PM<sub>2.5</sub> ranges from 5.7 µg/m<sup>3</sup> to 19.5 µg/m<sup>3</sup> and 63 µg/m<sup>3</sup> to 83.7 µg/m<sup>3</sup> respectively are within the limit at all locations whereas values of PM<sub>10</sub> ranges from 114 µg/m<sup>3</sup> to 232 µg/m<sup>3</sup> is crossing the standard ;imit at all locations. Average level of NO<sub>x</sub> is found at Ravivar Karanja CBS, Dwaraka Circle and Bytco Point (73.3 70, 751.1 µg/m<sup>3</sup> respectively) is almost nearing the limit because of the higher automobile exhaust. Emission from vehicles and automobile exhaust are responsible for more than 75% of the total air pollution.

**Sub-Section: Environmental Pollution & Waste Management  
Study and Fabrication of a Domestic Defluoridation Low Cost  
Filter Using Activated Alumina in Rajasthan**

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**Key words:** Activated Alumina (AA), FUC, Mud Block Machine.

**ABSTRACT**

Activated Alumina (AA) is assumed to remove fluoride from ground water. The AA has been used in different defluoridation filters and we have combined the conventional water filters with ceramic cartridge with Activated Alumina to fabricate a domestic filter. The fluoride uptake capacity (FUC) of the AA has been determined using groundwater brought in from a nearby fluorosis affected village. The quality parameters of both treated and untreated water has been determined. The AA has been regenerated using 1% NaOH and 1% H<sub>2</sub>SO<sub>4</sub> and the washings have been treated with lime to adjust the pH and fluoride content. By using Mud Block Machine, sludge obtained has been converted into building blocks using cement, sand, garden soil and waste broken concrete. The initial result of the study has been presented here.

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**Sub-Section: Environmental Pollution & Waste Management**  
**Study of the Effect of Air Pollution on Wheat**

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**Key words:** Wheat flowers, pollutants, particulates, micro electrochemical cell, acid rain, global warming and ozone depletion.

**ABSTRACT**

Wheat is a very important crop of Indian farmers. Most of the people feeding depend upon wheat. There are several eatable food products prepared by wheat. Wheat is cultivated mostly in Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal. Recently in these states industrialization and infrastructure development work are going very fast causing huge amounts of pollutants and particulate entering into the atmosphere. Pollutants are oxide of carbon, oxide of nitrogen, oxide of sulphur, oxide of chlorine, chloride ions, ammonia, organic acids and aldehydes where as particulates are dust, smoke, mist and fog. Particulates are deposited on the surface of wheat. Some of these particulates are hydroscopic in nature. They absorb pollutants and form acids. These acids in turn develop micro electrochemical cell with flower of wheat which destroy flowering of wheat. Other factors are acid rain, global warming and depletion of ozone layer also affect the production of wheat.

**Sub-Section: Environmental Pollution & Waste Management**  
**Physico-Chemical Analysis of Water of some important Ponds and Wells**  
**in and around the city of Patna, Bihar**

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**Key words:** Ponds and wells in and around Patna, heavily polluted, unsuitable for human consumption.

### **ABSTRACT**

Water is a basic natural resource and the most precious asset in any region. But it has been exploited, mistreated and contaminated in very many ways mainly through human activities. Most of the tap and well water are not safe for drinking due to environmental pollution. Same is true for most of the pond and well water which is not satisfactory for human consumption due to such local activities as dumping of solid waste, cleaning of animals in them, discharge of animal waste and effluents etc. The present research work reports physico-chemical and bacteriological analysis of water from several wells and ponds in and around the city of Patna and have found the presence of excess nitrate in most of them, in some wells and ponds as high as 200 mg/L. The DO levels have been found to be low (between 0.5-2.0 mg/l). Pollutants like phosphate, sulphate, sodium, potassium, turbidity etc, have also been observed to be on higher side.

#### **Sub-Section: Environmental Pollution & Waste Management Dyeing of Cellulosic & Protein Fabrics Using Medicinal Plant Leaves**

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**Key words:** Dyeing, medicinal, Azadirachta indica, fastness, ecofriendly.

### **ABSTRACT**

Dyeing is a process of imparting color to a textile material. It is a major component in the manufacturing of value-added textiles. The plant based formulations have been proved biologically more compatible with human system and less toxic. So there is need to explore the possibility of extracting the natural dyes from the part of medicinal plants which are being utilized or not being utilized for medicinal purpose. Thus in view to fulfill the above stated demand, an attempt has been made in present study to explore the use of eco-friendly natural dye from the dry leaves of Neem (Azadirachta Indica ) on protein (Silk & Wool) and cellulosic (Rayon & Jute) fabrics. In present study, protein (Silk & Wool) and cellulosic (Rayon & Jute) fabric sample were dyed from the powder of dry Neem leaves in three medium i.e. acidic, alkaline and aqueous with maintaining pH i.e. 6,8 and 10, time 45, 60 & 90 mins and concentration of dye 2% for light and 5 % for dark shade. After selection of best sample according to medium, pH, time and concentration, mordanting was done. Tests for

color fastness to light, washing, perspiration and crocking were carried out. Different colors were obtained from neem leaves and their fastness test showed that Neem leaves can be used successfully for dyeing. It will be very effective utilization of it and beneficial from the commercial point of view.

**Sub-Section: Environmental Pollution & Waste Management  
Purification and Utilization of Thane city waste water**

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**Key words:** Thane, water supply agencies, purification, irrigation.

**ABSTRACT**

The city of Thane receives 320 MLD of water from water supply agencies, per day. Only 56 MLD of water is treated while 210 MLD of water go untreated. This water is dumped in Thane creek through 12 nallahs (open drains) in the city. We collected a representative five sample from Wagle Estate nallah and analysed it for purify. We found that indeed this water after purification can be used safely for the purpose of irrigation.

**Sub-Section: Environmental Pollution & Waste Management  
Restoration Potential of *Jatropha curcas* Linn.  
in degraded hilly terrain in Manipur**

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**Key words:** *Jatropha curcas*, growth parameter, soil characteristics, oil extraction, restoration, degraded hilly terrain, Manipur

**ABSTRACT**

Shifting cultivation or Jhuming is a traditional form of agriculture which is increasingly and extensively practiced in the hills of Manipur in order to meet the ever

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increasing pressure of livelihood requirement of the growing population and developmental needs. As a result, a majority of the hills that cover ninth-tenth of total geographical area of the state are degraded. Such degraded fields can be utilized for carbon sequestration purposes to mitigate Global climate change and subsequent warming of the earth's temperature. *Jatropha curcas* is an ideal species for revegetating the degraded sloppy terrains in the hills of Manipur. Hence, this paper analyses the various growth parameters of *Jatropha curcas*, physico-chemical characteristics of the soil, potential of seeds as oil resources etc. in a study from Andro region of Manipur.

**Sub-Section: Environmental Pollution & Waste Management**  
**Quantitative Study of As (III & V) and Sb (III & V) Interaction with**  
**Mangrove Humic Substances by Molecular Fluorescence Spectroscopy**

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**Key words:** Arsenic, antimony, humic substances, stability constant.

**ABSTRACT**

This study reports the measurement of stability constant for the interaction of Arsenic (V & III) and Antimony (V & III) with humic substances extracted from Sundarban mangrove sediment. It was observed As and Sb formed a more stable association with fulvic acid (FA) than its counterpart humic acid (HA), but the difference of stability with respect to oxidation state of As and Sb were less prominent. However, their stability of association with FA and HA were lower in comparison with that of transitional metals, indicating their association are of iron pair interaction in nature.

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**Sub-Section: Environmental Pollution & Waste Management  
Innovative Experiment on Environmental Awareness**

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**Key words:** 5F's, food, fuel, fodder, fibre, fruit for sustainable livelihood.

**ABSTRACT**

For human survival environment is of prime concern. The population growth and advancement of knowledge compels to disturb biotic balance of nature. Human intervention has drastically changed the natural balance of land, water, air, atmosphere and energy. The Indian status of environment is yet more alarming. We have to accommodate 17% of world population within 2% of the world geographical area. The rapid population growth is estimated to cross 1480 million marks by 2048 as per present growth rate. In order to address such difficult situation over time some good micro experiments have been performed showing optimistic results in Chakriya Vikas Practice is system mechanism innovated by NGO (Non-Government Organization) named Society of Hill Resource Management School (SHRMS), Daltonganj, Jharkhand, where people came out with solution and developed strong natural resource base around project boundary which is not only sufficient to cater their own need but is surplus enough in sustainable manner to feed adjoining areas over time. The projected results are optimistic enough and show way forward for sustainable livelihood.

**Sub-Section: Environmental Pollution & Waste Management**

**Diversity of cellulolytic microbes and biodegradation of municipal solid waste**

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**Key words:** Municipal solid waste, cellulose, cellulolytic microbes, applications.

**ABSTRACT**

Municipal solid waste has contained high cellulose, which is an ideal organic waste for the growth of most of microorganism as well as composting by these microbes. In the present study, Congo red test was performed for screening of microorganism and after screened out potential strain which was further used for biodegradation of organic municipal solid waste. Forty nine out of the 250 different microbes tested (165 belong to fungi and 85 to bacteria) produced cellulase enzyme and among these *T. viride* was found potential strain in the secondary screening. During the bioconversion of organic waste, after 60 days, the total weight lose in control, plate I, plate II and Plate III were 12.51 %, 19.86 %, 20.69 % and 19.75 %. On the other hand, Piles contained 25 kg of waste showed that after 60 days, the average weight lose in three piles were 33.35% and 11.24% in control. The pH of the turned piles (Control, Pile I, Pile II, and Pile III) increased from an initial pH of 7.21, 7.18, 7.28 and 7.35 respectively, to a pH of 7.89, 8.20, 8.53 and 8.41 after 10 days and then stabilization with pH fluctuations between 7.24, 7.75, 7.81 and 7.77 after 30 days. The initial temperature of the turned piles (Control, Pile I, Pile II and pile III) were 29, 32, 30 and 31°C and rapidly rose to a peak of 59°C (Pile II) after a 20-day of decomposing period. The high temperature continued until 30 days of decomposition, after which the temperature dropped to 41°C and below during the maturation.



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**Sub-Section: Environmental Pollution & Waste Management  
Challenges of desertification in Asia**

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**Key words:** Desert, erosion, aeolian, climate, anthropogenic.

**ABSTRACT**

Anthropogenic impacts either directly or indirectly have been largely responsible for initiating desertification challenges all across the planet. Unrestricted human settlements, grazing, urbanization of fragile ecosystems, intense agricultural and industrial encroachments, climate change and population explosion have cumulatively aggravated desertification issues in all the major continents in some form or other. This article highlights major issues of desertification challenges from an Asian perspective with global implications.

**Sub-Section: Environmental Pollution & Waste Management  
Biogas Production Potentials of Kitchen Waste- A Feasibility Study**

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**Key words:** Biogas, gas chromatography, kitchen waste, physicochemical characteristics.

**ABSTRACT**

Due to the ever-growing industrialisation and urbanisation the rural India is diminishing, and so are the various rural technologies such as the 'gobar-gas' technology. In order to make the technology relevant in the changing scenario, R&D needs to be undertaken by changing the substrate from cow-dung and other cattle-shed refuse to the various organic form of refuse from the urban set-up, be it municipal waste, wastes generated from commercial

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activities, or the kitchen waste. Present study was envisaged to estimate the methane-production potentials of the household kitchen refuse without manipulating the physicochemical or microbiological environment. The refuse was collected, shredded, mixed with three-time water V/V, and packed into a plastic jerry-can till 10% of headspace. The pH was adjusted upto 6.5 by using phosphates solution as buffer, and the ambient temperature was provided. This 30-day study had a weekly sampling schedule, excepting for methane estimation which was made through on-line gas chromatography. The average mean temperature during the period of the experiment was 30.5°C. The set up was monitored for period of 30 days for changes in its physicochemical and biological status, and the methanogenesis potential. As the previous reports suggested close relation of pH and VFA to the CH<sub>4</sub> production, these three parameters were monitored. On the 7th day of the experiment, the pH dropped to 4.8 from 6.5, VFA (mg/l) and CH<sub>4</sub> (%) were recorded 2860 and 12%, respectively. CH<sub>4</sub> production started by the 13th day and the generated biogas remained in a constituent-wise mean range of 58%. During the time, the pH and VFA were 5.2 and 7703, respectively. The pH value showed a constant increment as recorded on the 21st (5.6) and 28th (5.8) day. The VFA level on the same days exhibited constant reduction, i.e., 6138 and 4812, respectively. The CH<sub>4</sub> production was maximum on the 21st day (43%) and gradually decreased to 24% by the end of the study, attributable to the fact that no special measures to ensure anaerobiosis was in place. As the pH lowered, the VFA accumulation increased, which reportedly has an inhibition effect on the CH<sub>4</sub> production. The total microbial count (CFU/ml) was highest on the 7th day (7.5 X 10<sup>5</sup>), and exhibited a constant decrement till the end of the study (8.8 X 10<sup>4</sup>). Some gram +ve bacterial isolates exhibited cellulase activity. The study thus strongly suggests that the kitchen waste which is organically rich has every potential to be replaced as a substrate for biogas generation, possibly with special measures to encourage anaerobiosis by providing oxygen scavengers. Since biogas production is dependent on the quality of the inocula (microbial consortia), it is recommended that further work be carried out on the relevant microbial consortia, both at the organism as well as molecular levels for enhanced and economic biogas production.

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**Sub-Section: Environmental Pollution & Waste Management**  
**Water Quality and Fish Diversity of Kapila River, Mysore District, Karnataka**

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**Key words:** Nanjangud, Cypriniformes, Kapila River, Catla catla

**ABSTRACT**

Rapidly increasing demands for freshwater systems make it essential that resources are exploited in a sustainable manner. In the present study an attempt was made to assess the water quality and freshwater fish diversity in and around Nanjangud area, Mysore district, Karnataka. The Physico-chemical analysis of water was made from August 2010 to February 2011. The water samples were analyzed for temperature, pH, electrical conductivity, alkalinity, hardness, dissolved oxygen, phosphate, sulphate and nitrate. In the present ichthyofaunal study, 19 species of 12 different genera 7 families and 4 order were recorded from the Kapila River of Nanjangud. The members of Order Cypriniformes were dominated by 13 species followed by Siluriformes 3 species, Peciformes 2 species and Osteoglossiformes with one species. Catla-catla, labeo rohita, Hypothalmichthys molitrix, Cyprinus carpio and Cirrihinus mrigala were found most abundant. Puntius Carnaticus and Gonoproktopterus curmuca were found in less abundant.

**Sub-Section: Environmental Pollution & Waste Management**  
**Physico-chemical Characteristics of Wastewater of Berhampur Municipal Corporation, Orissa**

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**Key words:** Physico-chemical characteristics, wastewater, Berhampur Municipality Corporation, Orissa.

**ABSTRACT**

The physico-chemical parameters of wastewater of Berhampur Municipal Corporation were studied during January-2009 to December-2009. The pH varied from 6.1 to 8.2 the dissolved oxygen (DO) content was highest being 9.1mg/l and lowest DO content was 0.3 mg/l. Biochemical oxygen demand varied between 1.6mg/l to 15.6mg/l. Chemical oxygen demand varied from 8.6mg/l to 126mg/l. Total suspended solid and total dissolved solid varied from 22mg/l to 4750mg/l and 22mg/l to 4750mg/l respectively. Calcium hardness and Magnesium hardness varied from 0.5mg/l to 2600mg/l and 21mg/l to 3550mg/l. Total hardness varied from 35mg/l to 5850 mg/l. Similarly, electronic conductivity varied from 22.4 to 3979.5mg/l. Nitrate value varied between 0.106 mg/l to 8.15 mg/l. The Phosphate value varied between 0.001 mg/l to 1.186 mg/l. All the parameters were compared with the permissible limit prescribed by the United State Environmental Protection Agency and World Health Organization (WHO).

**Sub-Section: Environmental Pollution & Waste Management  
An Electronic System with device for Pollution  
Control --Electronic pollution control system**

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**Key words:** Pollution, Electronic Pollution Control System, gas detector, ANALOG signal.

**ABSTRACT**

The emerging world has been covered with a new blanket along with the atmosphere, in the recent times and that blanket is named "POLLUTION". And measures have been taken in recent times, to the core, to control and enroll certain measures to remove the blanket and it is successfully on way. Here this is a part of it. This Electronic Pollution control system has been designed for the above purpose. This has a gas detector in the exhaust tube of every vehicle in case of automobile and in the chimney top, in case of different petro-chemical industries, which top the table of leading polluting industries. This sensor will monitor the toxic gases coming through the exhaust and give an electronic output, which will be monitored by small software. Now when the output from the sensor for a

particular season, or a particular period of time goes beyond the safer value, an ANALOG signal will be sent to the nearest transport or police department, with the help of an artificial SIM, equipped in the car. This signal has data regarding the owner's license, bank account number etc details, which helps them to take action on that vehicle.

**Sub-Section: Environmental Pollution & Waste Management  
Studies on Mercury Bioaccumulation in Fishes Collected from Kolkata  
and Suburban Area of West Bengal, India**

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**Key words:** Mercury, bioaccumulation, sewage fed aquaculture.

**ABSTRACT**

Bioaccumulation of total mercury concentration were quantified in *Tilapia mossambicus*, *Cirrhinus mrigela* and *Labeo rohita*, captured from two sewage fed fish ponds namely East Calcutta Wetlands and Titagarh sewage fed aquaculture ponds. The Bioconcentration factor of collected fishes was assessed. Bioaccumulation of mercury ranged from 0.94 to 0.073  $\mu\text{g/gm}$  in both pre and post monsoon season. *T. mossambicus* in both season and *C. mrigela* at pre monsoon, cross the Indian recommended maximum limit for food consumption and according to WHO guidelines all fishes were not recommended for pregnant women and individuals under 15 years ages. A significant correlation was observed between mercury content of aquaculture pond water and fish muscle tissue. All data of mercury accumulation in sewage fed fish were higher than the control area (Wilcoxon Ranked-Sum test  $P > 0.05$ ), which suggested the connection between mercury bioaccumulation and sewage fed aquaculture.

**Sub-Section: Environmental Pollution & Waste Management**  
**Impact of Concrete Embankment on the Ecology of**  
**Freshwater Pond in Kolkata- A Case Study**

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**Key words:** Macro-benthic fauna, macrophyte, Oligochaetes, earthen pond.

**ABSTRACT**

This paper deals with comparative study of macro-benthic fauna, physico-chemical parameters of water, macrophyte abundance, plankton-diversity-richness- abundance of earthen and artificial concrete embankment pond in south Kolkata. The macrobenthic fauna are in total 14 species dominated by Oligochaetes, Gastropods and insects and the maximum population was recorded as 722m<sup>-2</sup> and very less (290 m<sup>2</sup>) than embankment with concrete. Copepod, rotifer and other zooplankton is more in number in earthen pond. Earthen pond shows less alkaline, more DO<sub>2</sub>, less pH, less dissolved CO<sub>2</sub> and more macrophyte population. Moreover total health of aquatic ecosystem is far better in earthen embankment ponds under investigation.

**Sub-Section: Environmental Pollution & Waste Management**  
**Quality Assesment of Drinking Water in the Vicinity of Domestic Waste**  
**Water of Village Lathang in District Jagatsinghpur, Odisha.**

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**Keywords:** Drinking water, physico-chemical, BOD, fluoride, Lathang.

**ABSTRACT**

The present research study was focused to evaluate the physico-chemical and biological quality of drinking water of village Lathang and waste water of its domestic drains and the influence of waste water on ground water. The water samples were collected from the open wells, deep wells like hand pump or tube wells as well as waste water from the drains and analysed for pH, Total Dissolved Solid (TDS), Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD). The research study was carried out from July to December 2009. The average value of these parameters in open wells and deep wells were found well within the limit of WHO Standards except fluorides. The average value of fluoride concentration was found to be 1.79mg/l, 1.41mg/l and 2.53mg/l in open well, tube well and waste water of drain respectively. The results indicated that waste water is highly contaminated and it is also affected quality of drinking water of open wells.

**Sub-Section: Environmental Pollution & Waste Management**  
**Sunlight Induced Degradation of Plastic Bag Waste**  
**Using Semiconductor Oxide Photocatalysis**

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**Key words:** TiO<sub>2</sub>, photocatalysis, plastic, sunlight.

**ABSTRACT**

Polythene bags thrown around carelessly are a major environmental hazard. Plastics are chemically stable and resistant to microbial and enzymatic degradation. Incineration of plastic also lead to toxic gases, if the process is not carefully controlled. Studies in our laboratory show that photocatalysis, in presence of semiconductor oxides can be a viable technique for the degradation of plastics. The process is investigated using TiO<sub>2</sub> and ZnO as catalysts in presence of UV light and sunlight. Measurement of weight loss, physical observation, SEM study and chemical analysis showed that degradation upto 3% can be achieved in 20 hr time in presence of sunlight. Additives such as H<sub>2</sub>O<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, and SDS accelerate the degradation. H<sub>2</sub>O<sub>2</sub> formed during degradation undergoes simultaneous decomposition. Rate of degradation is found to vary with pH and acidic medium favours the process. ZnO is more efficient compared TiO<sub>2</sub> as the photocatalyst.

**Sub-Section: Environmental Pollution & Waste Management**  
**Physico-chemical Status of Three Surface Waterbodies in NCR of Delhi**

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**Key words:** Physico-chemical parameters, water characteristics, surface water analysis, GPS, multi parameter aquameter.

**ABSTRACT**

Stagnant surface water bodies have more complex and fragile ecosystems in comparison to running water bodies due to lacking of self-cleaning ability and hence, readily accumulate greater quantities of pollutants. A laboratory study was conducted to monitor the surface water quality of selected water bodies (Hauz Khas lake, India Gate pond & Bhalswa lake) of National Capital Region (NCR) of Delhi by examining various physico-chemical parameters like temperature, pH, ORP, TDS, DO, EC, salinity, alkalinity, turbidity, hardness, Ca, Mg, chlorides, Fe, NO<sub>3</sub>, fluorides, residual free chlorine, etc. The results indicate that all the three water bodies were in polluted condition out of which India gate recreational pond was the most polluted one.

**Sub-Section: Environmental Pollution & Waste Management**  
**Analysis of some physico - chemical Parameters of**  
**Sen Pokhar of Dumka, Jharkhand**

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**Key words:** Pond, lentic, algal mat, abiotic factors.



**ABSTRACT**

Water, the most vital resource for life on this planet is adversely affected both qualitatively as well as quantitatively by various kinds of physical and chemical factors. The physical and chemical properties of water influence its suitability for specific application and also affect the general conditions of the aquatic environment and its biota. Dumka district, (Jharkhand) is situated between 87014'N - 87025'N latitude and 24020'E - 24021'E longitude. It is situated on bank of river Mayurakshi. A pond commonly called Sen Pokhar is large perennial pond of Nonihat of Dumka district. This Pond is freshwater with lentic and aquatic ecosystem and is used by the localites for their needs viz, drinking, bathing, washing, fishing, boating etc. Physico-chemical analysis of this pond was done at monthly intervals for a year during ....., and noticeable variations were recorded, some of which has found beyond the permissible limits.

**Sub-Section: Environmental Pollution & Waste Management  
Study of Pollution Exposure to Roadside Shopkeepers and Vendors in  
Santiniketan- Bolpur Area**

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**Key words:** PM2.5, PM10, respiratory health, roadside exposure, vehicular pollution.

**ABSTRACT**

The main objective of the present investigation is to study the air pollution exposure to the roadside shopkeepers and vendors. For the sake of occupation, they usually spend a large portion of time daily to the traffic pollution exposure. Vehicular pollution study in Santiniketan- Bolpur area shows that particulate pollution load including PM2.5 is predominant over any kind of gaseous pollution. The levels of particulates (all kinds) are very high and violate the standards prescribed by CPCB, New Delhi. Respirable particulates may have a potential health threat to respiratory system and lung related diseases in the exposed population.

**Sub-Section: Environmental Pollution & Waste Management  
Broadband and Ultraviolet radiation characteristics and its  
relation with aerosol optical depth over Delhi**

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**Key words:** Broadband solar radiation (BrR), UV radiation, UV fraction, AOD,

**ABSTRACT**

Broadband (BrR) and ultraviolet (UV) solar radiation data have been observed on a horizontal plane, for the period of April 2010 - March 2011 over the megacity Delhi along with the column aerosol optical depth. In this study, we found that the monthly average values of the UV fraction as a ratio of UV to BrR flux, varied within the interval 3.0% - 5.3 % with an annual average value of  $4.2\% \pm 0.3\%$ . UV radiation is well correlated with the BrR and represents a definite diurnal pattern, with lower values during sunrise/sunset and higher values around noon time. The monthly hourly average BrR varies between 10.6 - 22.0 MJ/m<sup>2</sup> with average value of 15.68 MJ/m<sup>2</sup> while UV radiation had maximum value 0.85 MJ/m<sup>2</sup> and minimum of 0.38 MJ/m<sup>2</sup> with an average of 0.66 MJ/m<sup>2</sup>. UV and broadband solar radiation shows lowest value during winter season and peaks during summer season. The average monthly AOD varied between 0.5 to 0.9 during the observation period. It generally shows an anti correlation with the observed radiation flux.

**Sub-Section: Environmental Pollution & Waste Management  
Urban Solid Waste and Its Disposal: An Emerging Challenge in Sangamner  
City, District Ahmednagar, Maharashtra (MS)**

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**Key words:** Solid waste, composition, characteristics, disposal.

**ABSTRACT**

The characteristics and composition of urban solid waste in Sangamner city of Ahmednagar district in Maharashtra were studied. The city generates about 30 tons of waste per day out of which 20 % waste is not cleared every day due to number of reasons. This uncleaned waste creates various environmental problems to the urban population as well as management system in the town. It is also observed that, from the total waste 61% is organic in nature and rest is of inorganic. The attempt is also made to analyze the organic content of solid waste for pH, Electrical Conductivity (EC), Organic Matter (OM), Moisture content, Calcium (Ca), Magnesium (Mg), Chloride (Cl), Nitrate (NO<sub>3</sub>), Phosphate (PO<sub>4</sub>), Sulphate (SO<sub>4</sub>), Potassium (K) and Sodium (Na) to see its nutritional value. Based on the current assessment of the composition and characteristics of the solid waste the management tool is suggested, which if applied can recycle as many as 90 % of total waste and only 10 % waste needs to be landfilled which hence not only reduces the cost of the land required for the landfilling but also gives various byproducts.

**Sub-Section: Environmental Pollution & Waste Management**  
**Influence of Environment Pollution on Sustainable**  
**Animal Reproductive Efficiency**

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**Key words:** Pollution, reproductive efficiency, animal.

**ABSTRACT**

Certain environmental pollutants, called endocrine disruptors, could adversely affect the various systems of animals including the interference with reproductive functions in either sex. The study is aimed to conduct a survey questionnaire study on the series of studies designed to address the effects of exposure of common endocrine disruptors / environmental pollutants and high-end reproductive biotechniques on female and male reproduction and other systems of animal to elucidate the compatible or incompatible sustainable production. Chemical groups represent different elements of environmental pollutants, namely, heavy metals, pesticides and industrial chemicals. Results suggested that there is a decrease of 5-10% reproductive efficiency due to environmental pollution.

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Further research on toxic effects of environmental pollutants on animal production and health is required.

**Sub-Section: Environmental Management & Socio- Economic  
Occupational work in Indoor Environment:  
Heat Stress Vulnerability in Western India**

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**Key words:** Environmental warmth, WBGT, tolerance time.

**ABSTRACT**

In order to find out heat stress vulnerability, a study was conducted in May-June among male workers in iron (N=197, Age 33.6 12.5) and ceramics (N=138, Age 25.3 7.3) industries. The WBGT index of the work place was 32.4 1.83 and 33.9 1.880C with RH varying from 40 to 80%. Average sweating responses of iron and ceramics workers were 12.9±1.4 & 14±1.4gm/min, T<sub>cr</sub> was 36.9±0.5 and 37.1±0.60C and tolerance time was 91±15 and 79±13min respectively. The indoor occupational groups have a potential risk of developing heat related illness in peak summer. Study provides information to manage risks and response plans to combat heat related emergencies.

**Sub-Section: Environmental Management & Socio- Economic  
Respiratory health symptoms among the residents of Patancheru  
industrial area, Hyderabad, Andhra Pradesh**

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**Key words:** Air pollution, public health, respiratory symptoms, gaseous pollutants.

**ABSTRACT**

Indoor and outdoor air pollution is one of the most serious environmental and public

health problems in the industrialized countries. The epidemiological evidences establish an association between exposure to ambient air pollutants and various health effects such as respiratory symptoms or impaired cardio-pulmonary function and premature mortalities. The air pollutant concentrations are relatively high in densely populated conjoined locations and more prominent at industrialized zones. In this study we aimed to investigate the frequency of respiratory health symptoms among the residents of highly industrial zone-Patancheru, Hyderabad. A cross sectional survey was performed among 500 residents and the ambient air concentrations were measured by using air samplers in order to investigate the possible routes of exposure. The chronic pulmonary diseases (OR= 1.68: 95% CI; 1.10-2.03,  $p<0.05$ ), tightness in the chest (OR= 1.78: 95%CI: 1.20-2.36,  $p<0.05$ ), morning cough (OR= 1.81:95%CI: 1.19-2.75,  $P<0.05$ ) were observed among the residents in the industrial zone where the ambient air pollutants are also high. In conclusion this study indicates that the air pollution and respiratory problems among the residents are high. From public health point of view it is important to control the possible risk on the health status of the residents. By considering the fact the residents are more sensitive to the contaminating effects of the pollutants, regulatory authorities should take up this aspect seriously.

### **Sub-Section: Environmental Management & Socio- Economic Watershed Management**

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**Key words:** Concept of watershed management, features, current status, remedies.

#### **ABSTRACT**

This paper describes watershed management in India. Recent report on water in India raises various issues on water management. Watershed management is the process of creating and implementing plans to enhance watershed functions that affect all the living beings within a watershed boundary. Features: The agencies that seek to manage include water supply, water quality, drainage, storm water runoff, water rights, and the overall planning and utilization of watersheds. Landowners, land use agencies, etc. play an integral part in the management. India has vast diversity of water resources. India has seasonal rainfall with high temporal and spatial variability. 50% of rainfall in a year falls in just 15

days and over 90% rivers flow in just four months. But, water management practices in India are sadly lacking causing water shortage in India, which is getting worse. So, watershed management is needed to improve the quality and quantity of water.

**Sub-Section: Environmental Management & Socio- Economic  
Soil heavy metals and associated human health risks in Durgapur industrial area**

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**Key words:** Soil heavy metals, human health, human exposure, Durgapur.

**ABSTRACT**

Anthropogenic activities mainly industries have significant long lasting effects on the surrounding soil quality and human health. Soil samples were collected from Durgapur industrial area and analysed for environmental pollutants and compared with control site. Cr, Mn and Zn were found to be enriched in the soil samples, and Pb, Ni and Cu were in considerable concentrations. A comprehensive health survey was conducted on surrounding inhabitants for their general life style, eating and drinking habits along with their health problems using epidemiological questionnaire. The observations revealed the prevalence of gastro-intestinal disorder (29.03%), arthritis (22.04%), asthma ( 12.90%), skin disorders (11.83%) and eye and ear problem (11.29%), high blood pressure (5.91%), etc. in the industrial area as compared to the control sites. This is due probably to the environmental changes which have resulted in the form of health problems with high prevalence of diseases.

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**Sub-Section: Environmental Management & Socio- Economic  
Health Effects of RSPM- A Case Study of Kakinada City**

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**Key words:** RSPM, gaseous pollutants, health effects of RSPM, Kakinada city.

**ABSTRACT**

This study was undertaken to investigate the quality of air in Kakinada during 2010-2011 with reference to RSPM, NO<sub>x</sub> and SO<sub>2</sub> and to study their health effects. The minimum and maximum concentration of RSPM in ambient air at different locations of Kakinada was recorded as 79.69-190.11 µg/m<sup>3</sup> and in summer, 63.22-175.21 µg/m<sup>3</sup> in monsoon and 83.36-205.21 µg/m<sup>3</sup> in winter season. The AQI of the study area was calculated and the industrial and commercial areas were found to be polluted. About 100 families of Dummulupeta industrial area were surveyed for prevalence of air pollution oriented diseases among the people. Results indicated high incidence of respiratory diseases among the affected people.

**Sub-Section: Environmental Management & Socio- Economic  
Alternative Livelihood by Iczmp for Fisher Folk of Odisha  
Affected Due to Ban in Fishing**

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**Key words:** CITES, endangered species, mass nesting, scampi, shrimp, seabass; ICZMP

**ABSTRACT**

Odisha coast is known world-wide for the Olive Ridley Sea Turtle *Lepidochelys olivacea*, for mass nesting in Gahirmatha, Ekakulanasi, river mouths of Devi and Rushikulya.

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Olive Ridelys found in the state have been enlisted as endangered animal by IUCN and are protected under the CMS and CITES. Government of Odisha has imposed ban in fishing within the 20km. radius of mass nesting sites. Ban in fishing has adversely affected the livelihood of thousands of fisherman living in and around in the coast. The World Bank aided ICZMP Odisha is being implemented along the coast of Odisha. One of the objectives of ICZMP Project is to address the livelihood issues of the coastal fishers whose livelihood is adversely affected due to ban on fishing for conservation of Olive Ridley. This component envisages activities like Pisciculture; Scampi; Shrimp, Seabass and Crab culture; Hygienic dry fish & value added products including non-fisheries activities like Dairy, Poultry, Duckary and horticulture, marketing of raw and dry fish. The Fishery & Animal Resource Development Department is the PEA (Project Executing Agency) for implementation of this project component.

**Sub-Section: Environmental Management & Socio- Economic  
ENVIRONMENTAL RADIOACTIVITY AND ITS IMPACT ON HUMAN HEALTH**

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*Key words: Radiation, radon, lung cancer, health.*

**ABSTRACT**

All humans are constantly exposed to radiations spontaneously emitted by naturally occurring atomic elements like  $^{238}\text{U}$  and  $^{232}\text{Th}$  ever since their existence on the earth. These radioactive materials emit three types of radiations i.e. alpha, beta and gamma radiations, which differ in their energy and penetrating power. The other radiation sources are nuclear fallout from weapon tests, radioactive releases from nuclear reactor operations and accidents, exposure due to radioactive waste disposal and industrial, medical and use of radio isotopes in the agricultural production. These radiations consist of cosmic rays, including high energy electrons and protons, coming from the outer space becoming more intense at higher altitudes, alpha particles emitted from radioactive isotopes of naturally occurring radioactive materials such as uranium and thorium and beta particles emitted from potassium-40. These radioactive materials also give off gamma rays. Finally, uranium and thorium rocks and the soil get decayed to a radioactive gas known as radon. Radon, along with its progeny, leak into the atmosphere where people inhale and get their lungs



irradiated. Natural radiation is of particular importance because this source is the largest contributor even today to the collective dose of world population. Keeping this in mind the estimation annual effective doses received by the residents living in different types of Indian dwellings and some industrial workers has been carried out. The radon thoron twin dosimeter cups designed by environmental assessment division of Bhabha Atomic Research Centre (BARC) Mumbai, India have been used for the study. Three pieces of LR-115 solid-state Nuclear Track detectors are fixed in the dosimeters and are suspended in the dwellings for three months during a season. One gives radon, thoron and progeny concentration, second gives radon and thoron concentration while the third gives only the radon concentration.

**Sub-Section: Environmental Management & Socio- Economic  
Mining impacts on surface and ground water  
quality- a case study from Jamadoba colliery**

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**Key words:** Coal mining, water quality, threshold limits

**ABSTRACT**

Water the most precious and susceptible resource for life sustenance is constantly under threat from various anthropological activities. In particular, while coal mining and associated industrial activities provide the economic support to the nation, the ecological impacts of the same are also an important matter to be addressed. Keeping these in view, Jamadoba colliery was selected to study the impacts of colliery activities on the water quality.

The results of the water quality of the selected area (7 sampling points) indicated good quality of supplied drinking water, but the surface water quality (4 sampling points) showed slight increase in the values of some of the parameters (TDS and TSS), but still well within the threshold limits prescribed by IS 10500.

**Sub-Section: Environmental Management & Socio- Economic  
National Growth by lowering Energy Intention.**

**S. Ganapathi**

*S.E.Retd. A.P.Transco,*

**Key words:** Energy Intensity, ewnergy efficiency and conservation, Integrated Energy Policy of Govt. of India.

**ABSTRACT**

Electricity growth rate around the world is 4.66% for 2007, 18187 BU against 17377 BU in 2006, as per the last data available. World GDP growth rate in 2007 is 6.7% in PPP (Purchasing power parity) terms, 61428 Billion US \$ against 57564 Billion US \$ in 2006. Carbon dioxide emissions raised by 3.42 %, 28962 Million tons in 2007 against 28002 MT in 2006. Only United Kingdom had reduced electricity growth by 0.39% and carbon dioxide by 2.43% still enhancing its GDP growth rate by 4.8% in 2007 in the G-20 countries accounting for 76% of World GDP. Denmark is other than G-20 country showing excellent result like U.K. Countries like Italy, Germany and France etc. are also on similar lines. Energy intensity is the energy required for making a product and also for extending services in any country, around the globe. Lowering energy intensity is the main objective of the developed and developing countries. Energy efficiency and energy conservation are required for all the countries for better environment of the world. Energy poverty for people of the globe has to be eradicated quickly.

**Sub-Section: Environmental Management & Socio- Economic  
The brass industry in Moradabad: Respiratory hazards to workers**

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**Key words:** Brass workers, occupational health hazards, respiratory hazards.

**ABSTRACT**

The city of Moradabad, also known as the brass capital of India, has been famous for production and supply of metal artifacts since the eighteenth century. It provides the country a foreign exchange worth millions. 80 to 85% of the people living in the city depend, either directly or indirectly, on the brass industry, for their livelihood. Metal fumes are liberated into the working environment at every stage of preparing the brass artifacts. Brass flakes are also released during the various processes specially during polishing. These pollutants pose a threat to the health of these workers, as no proper control measures, like exhaust ventilation etc. are installed in the small brass artifact-manufacturing units. A study was conducted to determine the respiratory hazards in the brass workers. The study group was selected randomly. The control group was selected from the general population. It was observed that the brass workers were at a significantly higher risk of developing respiratory symptoms. Cough, phlegm, chronic bronchitis dyspnoea and wheezing were particularly higher among brass workers. The ventilation capacity in the brass industry workers was also observed lower than the control group.

**Sub-Section: Environmental Management & Socio- Economic  
A Brief Study on Chronological Development  
of Environmental Jurisprudence and Law**

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**Key words:** Conservation of nature in Vedic era, Kautilya's Arthashastra, Mughals Imperialism and environment, British rule, modern codification of environmental law till 1947.

**ABSTRACT**

India has a glorious tradition to protect environment for last 5000 years. The essence of Vedic culture was the protection and cleaning up the environment. Various books of that time like Rig Veda, Atharv Veda, Upanishada, Charak Samhita, Varaha Purana, Agni Purana etc give details of the laws regarding environment of that time. This ancient tradition has been followed in the civilization of Mohanjedaro, Harappa, Channudaro and Dravidian civilization which flourished in India in between 2000-5000 B.C. The Mauryan period was the most glorious chapter of India history from the point of view of environmental protection.

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Kautilya's Arthashastra was the best evidence of that period. Though the history of India did not give any specific provision regarding environment during the Muslim Rule, the Mughal emperor Babar and Jahangir were known as nature lover. Though the environment policy during the British rule was not directed at the conservation of nature rather was directed at the appropriation and exploitation of common resources with the primary objective of earning revenue, the modern codification of various environmental laws started under British rule.

**Sub-Section: Environmental Management & Socio- Economic  
Munackal Deposits - Contemporary Challenges and Opportunities, A Preview**

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**Key words:** - Periyar river, Muzris, sand, brackish.

**ABSTRACT**

The Periyar River is the largest and second longest river in Kerala. It originates from Sivagiri hills of Western Ghats and joins Arabian Sea at Munambam (Munackal). The direct and free drainage of this river to sea is restricted naturally by a land mass reportedly deposited at river mouth due to a massive flood in Periyar River during 1341AD. This paper provides a brief note on ecological, economical and social challenges - in particular safety associated with this land mass and emphasizes the need of a detailed study to be conducted. This paper also describes a few means of recovering a brackish water body into a freshwater lake with an added advantage of opening a versatile port at western coast of India.

**Sub-Section: Environmental Management & Socio- Economic  
A study of Assessing Socio-Economic Impact and Environmental Monitoring  
Plan of North - Western Railway Line Project from Ajmer (Madar) to Pushkar**

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**Key words:** Socio-economic impact assessment, project, environmental monitoring plan.

**ABSTRACT**

Socio-Economic Impact Assessment means the processes of analyzing, monitoring and managing the positive and negative impacts of the particular project activities in particular region, in which the project activities are to be run. The major objective of the socio-economic analysis is to achieve basic understanding of the interconnections of the socio-economic and environmental impacts and factors in project areas. The present study was to assess socio-economic impact of proposed railway line between Ajmer (Madar) to Pushkar. The total length of this railway track is 25.4 km. The major objective of the study was to achieve basic understanding of the links of the socio-economic impacts in project area. The questionnaire based survey was conducted during 2005-06. It was observed that 70% of affected people were satisfied and remaining of them were unsatisfied with the proposed railway line project. The major negative impacts including changes in land use patterns, displacement of fauna, loss of forest, loss of soil fertility and soil productivity, environmental pollution and damage of historic and cultural monuments. On other hand the major positive impacts of railway line project will be development of nation, employment generation, safe transportation, social upliftment, market development and decrease traffic load on highways. The overall conclusion of the study indicates that the negative impacts of the proposed project are negligible. Proper Environmental Monitoring Plan (EMP) may reduce the all above given negative impacts. Afterall, the proposed railway line project connects the rural and urban areas and it will also promote and improve the socio-economic background and life style of local people.

**Sub-Section: Environmental Management & Socio- Economic  
Environmental Impact of Jagatpur Industrial Estate on the Health of  
Workers & Nearby Villagers, Cuttack District , Odisha**

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**Key words:** Health, environment, industrial workers, respiratory problems.

**ABSTRACT**

Health is the state of complete physical, mental and social well being and not merely an absence of a disease or infirmity. Health is the harmonious balance of the state of human individual with his environment. A deteriorating environment have adverse effect on the health of residing inhabitants industrial workers constitute only a part of general population and factors that influence the population i.e. housing, water, sewerage ,water disposal, nutrition , and education. In addition to these factors the health of industrial workers will be influenced by conditions, prevailed in their work place. E.S.I. Dispensary Jagatpur is selected for experimental study to establish the adverse impact of industries on the health of workers as well as villagers for two years 2008 & 2009. This dispensary is situated from Jagatpur Industrial Estate beyond a distance of 5 kms. During interaction with the authorities of E.S.I. Dispensary it was learnt that the most common diseases prevalent amongst the worker community & inhabitants were gastrointestinal problems with 35% , respiratory problems 10% , Hypertensive 15% , common cold & cough 30% , other helminthes disease , dysentery etc. 10% instances .50% of the workers suffering from hyperacidity due to irregular job timing (shift duty) coupled with incompatible working environment is the root cause of their disease . Respiratory problems are reportedly due to dust generations from air polluting industries, automobiles. Skin infections are in the form of lesions, patches, scaly abrasions, caused by detergents, alkali acids, solvents and abrasive dusts. Gastrointestinal diseases are due to toxic chemicals and pathogenic organisms from municipal drains, exhaust water from various factories contamination with drinking water sources. Also lack of knowledge in maintaining sanitation and hygiene is major reason for passage of different pathogens to the body through food. It is a cohesion of biological, economical, social, cultural, educational and environmental factors that determines the health of a person. These factors are closely interlinked and they play a major role in providing good health. Co inhibition of any one of factors will lead to generation of disease and poor health.

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**Sub-Section: Toxicology & Bioremediation**  
**Cadmium Induced Genotoxic and Histopathological changes in the testis, liver and kidney of Swiss albino mice, *Mus musculus***

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**Key words:** Seminiferous tubules, germinal epithelium, spermatogonia, spermatocytes, spermatids, interstitial cells of Leydig, sertoli cells, hepatic plates, hepatocytes, renal tubules and renal corpuscles.

**ABSTRACT**

Cadmium is known to exert toxic effects on multiple organs. The present study aims to study both genotoxic and histopathological effects of cadmium in male Swiss albino mice. Oral administration of cadmium chloride caused DNA damage in the tissues of testes, liver and kidneys. Marked changes in the histological architecture of these organs were observed. Distortion of seminiferous tubules, desquamation of spermatogonia, spermatocytes and spermatids with cytoplasmic vacuolization and nuclear fragmentation in testes; disruption in arrangement of hepatic plates, widespread fibrosis, interstitial mononuclear cellular infiltration and hemorrhagic spots with necrotic hepatocytes having pyknotic nuclei in the liver and severe multifocal cloudy, hydropic degeneration with loss of cellular integrity in the renal tissues were observed. The severity of pathological effects was dependent on the duration of post treatment period.

**Sub-Section: Toxicology & Bioremediation**

**Distribution of heavy metals and their bioavailability using SEM/AVS in the sediments of Lake Burragorang, Sydney, Australia**

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**Key words:** Anoxic sediment, acid volatile sulphide, simultaneously extracted metal.

**ABSTRACT**

Under anaerobic conditions the sulphide phase acts as an important sink for metals in sediments. The measure of acid volatile sulphide (AVS) and simultaneously extracted metal (SEM) method have gained wide acceptance to predict the availability of various heavy metals for different organisms. Sediment core samples from Lake Burragorang, were subjected to speciation using SEM and AVS ratio to determine the potential toxicity of sediments due to metals. The results showed that these simultaneously extracted metals at all stations were higher than AVS and their ratio was found greater than 1, which indicates that available AVS is not sufficient to bind with the extracted metals. This reveals that AVS is not a major metal binding component for Lake Burragorang sediments and contained metals potentially bioavailable to benthic organisms.



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**Sub-Section: Toxicology & Bioremediation**  
**Removal of Copper Using Copper-Resistant Bacteria**  
**Isolated From Soil of Polluted Wasteland**

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**Key words:** Heavy metal, biosorption, dry dead biomass, aqueous solution.

**ABSTRACT**

Copper is one of the heavy metal which is essential but toxic at high concentrations. High uptakes of copper may cause liver and kidney damage and even death. This study investigates copper biosorption by a group of bacteria isolated from copper polluted areas. Copper resistant bacteria isolated from soils of polluted wasteland exhibits maximum copper resistance upto 200 mg L<sup>-1</sup> Cu (II). Dry dead biomass was prepared from the isolated bacteria. The biomass was used for batch study of copper biosorption from aqueous solution with Cu concentration varying from 10 mg L<sup>-1</sup> to 100 mg L<sup>-1</sup> and also pH from 2 to 5. From the experimental results it was observed that almost 80-90% copper can be removed from aqueous solution using the biomass.

**Sub-Section: Toxicology & Bioremediation**  
**Bioremediation Potential of Immobilized Cell of *Aspergillus oryzae***

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**Key words:** Biosorption; Immobilized Fungi- *Aspergillus oryzae* ; Cr (VI) removal; Isotherms; synthetic solution.

### **ABSTRACT**

Water pollution is a severe socio-environmental problem caused by the presence of some heavy metals ions and discharge of industrial wastewater. In view of their toxicity, non-biodegradability and persistent nature, their removal becomes an absolute requirement. Among the two forms of Chromium, Chromium (VI) is considered as the most toxic form of Chromium. It is one of the major pollutants in the environment and frequently present in wastewaters from various industrial units. In order to develop a biosorbent for removal of Cr (VI) from synthetic solution, a study was designed in which fungi (*Aspergillus oryzae*) isolated from soil of tannery industry was used to remove Chromium (VI) from its synthetic solution in batch mode. Batch mode experiments were conducted as a function of solution pH, biosorbent dose, contact time, initial concentration. 93% removal was achieved under optimized conditions. The data obtained was subjected to sorption isotherms namely Freundlich and Langmuir. Both isotherms were followed well showing the potential of immobilized biomass of fungi- *Aspergillus oryzae* for the removal of Cr (VI).

### **Sub-Section: Toxicology & Bioremediation** **Adsorption of copper (II) from aqueous solution by using chemically modified Tamarind indica fruit shell**

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**Key words:** Tamarind indica fruit shell, isotherm, adsorption, Cu (II) ions.

### **ABSTRACT**

In the present study removal Cu (II) ions from aqueous solution is investigated using chemically modified Tamarind indica fruit shell. Treatment of formaldehyde and sulfuric acid is given to the adsorbent for chemical modification. Batch adsorption experiments were performed for determination of the effects like pH, contact time, biomass concentration and temperature on the adsorption process. The optimum pH range for the removal of Cu (II) was 2-9. The maximum adsorption of 91.3%, 83.84% and 78.91% determined within the equilibrium time (2h) for an initial concentration of 10, 50 and 100mgL<sup>-1</sup> respectively at pH 5.0 under constant temperature of 300C. The Langmuir and Freundlich

isotherm models were tried to represent the equilibrium data of Cu (II) adsorption. The data is well fitted to the Langmuir model in the studied concentration range and monolayer sorption capacity obtained as 11.24 mg-1. The temperature dependence indicates the endothermic nature of adsorption process.

**Sub-Section: Toxicology & Bioremediation**  
**Microbial Kinetics in the Bio-remediation of Petroleum contaminated Soil**

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**Key words:** - Bioremediation, kinetics, soil, hydrocarbons.

**ABSTRACT**

The kinetics of petroleum hydrocarbons degradation was studied in solid phase treatment by preparing simulated contaminated soil. Simulated contaminated soil was prepared by mixing fresh soil with innocuous soil collected from VRL Logistics Ltd, near R.V.College, Mysore Road, Bangalore. The study was conducted using ten bioreactors. The simulated contaminated soil was filled in ten bioreactors and tested in the laboratory for various parameters at weekly intervals, for a period of sixteen weeks to determine the biodegradation rate of TPH under laboratory conditions by maintaining optimum CNP ratio of 100:10:1. Oily sludge was mixed in varying percentages from 2% to 15% by weight of soil in ten reactors. Moisture content was maintained at 60% of field capacity, pH was between 7&8.

From the results it was observed that maximum percentage of TPH removal was 70.2% at TPH concentration of 10% of weight of soil at TPH concentration above 10% the percentage removal was reduced. The specific growth rate was increased with substrate concentration to a maximum value of 0.09 /d at 10% TPH concentration, but at higher TPH concentrations above 10% there was a decrease in specific growth rate. The maximum degradation rate 0.01 /d of TPH was observed in the bioreactor having 10% TPH concentration. The highest yield coefficient of 0.22 was also at 10% TPH concentration. This indicates that the biological activity is influenced by the substrate concentration; which in turn affects the degradation of Petroleum Hydrocarbons.

**Sub-Section: Toxicology & Bioremediation**

**Virtual high-throughput screening of Ginkgolides-A and its derivatives against Beta Lactamase, Uridine-cytidine kinase2 and Thymidylate synthase thyX**

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**Key words:** Ginkgo biloba, high-throughput screening, ginkgolide A, FlexX, combinatorial library,  $\beta$ -lactamases, thymidylate synthase thyX, uridine cytidine kinase 2, docking.

**ABSTRACT**

Natural products viz. Ginkgolides A and B, Bilobalide reported from Ginkgo biloba are of tremendous medicinal importance. In this work, Ginkgolide-A was selected as lead molecule and the probable mode of action was predicted using target fishing tool PharmMapper server. The target fishing showed its probable binding potentiality with Beta Lactamase, Uridine-cytidine kinase2 and Thymidylate synthase thyX. The docking study revealed the inhibition potential against these three enzymes. The high-throughput screening of Ginkgolide-A derivatives showed some more potentially important lead molecules as inhibitors of Beta Lactamase, Uridine-cytidine kinase2 and Thymidylate synthase thyX.

**Sub-Section: Toxicology and Bioremediation**

**Mass Concentrations and Sources of Low Molecular Weight Organic Acids in Atmospheric Aerosol Collected over the Central State of India**

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*Key words: PM10, organic acids, mass concentration, source identification, oxalic acid*

**ABSTRACT**

Aerosol samples of aerodynamic diameter less than 10 $\mu$ m (PM10) were collected between July 2009 and November 2009 at Raipur city, India using eight-stage cascade impactor sampler at a flow rate of 28.3 ALPM. Collected PM10 samples were analyzed for

10 low molecular weight organic acids using ion chromatography. The average concentration of PM10 varied from 99.6 $\mu\text{g}/\text{m}^3$  to 407.2 $\mu\text{g}/\text{m}^3$  with the mean concentrations of 234.2 $\mu\text{g}/\text{m}^3$ . Oxalic acid (30.5 ng/m<sup>3</sup>) was the dominant organic acid species, followed by maleic acid (30.5 ng/m<sup>3</sup>) and fumaric acid (29.7 ng/m<sup>3</sup>). Citric acid (9.1 ng/m<sup>3</sup>) concentrations were found to be lowest.

**Sub-Section: Toxicology & Bioremediation**

**Extraction of multiclass pesticide residues in Cauliflower (*Brassica oleracea*) and Bean (*Phaseolus vulgaris*) vegetables by Gas Liquid Chromatography**

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*Key words: Extraction, multiclass pesticide residues, cauliflower and bean.*

**ABSTRACT**

Multiclass pesticide residues, viz. endosulphan, cypermethrin, monocrotophos and chlorpyrifos have been extracted in cauliflower (*Brassica oleracea*) and bean (*Phaseolus vulgaris*) vegetables by using gas liquid chromatography. In the sample of cauliflower four pesticides, endosulphan, cypermethrin, monocrotophos and chlorpyrifos and in bean two pesticides endosulphan and cypermethrin were detected. The concentrations of the detected pesticides were determined from the area of the peaks. The concentration of the detected pesticides were well below the maximum residue limit (MRL) values but continuous consumption of such vegetables even with moderate contamination level can accumulate in the receptor's body and may prove fatal for human in the long term.

**Sub-Section: Toxicology & Bioremediation**

**Phytoaccumulation of Zinc by *Scripus mucranatus* (L.) Palla ex Kerner  
Donboklang Marbaniang\* and S. S. Chaturvedi**

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**Key words:** *Scripus mucranatus*, Zinc, phytoaccumulation, bioconcentration (BCF).

### **ABSTRACT**

The bioaccumulation of Zinc (Zn) by *Scripus mucranatus* (L.), in Hoagland solution enriched with 2.0, 4.0, 8.0, 16.0 and 32 mg L<sup>-1</sup> of Zn supplied as Zinc Sulphate (ZnSO<sub>4</sub>) for a period of 2, 4, 6, 8 and 10 days is reported. The accumulation of Zinc in plant depending on time and concentration was measured by atomic absorption spectrophotometer (AAS Perkin Elmer Model 3110). The results showed that under experimental conditions (pH- 6.0±0.1, T- 24±0.1, Photoperiod- 16h), *S. mucronatus* (L.) is able to accumulate considerable amount of Zn. Removal of the metals from the solution reached the maximum on the 8th day. The accumulation of Zn increased with the increasing concentration. The highest accumulation was observed in the root then by shoot tissues. The bioconcentration factor (BCF) for the metal was found to be maximum on the 8th day of exposure.

#### **Sub-Section: Toxicology & Bioremediation**

#### **Impact of stressors on hormonal profile of transport drivers**

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**Key words:** Hormonal profile, T3, T4, TSH, FSH, LH, cortisol, testosterone and transport drivers.

### **ABSTRACT**

The effect of excessive demands of occupational stress has been studied using the hormonal profile as an expression of impact of stress on physiological function of Transport drivers. Subjects, both Control (who were normal people) and Experimental Transport drivers, belonging to age group 40 to 49 years as Group I and age group 50 to 59 as Group II, were selected from around Coimbatore and the Nilgiris.

Blood samples were collected by venepuncture into unheparinized tubes, allowed to clot and serum separated by centrifugation and stored for hormonal analysis. The assay of FSH, LH, Testosterone, cortisol, T3, T4 and TSH hormones were undertaken. On comparison with controls, a significant increase (26-43%) in the levels of T3 and T4 was observed in Group I only, while Group II showed a significant increase (106%) in TSH level. Cortisol levels were significantly decreased (45%) in Group I only. While the levels

of FSH were prominently increased (164%) in both the groups, LH levels were significantly decreased in both groups. Accordingly, testosterone levels were also significantly decreased (50-59%) in both the groups.

From these observations, we can conclude that transport drivers do undergo stress conditions which may bring about adverse effects in the normal functioning of internal physiological processes. A better understanding of the precise role played by various mechanisms in mediating the response of various axes to stress has been arrived, thus aiding us in advocating more amicable working conditions for transport drivers.

**Sub-Section: Toxicology & Bioremediation**  
**Assessment of Heavy Metal Profile of the Subarnarekha River (India) By**  
**Indexing and Multivariate Statistical Techniques**

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**Key words:** Cluster analysis, drinking water standards, heavy metals, pollution index, principal component analysis, water pollution.

**ABSTRACT**

A comprehensive heavy metal pollution index (HPI) of the Subarnarekha River was prepared and multivariate statistical techniques were used to identify the sources of heavy metals. Seventeen locations were chosen and heavy metals viz. Fe, Zn, Cu, Cd and Mn were analyzed using Atomic Absorption Spectrophotometer. Though the mean HPI (49.12) was found to be below the critical pollution index value of 100, the severity of water pollution was effectively demonstrated by higher values of heavy metals. Principal component analysis and cluster analysis employed were found to be effective tools to identify the various sources of heavy metals.

**Sub-Section: Toxicology & Bioremediation**  
**Daily Intake of Heavy Metals through Consumption of**  
**Vegetables and their Health Risk Assessment**

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*Key words: Heavy metal, health risk, vegetable.*

**ABSTRACT**

The present study was carried out to assess the Health Risk due to heavy metals via four widely consumed vegetables in rural and urban areas in the city of Kakinada. The concentrations of eight metals were determined using Inductive Coupled Plasma Mass Spectrometry (ICP-MS). The range of metals in vegetables was 0.06709-1.036, 0.03082-0.7016, 0.01283-0.04819, 0.008481-0.0303, 0.1669-0.4506, 0.000387-0.001194, 0.2121-0.5118 and 0.038-0.0983 mg/kg for Zinc, Copper, Lead, Nickel, Chromium, Cobalt, Iron and Manganese respectively. There was a high concentration of heavy metals in vegetables grown in urban area compared to rural area. The DIM values were found to be well below the recommended levels proposed by WHO.

**Sub-Section: Toxicology & Bioremediation**  
**Assessment of Atmospheric Heavy Metal Pollution Level**  
**Using Dalbergia sissoo Leaves As Biomonitor**

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**Key words:** Dalbergia sissoo, heavy metals, biomonitor, pollution.

**ABSTRACT**

Dalbergia sissoo was studied as a biomonitor of pollution in Mysore region of Karnataka, India. 10 elements were studied in the leaf samples by using AAS. The roadside, residential and rural sites were investigated. The Pb, Cd, Zn, As, Hg, Mn, Cr, Fe, Ni and Cu



concentrations varied significantly in the leaves and soils. On comparing the concentrations of the heavy metals in the leaves and soils, the values in the roadside were higher than other sites. The result suggest that the leaves of Dalbergia sissoo plant have a good potential to indicate the air pollution level and the level of tolerance so that it can be used for setting up of tree alleys and forming wind protection zones along main traffic lines.

**Sub-Section: Toxicology & Bioremediation  
Studies on Bioaccumulation of Arsenic by Bacteria  
Isolated from Arsenic treated Soil**

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**Key words:** Bioaccumulation, arsenic, bacteria.

**ABSTRACT**

Arsenic contamination in soil is a serious environmental problem in many districts of West Bengal. Removal of arsenic from soil by physico-chemical methods is very expensive. Microbial bioremediation of arsenic in soil may be a suitable alternative option. The objective of this study was to isolate arsenic tolerant bacterial strains from arsenic contaminated soils and to observe their potential to remove arsenic under laboratory conditions. 4 bacterial strains (B1-4) were isolated from sodium arsenate treated (15 ppm) soil. After characterization the bacterial strains were screened for arsenic tolerance. The highest arsenic tolerance was shown by the strain B4, having minimum inhibitory concentration of 150 ppm. The arsenic accumulation was estimated by using Atomic Absorption Spectrophotometer. Arsenic accumulation was highest between 0-1 days. It was observed that the dead bacterial cells were able to adsorb arsenic from the media. Up to 46% arsenic removal was observed after 18th days. This bacterial strain has the potential to remediate the arsenic contamination in soil.

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**Sub-Section: Toxicology & Bioremediation**

**Degradation of Azo Dyes by Using an Unknown Bacterium Isolated From Dye Contaminated Sites: Optimisation of Process Parameters through Response Surface Methodology**

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**Key words:** Unknown bacterium, dye, contaminated.

**ABSTRACT**

An unknown bacterium isolated from a dye contaminated site was screened for its dye degrading capability. In this study, the bacterium was used for the removal of congo red dye and the process parameters: pH, concentration and time for the optimal removal of the dye was calculated by using response surface methodology. The process was optimised to link the input parameters with the output i.e. percentage of dye removal and analysis of variance was computed to check the accuracy of the experiments. It was observed from the experiments that pH 5.75, conc. 15 ppm and time 600 min are optimum for the removal of 62% of the dye, and the model is statistically significant.

**Sub-Section: Toxicology & Bioremediation**

**Effect of Ageing on Electrochemical Behavior of Nickel Hydroxide Samples Prepared from Nickel Sulphate Solution by using Urea as Neutralising Agent**

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**Key words:** Discharge capacity, urea, neutralising agent, ageing time.

**ABSTRACT**

The development of alternative energy sources is becoming a practical and urgent challenge for scientists and engineers all over the world since motor vehicles run by petroleum products cause environmental pollution to a major extent. Batteries have become one of the

most promising alternative energy sources because of the growing interest and demand for emission free vehicles. Further, the energy and maintenance costs of electric vans have been projected to be 40 - 60% of their gasoline and diesel powered counterparts. Nickel hydroxide is used as positive electrode material in all nickel based alkaline rechargeable batteries like Ni-MH (metal hydride). Different samples of nickel hydroxide were prepared by using urea as neutralizing agent. The effect of ageing time on physicochemical and electrochemical properties were studied. It was observed from XRD and FTIR results that the sample prepared without ageing is of  $\gamma$ - motif and those prepared by ageing for different time intervals are of  $\beta$ - motif. The samples prepared by ageing for different time intervals showed that with increase in ageing time, discharge capacity is decreased. Unaged sample shows highest discharge capacity of 375 mAh/g of nickel where as sample obtained by ageing for 48 hours exhibits lowest discharge capacity of 286 mAh/g of nickel.

**Sub-Section: Toxicology & Bioremediation**  
**Diversity of plankton attached to macrophytes**  
**from wed infested lake: A case study**

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**Key words:** Macrophytes, biodiversity, phytoplankton, zooplankton.

**ABSTRACT**

The decomposition of vegetation in water is one source of replenishment for the micro-organism inhibitory water bodies. According to Kudryavtsov et al. (1980) macrophytes that develop during the summer die in the autumn, their dead parts act as excellent substrate for the development of micro-organisms. On these, feed the planktons, which are the basic link of the food chain. This result in changing the biodiversity of water body in different reasons. This reflects on plankton as well as on the attached organisms. Hence the diversity study of plankton attached to the roots and submerged part of macrophytes was undertaken. The plankton attached to roots and submerged parts of macrophytes was collected and analyzed in the laboratory. During the present study the species of phytoplankton and also the zooplankton classes attached to macrophytes was studied in detail.

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**Sub-Section: Toxicology & Bioremediation  
In Search of an Ideal Condition to Alleviate  
Pollution from Sponge-Iron Plant**

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**Key words:** Pollution, sponge-Iron effluent, Box-Plot, ANOVA.

**ABSTRACT**

Pollution from sponge-Iron effluent is an age old problem in this country, and has grown over the years because it belongs to the unorganized sector mostly. In this, study a statistical solution has been provided to alleviate the pollution from sponge-Iron plant in the site of Angadpur, 2kms from Durgapur township. This solution is based on the level of dispersal of iron enriched pollutant in the surrounding plants, soil and water at the point close to the sponge- iron plant and another at a distance (10-15m). Box-Plot and ANOVA was carried out for adsorption of metals by different plant sample and also bacterial removal of metal from the soil and the lentic aquatic system in the vicinity. Results indicate that: In case of plants- An ANOVA (p-value=0.0001) shows that the metal uptake (iron and lead) is the maximum for *Evavulus nummularis*. In case of soil: The p-value (0.001) suggests that there is significant difference in iron uptake among the three bacteria. The iron uptake is maximum for *Bacillus anthracis*. In case of water, The p-value (0.001) suggests that there is significant difference in iron uptake among the colonies. The iron uptake is maximum in *Bacillus firmus*. Hence the ideal condition is predicted on the basis of these observations.

**Sub-Section: Toxicology & Bioremediation  
Toxic Effects of Heavy Metals**

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**Key words:** Heavy metals, source, concentration, toxic effects.

**ABSTRACT**

Industrial effluents carry small amounts of number of heavy metals into rivers & streams. There are over 50 heavy metals, out of which only 17 are considered to be very toxic. These occur in very small quantities in the earth's crust and hence are called trace metals. Metals like mercury (Hg), lead (Pb), copper ( Cu), zinc (Zn) nickel (Ni), etc are generally known as "toxic heavy metals". Heavy metals like mercury, lead, arsenic, cadmium, selenium, copper, zinc, nickel, and chromium, should be given particular attention in terms of water pollution and runoff/discharge effects. Toxic heavy metals change the biological structures and systems into inflexible & irreversible conformations leading to deformity in the body or death. Almost all metals are toxic at higher concentration and some are lethal even at very low concentrations, although heavy metals within limits are essential for aquatic organisms, plants as well as human to survive. Toxicity levels depend on the type of metal, its biological role and type of organisms that are exposed to it. These metals are a cause of environmental pollution (heavy metal pollution) from a number of sources, including lead in petrol, industrial effluents, and leaching of metal ions from the soil into lakes and rivers by acid rain. Heavy metal toxicity can be fatal for mental functions, energy, nervous system, kidneys, lungs and other organ functions. This paper deals with the study of harmful effects on biological system, testing and treatment of selective heavy metals.

**Sub-Section: Toxicology & Bioremediation**

**Bioaccumulation and Distribution Pattern of Long Lived Radionuclides (U-238, Th-232 and K-40) From Deep Bottom Sediments to Fresh Water Fishes (Angulliaro Strata & Cirrhinus Mrigala) Of Nagarjuna Sagar Dam, Andhra Pradesh**

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**Key words:** Radionuclides, Angullia rostrata, Cirrhinus mrigala, gamma spectrophotometer HPEG germanium detector.

**ABSTRACT**

To analyze and determine the concentration of naturally occurring long lived radionuclides (U-238, Th-232 & K-40) assumed to have significantly leached out from the uranium deposits enriched areas of Lambhapur and Pethagattu, near the Nagarjuna Sagar dam. The distribution pattern of environmental pollution of uranium and thorium was evaluated by determining the thorium and uranium concentrations in sediment, water and from two commercial available fresh water fishes (*Angullia rostrata* & *Cirrhinus mrigala*) from Nagarjuna Sagar Dam. For the present work, the deep sediment samples and the surface water samples from Nagarjuna Sagar Dam and the commercially available edible fishes from the fisher men community in and around NS dam were collected. The samples from different matrix were analyzed for the determination of naturally occurring radionuclides uranium-238, thorium-230 and potassium -40 by gamma spectrophotometer HPEG germanium detector. The average uranium concentrations found in the sediment sample was 281 Bq/Kg, whereas the concentration of the uranium found in the water sample is of 2-3 µg/l. Also with the two input parameters the radionuclide uptake by the fresh water fishes *Angulliaro strata* & *Cirrhinus mrigala* the Bio Concentration factor (BCF) and the distribution coefficient (Kd) of the fishes were determined.

**Sub-Section: Toxicology & Bioremediation**

**Phytoremediation of Methotrexate induced genotoxicity in *Heteropneustes fossilis* using poliphenolic extracts of *Asteracantha longifolia***

**Shirsendu Ghosh<sup>1</sup> and Pinakiranjan Chakrabarti<sup>2</sup>**

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**Key words:** *Asteracantha longifolia*, *Heteropneustes fossilis*, phytoremediation, methotrexate, genotoxicity, poliphenolic extracts, micronucleus.

**ABSTRACT**

In this study ameliorative property of methanol-water extract of *Asteracantha longifolia* was investigated against the genotoxic effects of methotrexate (MTX) by examining the occurrence of micronucleus (MN) in peripheral erythrocytes of *Heteropneustes fossilis*. Fishes, in different groups, were exposed to MTX (0.5 mg/liter) along with prior and simultaneous administration of plant extract (1 mg/liter). Prior

administration of plant extract significantly reduces MN frequencies as compared with MTX treated group, where as simultaneously plant extract application did not have any significant effect on the reduction of MN occurrence. Thus the extract may acts as a protecting agent against MTX induced genotoxicity but not remediate the same if it has already occurred.

**Sub-Section: Toxicology & Bioremediation**

**Phytoremediation of Methotrexate induced genotoxicity in *Heteropneustes fossilis* using poliphenolic extracts of Piper betle**

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**Key words:** Piper betle, *Heteropneustes fossilis*, phytoremediation, methotrexate, genotoxicity, poliphenolic extracts, micronucleus.

**ABSTRACT**

This study investigates the ameliorative property of methanol-water extract of Piper betle plant against methotrexate (MTX) induced genotoxic effects using the occurrence of micronucleus (MN) in peripheral erythrocytes of *Heteropneustes fossilis*. Fishes, in different groups, were exposed to MTX (0.5 mg/liter) along with prior and simultaneous administration of plant extract (1 mg/ml). Simultaneous administration of plant extract significantly reduces MN frequencies as compared with MTX treated group, where as prior plant extract application appears to be insignificant for the reduction of MN occurrence. Thus P. betle extract may remediate MTX induced genotoxic effects but may not give any added advantage in case of its prior administration.

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**Sub-Section: Toxicology & Bioremediation  
Bioremediation of Chromium from Fortified Solutions  
by Phanerochaete Chrysosporium (MTCC787)**

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**Key words:** Chromium, Phanerochaete chrysosporium (MTCC787), viable cells,  
biosorption, immobilization.

**ABSTRACT**

Pollution by chromium is of major concern as the metal is used in electroplating, metal finishing, leather tanning and chromate preparation. Cr. (VI) being of particular concern because of its greater toxicity. At present, various organisms are used for bioremediation of heavy metals from soil and water bodies. The aim of present work was to bioremediate chromium from fortified solutions by a fungus Phanerochaete chrysosporium (MTCC787). The potency of Fungus was evaluated to remediate chromium from fortified solution by viable cells, microbial biosorbents and immobilized cells for the first time. The study shows 99.7% Cr (VI) removal by biosorption with Phanerochaete chrysosporium.

**Sub-Section: Toxicology & Bioremediation  
Assessment of Chromium Accumulation Potential of Cyperus  
Rotundus L. For Its Use in Phytoremediation Programme**

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**Key words:** Cyperus rotundus, Cr accumulation, phytoremediation.

**ABSTRACT**

Cyperus rotundus L., an invasive weed belonging to the family Cyperaceae was



allowed to grow in the pots with added K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in the soil for 45 days. The concentrations of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> were prepared in such a manner that addition of 50 ml of solution in the pot resulted in the CrVI concentrations of 50, 100 and 200 ppm in the soil. Deionized water was taken in another pot as control. 10 seedlings of the plant were planted in each pot and were kept in the field condition. After 45 days of growth the plants were uprooted, washed and root and shoot parts were separated. Dried plant materials were subjected to acid digestion and Cr content was analyzed in an Atomic Absorption Spectrophotometer. It was found that with increase in the Cr concentration in the soil, the accumulation potential increased in the plant, both in roots and in shoots. At lower concentration, i.e., 50 ppm, more Cr accumulated in roots, but towards higher concentrations, i.e., 100 and 200 ppm, more Cr was found to accumulate in shoot tissues. Before metal extraction, some physiological parameters were analysed in leaf tissues and it was found that except for decrease in catalase and peroxidase activities, no significant effect was there on total chlorophyll content, soluble protein content and activities of ascorbate peroxidase and superoxide dismutase. Since no significant visual phenotypic symptom was observed in the plants with increased Cr in soil and the plant was found capable of accumulating higher amount of Cr, *Cyperus rotundus* can be used for Cr phytoremediation from contaminated soil.

**Sub-Section: Toxicology & Bioremediation**

**Synthesis of efficient NF membrane**

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**Key words:** Nanofiltration, membrane, efficient, composite.

**ABSTRACT**

Innovative composite nanofiltration (NF) membrane has been synthesised by interfacial polymerisation of diethylenediamine and 1,3,5-benzenetricarbonyl chloride as well as modified from Polyethersulfone (UF) membrane. Synthesized NF membrane has been found capable in rejecting various pesticides, bacteria, viruses and endocrine disrupting chemicals from surface water. It is proficient in rejecting trivalent chromium ions and is extensively used in treatment of waste water. Improved nano size membranes are also suitable for pre-treatment in the desalination route because of their skill to discard both mono and divalent ions at low flux values. Nanofiltration pre-treatment prior to reverse osmosis reduces

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fouling of reverse osmosis membranes as it removes turbidity, bacteria, reduces TDS count and enables RO to operate at lower pressure. Synthesized nanomaterials have been characterized by FTIR, SEM, AFM and XRD.

**Sub-Section: Toxicology & Bioremediation**  
**Photocatalytic degradation of dyes using ZnSnO<sub>3</sub>: A green chemistry approach**

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**Key words:** Photocatalyst, mechanochemical synthesis, green chemistry, TEM.

**ABSTRACT**

Present paper reports, photocatalytic degradation of Methyl blue, Indigo carmine and Acid violet dye by green chemistry approach. Heterogeneous oxide photocatalyst, zinc stannate was synthesised by mechanochemical method. The catalyst was characterized by various investigative techniques, like FTIR, UV-DRS, XRD, SEM, TEM and TGA to elucidate structural and spectroscopic properties of the photocatalyst. Synthesized zinc stannate particles had an average size of 105 nm with band gap 3.34 eV. The photocatalyst was found to be thermally stable over wide range of temperature. Photocatalytic activity of zinc stannate was studied by photo degradation of dyes under sunlight.

**Sub-Section: Toxicology & Bioremediation**  
**Removal of Heavy Metals from Leachate of Municipal Solid Waste**

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**Keywords:** Dumping, disposal, toxic, ground water

#### **ABSTRACT**

The municipal solid waste management is serious problems all over the world. Proper disposal methods are important in management of municipal solid waste. Open dumping have adversely affected environment and human health. Leachates are the byproduct of decomposition of municipal solid waste. It consists of various toxic, poisonous substance and heavy metals which also affect ground water. These heavy metals may percolate through soil in waste water and ground water may cause negative impacts. The present study deals with analysis of heavy metal and their removal from leachates of Municipal Solid Waste by employing indigenous fungi.

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**VII**

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