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# Evolution and Development of Banking in India

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The banking history explained itself that how the banking travelled from the safest place (temple) to different branches or stores for the storage of money and precious metals in banks. With the smooth flowing systems of banks given the success to new era. Banking system in India has a healthy economy but it should be able to meet new challenges faced by technology and external/ internal factors. Indian banking system slowly and gradually reached to the remote areas of the country and this is the main reasons of India's growth. The government's regular policy for Indian bank since 1969 has paid rich dividends with the nationalisation of 14 major private banks of India. Time is moving very fast earlier accountant had no wait for long hours for withdrawing his own money. Today the technology has made changes with the flick of an eye, money transfer from one bank to other bank.

**Table 1**
**Phases of Banking Industry**

| |
|---|
| **Phase 1 – Pre - Nationalisation phase (prior to 1955)** |
| **Phase 2 – Era of nationalisation and consolidation (1955 – 1990)** |
| **Phase 3 – Introduction of Indian financial and banking sector, reforms and partial liberalisation (1990 – 2004)** |
| **Phase 4 - Period of increased liberalisation (2004 onwards )** |

**Source:** RBI

The period known as pre nationalisation. This is era of inaugurations of joint stock banking companies. In 1805 Allahabad bank was established for first time exclusively by Indians. After the establishment of various banks like PNB in 1894, Bank of India, Bank of Baroda etc. RBI came into existence in 1935.

In phase 2 governments took major role to refine banking sector with the help of RBI. India took some reforms in Indian banking sector after 1947, after independence, in 955 it gave extensive facilities to rural and semi urban areas on large scale. In 1955 state bank of India has been formed to act as principal agent of RBI and to manage all banking transactions of the union and state government. In 1980, Indian banking reforms come up with seven more banks. Following steps are taken by government of India to regulate banking institutions in the country. These following dates are important and summary of bank.

**Table 2**
**Summaries of Banks**

| | |
|---|---|
| **1949** | **Enactment of Banking Regulation Act** |
| **1955** | Nationalisation of State Bank of India. |
| **1959** | Nationalisation of SBI subsidiaries. |
| **1961** | Insurance cover extended to deposits. |
| **1969** | Nationalisation of 14 major banks. |
| **1971** | Creation of credit guarantee corporation. |
| **1975** | Creation of regional rural banks. |

**Source:** RBI

After nationalisation of banks the branches of public sector bank matured approximately 8o% in deposits. By this effect government sector has polished and refined to work confidently to give its services to the country.

Phase 3 has risen to the advancements and the introduction to products and facilities in banking sector in the measures of reforms. In 1991, liberalisation has emerged in banking practices. And this phase has emerged with foreign banks and their ATM stations. Phone and net banking was introduced in this phase. This phase brought wings to fly freely in the world.

**STRUCTURE OF INDIAN BANKING SECTOR**

**Nationalsation of Banking Sector :-** Nationalisation of banking in India existed in 1969 by the Prime Minister Mrs. Indira Gandhi. At that time there were 14 banks owned and managed by businessman. The following were nationalised bank at the time of Mrs. Indira Gandhi.

**Table 3**
**Nationalised Banks**

| | |
|---|---|
| **Bank of India** | **Central bank of India** |
| **Allahabad bank** | Indian overseas bank |
| **Dena bank** | Bank of Baroda |
| **Punjab national bank** | Union bank |
| **Indian bank** | UCO bank |
| **Union Bank of India** | Syndicate bank |
| **Canara bank** | Bank of Maharashtra |

**Source:** Mumtaz Tariq, Mumtaz Tariq, History of Banking in India.

Nationalised bank is owned by the state usually because the state bought a private bank. Any profit of nationalised bank goes to the state and it enhances the share, bonuses, pensions of

politicians and civil servants who run nationalizes bank. Nationalising was an important and very useful to increase the efficiency of commercial banks. These banks were the provisions of adequate training as well as reasonable terms of services for the staff of bank. This contributed the major to encourage the new class of entrepreneurs. The nationalised banks also ensure the availability of resources to the plan priority sectors, the five year plans of government plays important part to contribute agriculture and small Industries etc. The following reasons for the emergence of nationalised banks.

**Table 4**
**Emergence of Banks**

| S. no. | Reason |
|---|---|
| 1. | Economic Power |
| 2. | Social control |
| 3. | Agriculture |
| 4. | Stability |
| 5. | Shareholder |
| 6. | New schemes like financial facilities extended to doctor, Engg, self employed persons |

State bank of India was the first bank who look place in July 1955 under the act of state bank if India in 1955. Further with the approval of SBI act, it came up with seven state banks of India in 1960. It was ranked India's largest commercial bank and was ranked one of the top five banks all over the world. That time it served 90 million customers. In 1980 seven more banks were nationalized with deposits over 200 crores.

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# Heavy Metal Concentrations in water and fish (Cyprinus carpio) from Kolar reservoir Bhopal, India

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**Abstract :** Kolar reservoir is used for drinking purpose since 1989 in Bhopal and is second largest water source in Bhopal. The present study was undertaken to detect the contamination of Kolar reservoir due to heavy metals. Between January to December 2017, heavy metals (As, Cu, Fe, Ni, Pb and Zn) contamination in water and fish species (Cyprinus carpio) collected from Kolar reservoir Bhopal, India were analyzed. Heavy metal were below permissible limits in water samples as well as in fish species (Cyprinus carpio).Statistical analysis revealed a significant variation ($p<0.05$) in heavy metal concentrations in water and fish during different seasons. The highest concentrations of heavy metals were found during summer and lowest in the spring. The concentrations of most of the studied heavy metals in water and fish species (Cyprinus carpio) were lower than the permissible limits proposed by the World Health Organization **(WHO 2011)** and Food and Agriculture Organization **(FAO 1983).**

**Introduction :** Aquatic environment contaminated by heavy metals is a global anxiety. Heavy metals have the capability to bioaccumulate in aquatic organisms. Human activity has continually disturbed the natural environment, particularly aquatic ecosystems. (Samanta et al., 2005; Singh and Singh, 2006).

Heavy metal accumulation in fish causes biomagnifications in the food chain. Fish are a major part of the human diet because of their high protein content, low saturated fat content and sufficient omega **fatty acid**s, which support good health. Therefore several studies have analyzed heavy metal concentrations in commercial fishes to evaluate the possible risk of fish consumption (Bhattacharyya et al., 2010; Sivaperumal et al., 2007; Yilmaz, 2009). Common carp (Cyprinus carpio) belongs to the order Cypriniformes and the family Cyprinidae, which is considered the largest family of freshwater fish. It generally inhabits freshwater environments, especially ponds, lakes and rivers (Barus et al., 2001). Data on heavy metals in fish are required first because fish are consumed locally and are potential bioindicators of heavy metal pollution (Batvari et al., 2008). To the best of our knowledge, no study has been conducted on heavy metal concentrations in the organs of fish in Kolar reservoir. Therefore, the present study was conducted to investigate the degree of concentration of heavy metals in Cyprinus carpio under food fish species Bhopal Township.

**STUDY AREA :** Kolar dam is located around 35 kms towards south-west of Bhopal city. It is built on Kolar River which is a tributary of river Narmada. This dam was constructed near Lawakhedi village in Sehore district. The dam was mainly constructed for the purpose of potable water (153 MLD) to Bhopal city and for irrigation purpose in the Budhni and Nasrullaganj tehsils of Sehore district. Looking to its scenic beauty, the reservoir has been thrown open to the tourists also.


**Fig 1: Sampling sites selected in Kolar dam**

**Sample Collection :** Water and fish samples were collected seasonally in the morning hours from January 2016 to December 2017. The Water samples were collected in polythene bottles for maintaining its physico-chemical characteristics. For heavy metal analysis, the water samples were acidified with concentrated nitric acid to bring down its pH to less or equal to 2 units. Fish samples were collected in a polythene bag. The collected samples were brought to the laboratory for analysis.

Fish samples collected were analyzed for the heavy metals viz., arsenic, copper, iron, nickel, lead and zinc following the method given by Hoffman, 1996 (USGS Method B 9001-95)

**Results and Discussion :**

**Air Temperature (˚C) -** The water temperature ranged from 15.2˚C to 32.2˚C minimum temperature was recorded during the winter season and the maximum temperature at site 2 during the summer season (Table 1).similar observation has been recorded by **Chpudhary (2011)** from same water body.

**Water Temperature (˚C) -** Water temperature generally governs the metabolic activities in a water body besides controlling the solubility of oxygen which increases with the declining temperature and vice-versa. The water temperature ranged from 14.3˚C to 25.7˚C minimum temperature was recorded during the winter season and the maximum temperature during the monsoon season (Table 1). **Pani and Wanganeo (1998)** recorded an average value of

(25.1°C) for water temperature during the 1990-1992 whereas, **Mohiuddinet al., (2009)** reported a range of 21-29.5°C for water temperature during the years 2002-2004 from Lower Lake Bhopal. On overall basis the alkaline nature of Kolar reservoir waters have been recorded during the present study.

**pH (Units)** – pH value is the key indicator for the presence of alkaline or acidic nature of water samples **Kataria et al., (2011)**. In the present study the pH ranged from 7.4 to 8.8 Units. Minimum pH was recorded during the monsoon season and the maximum pH was observed at during the summer season (Table 1). Similar observation has been recorded by **Katariya et al., (1996)** in Shapura Lake.

**TDS (ppm)** – Total dissolved solids (TDS) are a standard drinking water quality parameter. It develops a particular taste to the water and at higher concentration reduces its potability. According to **Klein (1972)** the higher amount of TDS in water can distress the ecological balance in the water due to suffocation and osmotic regulation caused in aquatic fauna. The TDS ranged from 128 to 147 ppm. Minimum TDS was recorded during the monsoon and the maximum TDS was recorded in summer season (Table 1). Similar observation has been recorded by **Garge et al., (2010)** in Ramsagar reservior.

**Specific Conductivity (µS/cm)** – Specific conductivity is considered to be a rapid and good measure of dissolved solids. A sudden increase in conductivity of water is an indicator of the addition of pollutant to the water (**Trivedi and Goel, 1986)**.In the present study conductivity ranged from 172 µS/cm to 237 µS/cm. Minimum conductivity was recorded during the winter season. The maximum conductivity was recorded during the summer season (Table 1). Similar observation has been recorded by **Singh et al., (1996)** in Nagchoon pond.

**Total Alkalinity (mg/l)** – Total alkalinity is the quantitative capacity of an aqueous media to react with H+ ions. The alkalinity ranged from 111 to 143 mg/l. Minimum alkalinity was found during winter season while, maximum alkalinity was recorded during the summer season (Table 1). Similar trend were also reported by **Radhika et al., (2004)** in Vellayani lake.

**Total Hardness (mg/l)** – The total hardness ranged from 41 to 67 mg/l. Minimum total hardness was recorded during the post monsoon season and the maximum total hardness was observed during the monsoon season (Table 1). Similar result was observed by **Bhatt et al., (1999)** in Taudaha lake.

**Chloride (mg/l)** – Chlorides are common constituents of all natural waters. Higher value of it imparts a salty taste to water, making it unacceptable for human consumption **Kataria et al., (2011)**.The chloride ranged from 14.98 to 21.99 mg/l. Minimum chloride was recorded during the winter season and the maximum chloride was recorded during the summer season (Table 1). Similar observation has been reported by **Govindan and Sundaresan (1979)** in Adyar river.

**Dissolved Oxygen (mg/l)** — Dissolved oxygen play an important role of regulator of metabolic activities of aquatic organisms **(Saksena & Kaushik 1994).** The DO ranged from 5.2 to 7.6 mg/l. Minimum Dissolved Oxygen was recorded during the summer season and the maximum Dissolved Oxygen was recorded during the monsoon season (Table 1). Similar trends were observed by Choudhary and Ahi (2015) in Sagar Lake.

**Sodium (mg/l)** – Sodium is a natural component of raw water, but its concentration escalates by dissolutions of salt laden rocks in catchment area besides use of detergents **(Kumar et al., 2014; Sajitha and Vijayamma 2016**). In the present study the sodium ranged from 4.37 to 7.26 mg/l. Minimum sodium was recorded during the winter season and the maximum sodium was recorded

during the summer season (Table 1). Similar result was observed by **Uchchariya (2012**) in Tighra reservoir

**Potassium (mg/l) – Provasoli 1958 and Wetzel (1983)** reported that Potassium in nature is acquired from the weathering of the potassium bearing rocks, which also tends to form plates of mica, and is insoluble and becomes unavailable to aquatic ecosystems. In the present study the potassium ranged from 0.51 to 2.49 mg/l. Minimum potassium was recorded during the monsoon season and the maximum potassium was recorded during the summer season (Table 1). Similar observations have been reported by **Mohan and Reddy (1987)** in fresh water lake of Hyderabad.

**Calcium (mg/l)** – Calcium is an important nutrient for aquatic organisms and commonly present in all water bodies (**Ansari and Prakash, 2000**). It is found in water naturally, but the accumulation of sewage waste is also responsible its increase (**Angandi et al., 2005 and Kumar et al., 2005**). During the present study the calcium ranged from 26.12 to 30.18 mg/l. Minimum calcium was recorded during the winter season and the maximum calcium was recorded during the summer season (Table 1). Similar observation has been reported by **Kamble et al., (2008)** in Khadakwasala reservoir.

**Heavy metal in water sample and fish (Cyprinus carpio):**

**Arsenic (mg/l)** – During the present study Arsenic ranged from 0.0009 to 0.0032 mg/l in water. Minimum value of arsenic was recorded during the summer season and the maximum value of arsenic was recorded during the monsoon season (Table 2 ). In the present investigation it has been seen that Arsenic were below detection level in Cyprinus carpio

**Copper (mg/l)** – During the present study the copper ranged from 0.026 to 0.045 mg/l. Minimum value of copper was recorded during the summer season and the maximum value of copper was recorded during the monsoon season (Table 2 & Fig. 2). In Cyprinus carpio the values of copper during the study ranged from 0.0001-0.0008 mg/kg on dry weight. **Nayaka et. al., (2009)** reported the concentration of copper in Cyprinus carpio ranging from 0.006 –0.042 mg/kg dry weight posses.

**Iron (mg/l)** – During the present study the Iron ranged from 0.027 to 0.051 mg/l. Minimum value of iron was recorded during the summer season and the maximum value of iron was recorded during the monsoon season (Table 2 & Fig. 2). On yearly basis the values of iron in whole fish ranged from 0.002-0.005 mg/kg dry weight. **Nayaka et. al., (2009)** reported the concentration of iron in Cyprinus carpio ranging from 0.22–1.080 mg/kg (dry weight).

**Nickel (mg/l)** – During the present study the nickel ranged from 0.001 to 0.008 mg/l. Minimum value of nickel was recorded at site 3 during the summer season (Table 3 & Fig. 7) and the maximum value of nickel was recorded at site 1 during the monsoon season (Table 1 & Fig. 3). In the present investigation it has been seen that nickel were below detection level in Cyprinus carpio

**Lead (mg/l)** - During the present study the lead ranged from 0.001 to 0.005 mg/l. Minimum value of lead were recorded during the summer season and the maximum value of lead were observed during the monsoon season (Table 2 & Fig. 2). In the present investigation it has been seen that lead were below detection level in Cyprinus carpio

**Zinc (mg/l)** – During the present study zinc ranged from 0.068 to 0.091 mg/l. Minimum value of zinc was recorded during the summer season and the maximum zinc was observed during the monsoon season (Table 2 & Fig. 2). In Cyprinus carpio the values of Zinc during the study ranged from 0.001-0.004 mg/kg on dry weight. **Nayaka et al., (2009)** reported the concentration of zinc in Cyprinus

carpio ranging from 0.012 –0.091mg/kg (dry weight).

**Conclusion :** On the basis of physico chemical parameters Kolar reservoir waters are fit for human consumption, however looking from the bacteriological point of view, the results revealed that the Kolar reservoir water is not fit for direct human consumption and needs to be treated before being used.

Although the major cations and anions were within the safe limits as per WHO (2011) and BIS (2016); yet the input from the catchment area and the human settlements from various areas may pose a serious threat towards the potable quality of Kolar reservoir.

The concentration of heavy metals detected in water and Cyprinus carpio revealed no major threat as all of them analyzed in the present investigation fall within the safe limits. However, looking to the fast opening up of the catchment area where in present land use land cover is fast changing towards buildup area and the agricultural land lot of chemical fertilizers and pesticides will be used which will ultimately culminate into the water body and pose a threat towards biomagnification of heavy metals in fish species under consideration. Attention is therefore invited towards the changing land use land cover pattern of the catchment area before it will be too late to adopt any suitable conservation strategy. As such it is suggested to:

1. Stop conversion of the forest land into the agricultural land.
2. Stop proliferation of human settlements into the riparian zone.
3. Large scale use of pesticides should be minimized in order to maintain the potable quality
   of Kolar reservoir.
4. Washing of vehicles Motor boats in the water body needs to be stopped.
5. Proper periodical monitoring of the water body is needed in order to maintain its potable quality.

**Table 1: Seasonal variation in various physico-chemical parameters in Kolar reservoir.**

| | Winter (2016-17) | | Summer (2016-17) | | Monsoon (2016-17) | | Post Monsoon (2016-17) | | APHA (2011) | BIS (2016) |
|---|---|---|---|---|---|---|---|---|---|---|
| Air temp. ($^{o}$C) | 15.2 | 16.1 | 31.7 | 32.2 | 21.1 | 21.4 | 18.2 | 20.3 | --- | --- |
| Water temp. ($^{o}$C) | 14.3 | 14.7 | 25.4 | 25.7 | 21.3 | 21.8 | 20.1 | 20.9 | --- | --- |
| Ph (Units) | 7.7 | 8.2 | 7.9 | 8.8 | 7.4 | 8.3 | 7.5 | 8.1 | 6.5-8.5 | 6.0-8.5 |
| TDS (ppm) | 119 | 131 | 147 | 151 | 128 | 138 | 134 | 143 | 500-1000 | 500-2000 |
| Specific Conductivity (ppm) | 172 | 185 | 232 | 237 | 178 | 219 | 208 | 225 | 750 | --- |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chloride (mg/l)** | **14.98** | **15.97** | **18.98** | **21.99** | **14.99** | **16.97** | **12.98** | **17.98** | **250** | **250-1000** |
| **DO(mg/l)** | **6.6** | **6.9** | **5.2** | **6.1** | **7.2** | **7.6** | **6.8** | **7.1** | **---** | **---** |
| **Total Alkalinity(mg/l)** | **111** | **128** | **136** | **143** | **114** | **127** | **122** | **128** | **---** | **200-500** |
| **Total hardness(mg/l)** | **59** | **61** | **65** | **67** | **44** | **52** | **41** | **59** | **100-500** | **200-600** |
| **Calcium Hardness (mg/l)** | **30** | **39** | **43** | **48** | **31** | **39** | **25** | **36** | **---** | **75-200** |
| **Sodium(mg/l)** | **4.37** | **5.21** | **7.26** | **7.81** | **5.31** | **6.69** | **5.25** | **6.02** | **20** | **20** |
| **Potassium(mg/l)** | **1.14** | **1.56** | **2.38** | **2.49** | **1.34** | **1.72** | **0.51** | **1.21** | **100** | **---** |
| **Calcium(mg/l)** | **26.12** | **27.81** | **29.61** | **30.18** | **26.62** | **27.56** | **26.09** | **27.21** | **75** | **75-200** |

**Table-2: Seasonal variation of heavy metal in water samples.**

| | Winter | | Summer | | Monsoon | | Post Monsoon) | | APHA (2011) | BIS (2016) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2016 | 2017 | 2016 | 2017 | 2016 | 2017 | -- | --- |
| Arsenic (mg/l) | 0.0023 | 0.0019 | 0.0009 | 0.0011 | 0.0032 | 0.0013 | 0.002 | 0.0015 | 0.01-0.05 | 0.05-1.5 |
| Copper (mg/l) | 0.027 | 0.031 | 0.026 | 0.042 | 0.039 | 0.045 | 0.036 | 0.041 | --- | 0.05-1.5 |
| Iron (mg/l) | 0.036 | 0.032 | 0.027 | 0.033 | 0.046 | 0.051 | 0.037 | 0.035 | 0.3 | 0.1-0.3 |
| Lead (mg/l) | 0.002 | 0.003 | 0.001 | 0.002 | 0.005 | 0.002 | 0.003 | 0.002 | 0.01-0.05 | 0.01 |
| Nickel (mg/l) | 0.0002 | 0.0003 | 0.0001 | 0.0002 | 0.0007 | 0.0005 | 0.0004 | 0.0003 | 0.02-0.07 | 0.01-0.02 |
| Zinc (mg/l) | 0.082 | 0.072 | 0.076 | 0.068 | 0.091 | 0.089 | 0.071 | 0.079 | 3-5 | 5-15 |

**Table-3: Showing the seasonal variation of heavy metal (mg/kg, dry weight) in Cyprinus carpio**

| Season's | Study period (2016-17) | As | Cu | Fe | Ni | Pb | Zn |
|---|---|---|---|---|---|---|---|
| Winter | 2016 | Not detected | 0.0008 | 0.005 | Not detected | Not detected | 0.003 |
| | 2017 | Not detected | 0.0005 | 0.004 | Not detected | Not detected | 0.001 |
| Summer | 2016 | Not detected | 0.0003 | 0.002 | Not detected | Not detected | 0.001 |
| | 2017 | Not detected | 0.0001 | 0.003 | Not detected | Not detected | 0.003 |
| Post Monsoon | 2016 | Not detected | 0.0005 | 0.003 | Not detected | Not detected | 0.002 |
| | 2017 | Not detected | 0.0002 | 0.004 | Not detected | Not detected | 0.001 |
| FAO (1983) | | 0.01 | 0.03 | 1 | 0.05 | 0.005 | 0.03 |

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# Forest as a Carbon Sink or Source

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**Abstract :-** Forest and climate are intrinsically linked: forest loss and degradation is both a cause and an effect of our changing climate and account for about a quarter of all global greenhouse gas (GHG) emissions. However, the encounters of climate change can be successfully overcome by the storage of carbon in terrestrial carbon sinks viz. plants, plant products and soils for longer periods of time via increased carbon sequestration. The climatic impacts of forests are not limited to only atmospheric greenhouse gas concentrations, but, on the other hand, a growing body of research suggest that albedo - related climatic changes stemming from land – use change may diminish or counteract the climatic benefits of sequestration. This paper is an analysis of the fact that whether forests works as a carbon sink or with the 'Albedo-effect' they can produce added warming, bonus cooling to the atmosphere. Because, globally, forest disturbances are a major factor in the carbon cycle and greenhouse gas warming. They can promptly shift forests from carbon sinks into carbon sources.

**Key words :-** Forests, Climate change, Greenhouse gas, Carbon sequestration, Carbon sink, Albedo-effect

**JEL Code :-** Q01, Q23, Q56, Q51

**1. Background :-** The world's climate is undergoing significant change and the trends show that the future will face warmer climate than the world is currently experiencing. Emissions released by human activities are constantly feeding the atmosphere with pollutants and gases that have a long life cycle (IPCC Fourth Assessment Report, 2007). The anthropogenic activities, such as deforestation and the burning of fossil fuel, are amongst the main factors which contribute to the release of gas emissions into the atmosphere (Griffiths & Jarvis, 2005., Pearman, 1988). The possibility of encouraging the growth of forests as a means of sequestering carbon dioxide has received considerable attention because of concerns about the threat of global climate change due to the greenhouse effect. In fact, this method has been an explicit component of international climate policies, partly because of evidence that growing trees to sequester carbon can be a relatively inexpensive means of combating climate change. In this approach, Forestry can make a very noteworthy contribution to a low-cost global mitigation portfolio that delivers synergies with adaptation and sustainable development.

Forests are a vibrant part of the carbon cycle, both storing and releasing this indispensable element in a dynamic process of growth, decay, disturbance and renewal. At a global gage, forests aid maintain Earth's carbon balance. Over the past few decades, forests have diluted climate change by captivating about one-quarter of the carbon released by human deeds such as the burning of fossil fuels and the changing of land uses. Carbon uptake by forests diminishes the rate at which carbon accumulates in the atmosphere and thus reduces the rate at which climate change arises.

Every instant, the world's approximately 3 trillion trees either suck up carbon dioxide from the air or release it into the atmosphere. Precisely quantifying these carbon flows is a long-standing experiment that has hindered scientists' understanding of how forests help to normalize Earth's climate. Now, researchers have united ground and satellite measurements to determine that tropical forests seem to be a net source of heat-trapping carbon emissions, rather than a carbon sink.

**2. Introduction :-** Forest ecosystems play an important role in the global biochemical cycles. Forests act both as sources and sinks of greenhouse gases (GHG), through which they have

significant influence on the climate on earth. Forests and forestry donate to climate change mitigation by stabilizing and expanding carbon stocks in the forests (including above- and below-ground biomass, deadwood, litter, and soil. The influences of forests on climate extend well beyond simply the benefits of carbon sequestration in the forest. Because reducing carbon emissions is not the only way that forests influence climate; how forests are managed is also important. A recent study concluded that despite the fact that Europe had seen a 75,676 mi2 increase in forests since 1750, a circumstance widely assumed to reduce climate change, the net effect of forest influences has been a slight warming. Naudts et al. (2016) states, "Thus, two and a half centuries of forest management in Europe have not cooled the climate. The dogmatic authoritative to mitigate climate change through afforestation and forest management consequently threats failure, unless it is acknowledged that not all forestry contributes to climate change mitigation." In other words, other factors related to the nature and use of the forests, beyond their mere extent, are also important. "Albedo effect" is one of those factors. Because forests are generally darker than bare or agricultural land they absorb relatively more solar radiation, which may exert a local warming influence. This phenomenon is known as the "albedo effect." Thus, a "carbon-only" accounting approach ignores albedo impacts that can significantly overestimate the climatic benefit of forests.

**3. Forests : Mitigating climate change and beyond :-** Forests are an indispensible link in the global carbon cycle because of their ability to remove CO2 from the atmosphere and to stockpile it in biomass and soil. Health and resilience of forest ecosystems are crucial for the continuation of this storage capacity and function. Forest growth offsets rising GHG concentrations in the atmosphere by providing an imperative carbon sink. On the other hand forest degradation and/or conversion to other land use can cause substantial GHG emissions due to fires, biomass decay and/or mineralisation of soil organic matter, leading to forests becoming a source of CO2 emissions. Furthermore, this can lead to a reduced resilience of forest to the dangers of climate change.

Robust mitigation action must be taken in all deliberate sectors together with the forestry sector to limit temperature rise well below 2° C in order to avoid dangerous climate change. An increasing number of hotspots for forest biodiversity will be disrupted as temperatures increase from 2°C to 3°C. Finally at 3°C, or 2.5°C for forests, the sink service of the terrestrial biosphere will begin to convert to a source, and together with increased fire frequency this will result in forest decline worldwide.

The forestry industry is currently the third largest contributor of global greenhouse gas emissions, and is a larger emitter than the transport sector.

**Figure 1** : Photograph : AFP/Getty Images

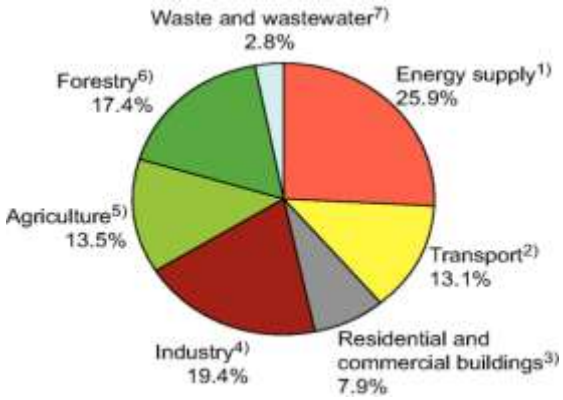



**Figure 2** : (IPCC AR4 WG3 chp9)

"This shows that we can't just sit back. The forest is not performing what we thought it was performing," said Alessandro Baccini, who is one of the leader writers of the research team from Woods Hole Research Center and Boston University. "As always, trees are removing carbon from the atmosphere, but the volume of the forest is no longer enough to compensate for the losses. The region is not a sink any more."

Developing optimal regional strategies for climate change mitigation (possibly in combination with adaptation) involving forests will require complex analyses of the trade-offs and synergies between different mitigation strategies and measures, especially regarding possible conflicts of enhancing the timber harvest for substitution or increasing the carbon stocks in forest stands. This trade-off applies to many world forests, but not to all (e.g. many forests endangered by wild fires, storm-felling, insect damage, etc). Additionally, the multi-functional role of forests essentials to be taken into account, considering trade-offs and synergies with other, environmental, economic and social, forest functions.

**4. Implications of Albedo effect on the benefits of forest as a carbon sink :-** Establishing forests has long been regarded as a useful greenhouse mitigation option, as carbon is stored in trees rather than residing in the atmosphere where it would lead to global warming. However, the usefulness of that strategy was questioned through studies that explicitly considered the radiative forcing associated with changes in energy absorption vs reflection (albedo) at the surface (Brovkin et al., 1999; Betts, 2000; South et al., 2011). Those studies showed that, depending on the extent of albedo changes, incident radiation and carbon-storage potential at different locations, the benefit of tree plantings could be much diminished, or even become negative at sites with extended snow cover and poor tree-growth potential.

Betts (2000), in particular, concluded that in large parts of the temperate and boreal regions, the overall radiative forcing from a decrease in surface albedo by afforestation was equal in magnitude to the radiative forcing of increasing carbon sequestration. The albedo effect is more important at high latitudes because albedo differences between evergreen forest and pasture or cropland are greatly accentuated when snow covers the ground. In more temperate regions, like New Zealand, snow cover is less important, and albedo effects resulting from vegetation shifts are therefore likely to be less important than in boreal regions with extended snow cover.

In quite a different study, Juang et al. (2007) combined modelling and observations and concluded that converting a grassland to pine or hardwood forest resulted in an overall cooling by about 1.5 C, with a cooling effect of about 2.5 C due to greater latent heat (evaporative) and sensible heat exchange of forests offset by albedo-caused warming by about 0.8 C. This study highlights the apparent contradiction between global and local effects. Forests can be cooler than neighbouring pasture, primarily because of the effects of evaporation, which cools the local environment. However, that local cooling is not relevant in the global context as evaporation simply transfers heat from the evaporating surface to the atmosphere. When the water vapour condenses as liquid in clouds or rain, the heat is returned to the atmosphere. On the global scale, the effects of evaporation and condensation cancel each other out with no net effect. Only effects on the radiative balance remain.

Conventionally, the net radiation, Qn, retained by a body, like the Earth, is given by the conservation equation:

$$Qn = Qs\downarrow - Qs\uparrow + Ql\downarrow - Ql\uparrow \quad \ldots\ldots\ldots (1)$$

$$= (1 - \alpha)\, Qs\downarrow + Ql\downarrow - Ql\uparrow$$

where the radiation components are $Qs\downarrow$ downward shortwave radiation, $Qs\uparrow$ upward reflected short-wave radiation, $Ql\downarrow$ downward long-wave radiation and $Ql\uparrow$ long-wave radiation emitted from the body and α is the albedo of the body, defined as the fraction of downward short-wave radiation that is reflected from the body (Landsberg and Gower, 1997).

Considering the Earth as a whole, incoming long-wave radiation and emission of short-wave radiation are negligible. Equation (1) can therefore be simplified and extended to give:

$$Qs\downarrow - Qs\uparrow = (1-\alpha)Qs\downarrow = -Ql\uparrow = f(T^4) \quad \ldots\ldots\ldots\ldots (2)$$

where T is temperature in Kelvin. This shows that, following the Stefan-Boltzmann law, the amount of long-wave radiation emitted from the Earth is a function of its temperature raised to the fourth power. Any decrease in albedo leads to increased energy absorption by the Earth. To regain energy equilibrium, outgoing long-wave radiation from the Earth must be increased to match the increased absorption of short-wave radiation, which can only be accomplished through an increase in temperature.

Direct and indirect effects of changes in albedo associated with the conversion of pasture to forest are described in Fig. 1 (based on a figure from Findell et al., 2007). Storing carbon in vegetation reduces atmospheric CO2 and thereby allows more long-wave radiation to escape from the Earth, with consequent negative radiative forcing (term A). This beneficial effect of tree plantings is partly offset by the direct effects of decreasing albedo (i.e., less reflection), which means that more short-wave radiation is absorbed at the surface (term B). In addition, there are indirect effects of afforestation (terms C, D) because forests evaporate and transpire (termed evapotranspiration) more water than grasslands (e.g., Zhang et al. 2001; Beets and Oliver, 2007), principally because of higher interception of rainfall by forest canopies than shorter grassland canopies (Jarvis and McNaughton, 1986; Beets and Oliver, 2007).

The resultant surface radiation balance is complicated by the resultant changes in the partitioning of available energy into latent heat (evaporation of water) and sensible heat (terms C and D). Increasing latent heat flux reduces both the amount of energy available as sensible heat and the local surface temperature. That latent heat is released somewhere else in the atmosphere when water condenses again, but the increased amount of water vapour in the atmosphere absorbs some outgoing long-wave radiation, prevents it from escaping from the Earth system (term C) and adds to global warming. The increased amount of water transferred to the atmosphere must also be returned to the surface as precipitation, which involves cloud formation. As low clouds tend to have high albedo, they predominantly reduce the short-wave flux to the surface (term D) and thus cool the Earth.

**M. U. F. Kirschbaum et al.: Carbon, albedo and climate benefits**

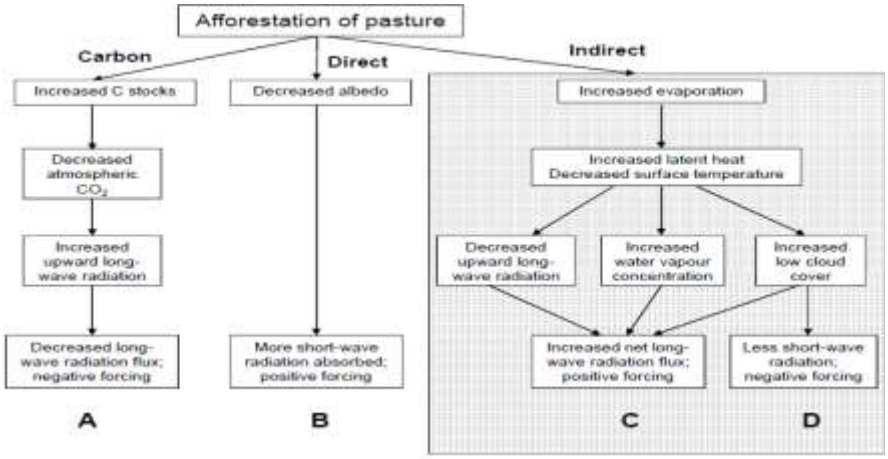


**Figure 3 :** Schematic representation of the direct **(A, B)** and indirect **(C, D)** radiative effects associated with conversion from pasture to forest. All the radiative fluxes described are at the surface and the convention is that fluxes are positive for energy moving towards the surface. Indirect effects are shown in the hatched box in this diagram because the present work considers only the carbon and direct albedo effects. Diagram modified from Findell et al. (2007).

In summary, the direct effect of decreasing albedo with afforestation (term B) will increase radiative forcing at the surface. However, increased evaporation (terms C and D) can result in an increase or decrease in radiative forcing. The final combined effect is determined by the relative sizes of the two components (terms C and D). If the combined net surface radiative balance is positive, then both latent and sensible heat fluxes may increase and surface temperatures may increase even more that that due to term B alone. These indirect effects are difficult to compute and were beyond the scope of the present study. However, other studies have shown that under some conditions they may be quantitatively as important as the direct effects (e.g., Bala et al., 2007).

**5. Carbon storage and albedo effect for climate change mitigation :-** Carbon plantations consist of vegetation types selected to provide an optimal net $CO_2$ uptake under local climate conditions. Active afforestation policies and forest management can enhance carbon uptake compared to natural systems. Without harvesting, the net gain in uptake could typically last several decades; in combination with harvesting, the net gain will continue assuming the harvested wood is used to displace fossil fuels as biofuel and/or wood from natural forests as timber.

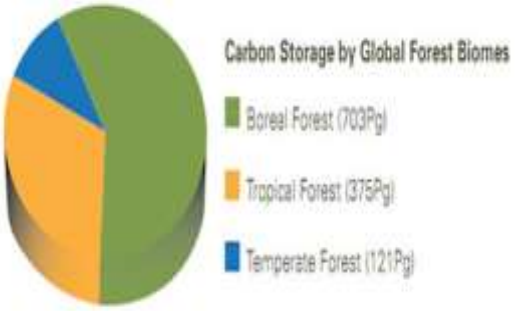
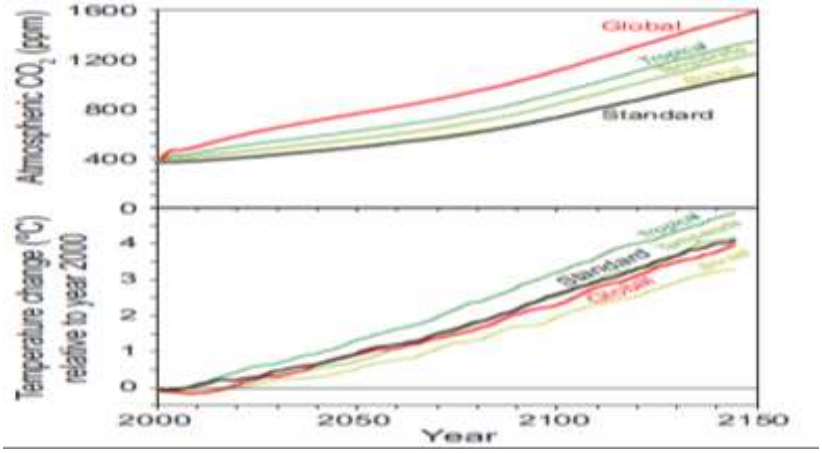



**Figure 4 :** A comparison of carbon storage by global boreal, tropical and temperate forests, One Pg (petagram) is equivalent to one billion tonnes.

The prevention of deforestation and promotion of afforestation have often been cited as strategies to mitigate climate change. Deforestation discharges CO2 to the atmosphere, which exerts a warming stimulus on Earth's climate. Nevertheless, biophysical effects of deforestation, which contain alterations in land surface albedo, evapotranspiration, and cloud cover also affect climate. Many readings have established that global-level deforestation has a net cooling effect on Earth's climate, because the warming carbon-cycle effects of deforestation are overwhelmed by the net cooling associated with changes in albedo and evapotranspiration.




Source : Carnegie Department of Global Ecology

**Figure 5 :** Simulated temporal evolution of atmospheric CO2 (Upper) and 10-year running mean of surface temperature change (Lower) for the period 2000–2150 in the Standard and deforestation experiments.

**The effect of deforestation on climate :-** The above figure shows that warming effects of increased atmospheric CO2 are more than offset by the cooling biophysical effects of global deforestation in the Global case, producing a cooling relative to the Standard experiment of -0.3 K around year 2100. The combined carbon-cycle and biophysical effects from Tropical, Temperate, and Boreal deforestation are net cooling, near-zero temperature change, and net warming, respectively. When global deforestation is implemented in the model, temperatures are raised only in the Tropical regions of the world, are changed by a negligibly small amount in Temperate regions, and are decreased in Boreal regions. This leads to an overall decrease in temperature due to global deforestation, implying that afforestation projects would only be useful to combat global warming if implemented in the Tropics.

**6. Discussion :-** Lastly, we must endure in mind that preservation of ecosystems is a key goal of preventing global warming, and the destruction of ecosystems to prevent global warming would be a counterproductive and perverse strategy. For that reason, the cooling that could potentially ascend from deforestation outside the tropics should not inevitably be viewed as a strategy for mitigating climate change because, apart from their possible climatic role, forests are important in many aspects. They supply natural habitat to plantss, safeguard the biodiversity of natural ecosystems, yield economically valuable timber and firewood, protect watersheds through prevention of soil erosion, and indirectly prevent ocean acidification by dropping atmospheric CO2. In planning responses to global challenges, therefore, it is important to pursue broad goals and to avoid narrow criteria that may lead to environmentally harmful consequences.

**7. Conclusion :-** The studies reviewed have presented a new perspective on the role of forests in the global carbon budget. The earlier view of this biome as a CO2-stimulated carbon sink seemed to be well founded on diverse lines of evidence. One set of readings has given the impression to point to boost the carbon uptake; however, questions have arisen about these findings, and recent experiments with tropical forest trees indicate carbon saturation of canopy leaves plus no biomass upsurge under enhanced CO2. Other field observations indicate decreased forest productivity and increased tree mortality in recent years of peak temperatures and drought (strong El Nin~o episodes) which involves large uncertainties and questions related to methods and interpretation. Change in aboveground biomass is just one component of net forest carbon balance, and in no tropical rainforest has a complete assessment been made of total carbon stocks and their change through time. To define current climatic reactions of forests around the world tropics will require careful annual monitoring of ecosystem performance in representative forests. To develop the essential process-level considerate of these responses will necessitate intensified experimentation at the whole-tree and stand levels. Finally, a more complete understanding of tropical rainforest carbon cycling is needed for determining whether these ecosystems are carbon sinks or sources now, and how this status might change during the next century.

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# Carbon Less Cities - A New Paradigm of Sustainable Cities

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**ABSTRACT :-** As towns and cities are growing at an alarming rate, with an increasing trend of urbanization, which in turn increases greater demand for urban infrastructure and urban land for accommodating the future urban growth and development. Many countries are facing the problem of running- out of fossil fuels and their increasing global demand, consequently the future of cities is limited because there is no longer enough energy to run them. It is the gap between the use of fossil fuels and the exponential escalation in the demand of energy which is already resulting in the energy insecurity that will be a hallmark of life and in all countries in the next decades. Thus, there is a need for zero- carbon cities which are urban areas powered by renewable energy techniques and technologies. Many countries around the world are conniving and implementing Low Emission Development Strategies (LEDS). These stratagems seek to achieve social, economic, and environmental development goals while reducing long term GHGs emissions and increasing resilience to climate change impacts. Altogether, executed low carbon economies are therefore projected by those having drawn the conclusion as a means to avoid catastrophic climate change and as a precursor to the more advanced, zero- carbon economy. In spite of the ample approach in urban planning, most of the urban problems remained as irresolvable and becoming beyond the control of planners which in turn bring down both quality of life and the nature environment. The paper will analyze different cities having the same climate characteristics to achieve and understanding of the key interrelationships between the zero carbon strategy and the design of structure and spaces by using the data from RESIDEX, GREENEX and GREENDEX. It concentrates on developing a stage for a high quality of life where inhabitants can find the carbon footprint is zero. Cities are the focal points and the drivers of societal development in all countries.

**KEYWORDS :-** Zero Carbon City; Sustainability; Urban planning; ecology

**JEL CODE** :- Q01, Q55, Q53

**INTRODUCTION** :- Environment and energy are two sides of the same coin. Cities are the major consumers of fossil fuels which have risen 4% of global energy consumption in the early 1900s to over 86% at present time. For all these reasons, cities play an inordinate role in greenhouse gases. Cities are the focal points and drivers of societal development in all countries. At the same time, they are the largest consumers of natural resources and the biggest resources of pollution. One of the most significant environmental challenges within cities is CLIMATE CHANGE. A second major concern is the environmental impact of fossil fuel use in cities, especially oil.

Responding to climate change, sustainable design approach came from the rising concern about the environment. At the same time, sustainability concept has some threats and points of weaknesses. The most important threats of sustainability are the depletion of energy resources, fresh water shortage and economic wastes. However, the absence of qualified skilled workers, the high initial costs of sustainable technology and the difficulty of persuading people to accept the advanced ideas represent its points of weaknesses. Accordingly, new types of cities have arisen that reduce carbon emissions on the annual basis. The Paper presents the main features of zero carbon cities that can be applied during their construction and operation process.

Finally, the aim of this paper is to provide a checklist for Indian metropolitan cities and planners to achieve zero-carbon goals with sustainable design approaches that facilitate fulfilling energy future requirements. These design approaches include the utilization of renewable energy resources replacing the traditional oil-

based energy sources and playing an important role in increasing the efficiency of energy consumption in buildings. Not only has this, but to achieve sustainable development objectives and in turn reduce negative impacted of pollution on these metropolitan cities.

**DEFINITION, CONCEPT AND PRINCIPLES OF ZERO-CARBON CITIES** :- Depending on the technology used generating energy whether electricity or heat will produce emissions directly through combustion of fossil fuels or indirectly through the manufacture of the equipment itself or through the transport of fuel.

Technologies such as photovoltaic, biomass, wind and hydropower produce very low levels of carbon emissions relative to energy produced directly from fossil fuels and can be thought as "low or zero carbon technologies."

Thus, the definition of a zero carbon city is "that over a year the net carbon dioxide emissions from all energy use within the buildings as a whole are zero or below." This means that at assured times of the year a city may produce less. That is to say that, "it is the city that on the annual basis produces as much energy as it uses." This definition of zero carbon technology is applied to the whole development rather than individual buildings.

The ambition of a zero-carbon city is reducing carbon emissions from buildings, reducing waste, transport, materials and food emissions by 50% globally. It can be achieved by the following energy hierarchy:

- Reducing energy-use wherever possible in the buildings and transportation sector.
- Adding as much renewable energy as possible and offsetting any $CO_2$ emitted through purchasing carbon credits

The zero carbon goal is applied to carbon emissions arising from energy use in domestic, non-domestic, public spaces and structures in a completed development. In another context, applying the following principles over the life time of a city contributes to reducing energy use and residual carbon emissions.

- Developing renewable energy and in distributed power and water systems
- Increasing photosynthetic spaces as a part of green infrastructure.
- Improving eco-efficiency and increasing a sense of place
- Developing sustainable transport and also developing cities without slums.

Thus, the challenge for urban planners is ti apply all of these approaches together in order to generate a sense of purpose through a combination of new technology, city design and community based innovation.

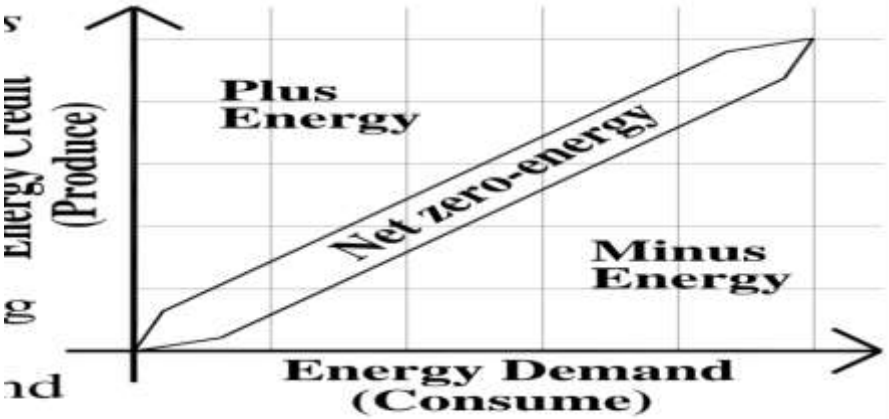


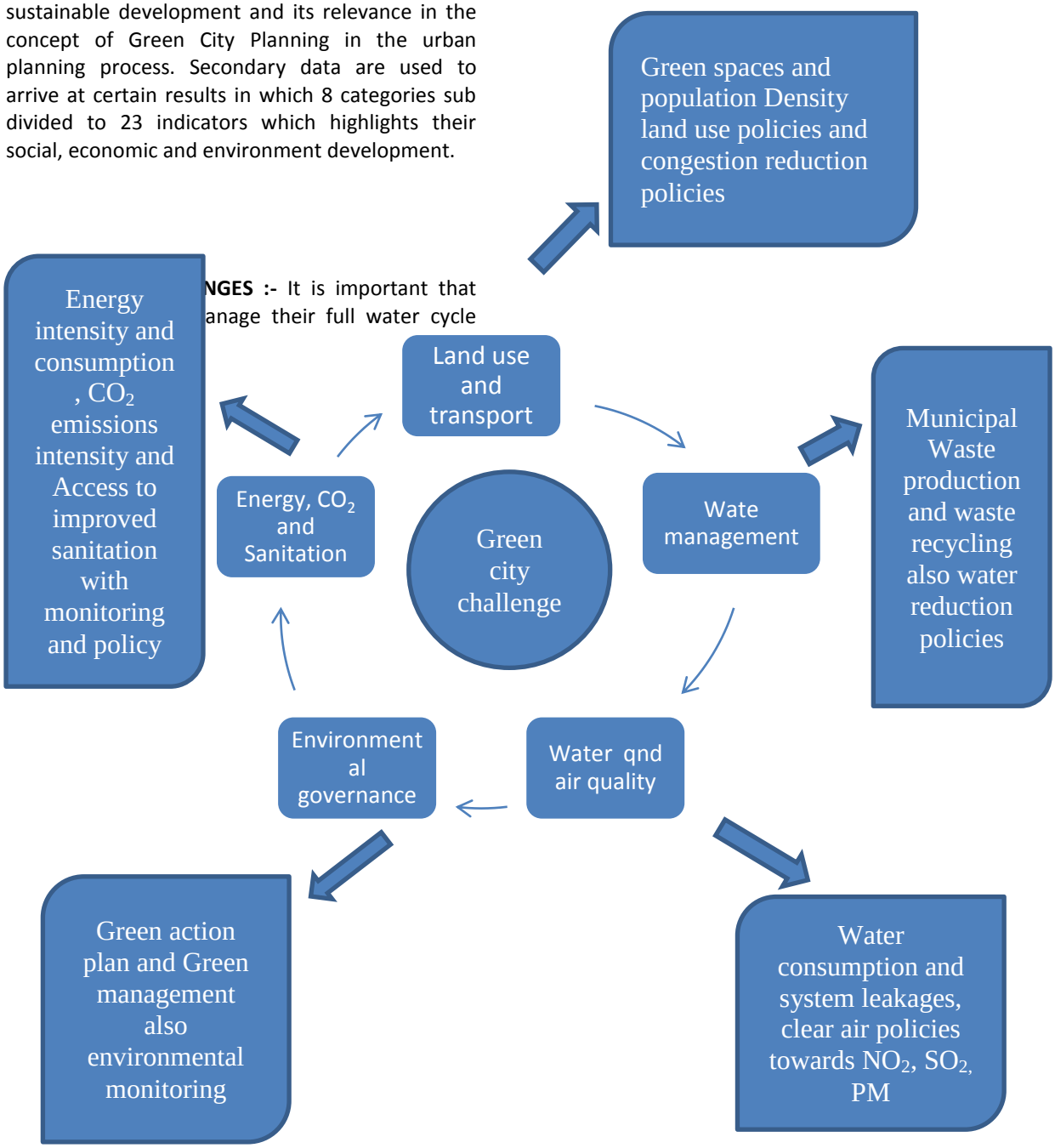

Fig. 1 Concept of zero-energy cities

Green city concept – towards greener economy

**Study area :-** In this paper, the concept of green city planning has been discussed and 6 metropolitan cities i.e., Delhi, Mumbai, Chennai, Kolkata, Lucknow, Bangalore, Ahmedabad are assessed in 23 indicators to get the closer proximity towards greener economy using three indices RESIDEX, GREENEX and GREENDEX.

**Methodology :-** This paper focuses only on the thematic discussions of other issues connected to sustainable development and its relevance in the concept of Green City Planning in the urban planning process. Secondary data are used to arrive at certain results in which 8 categories sub divided to 23 indicators which highlights their social, economic and environment development.

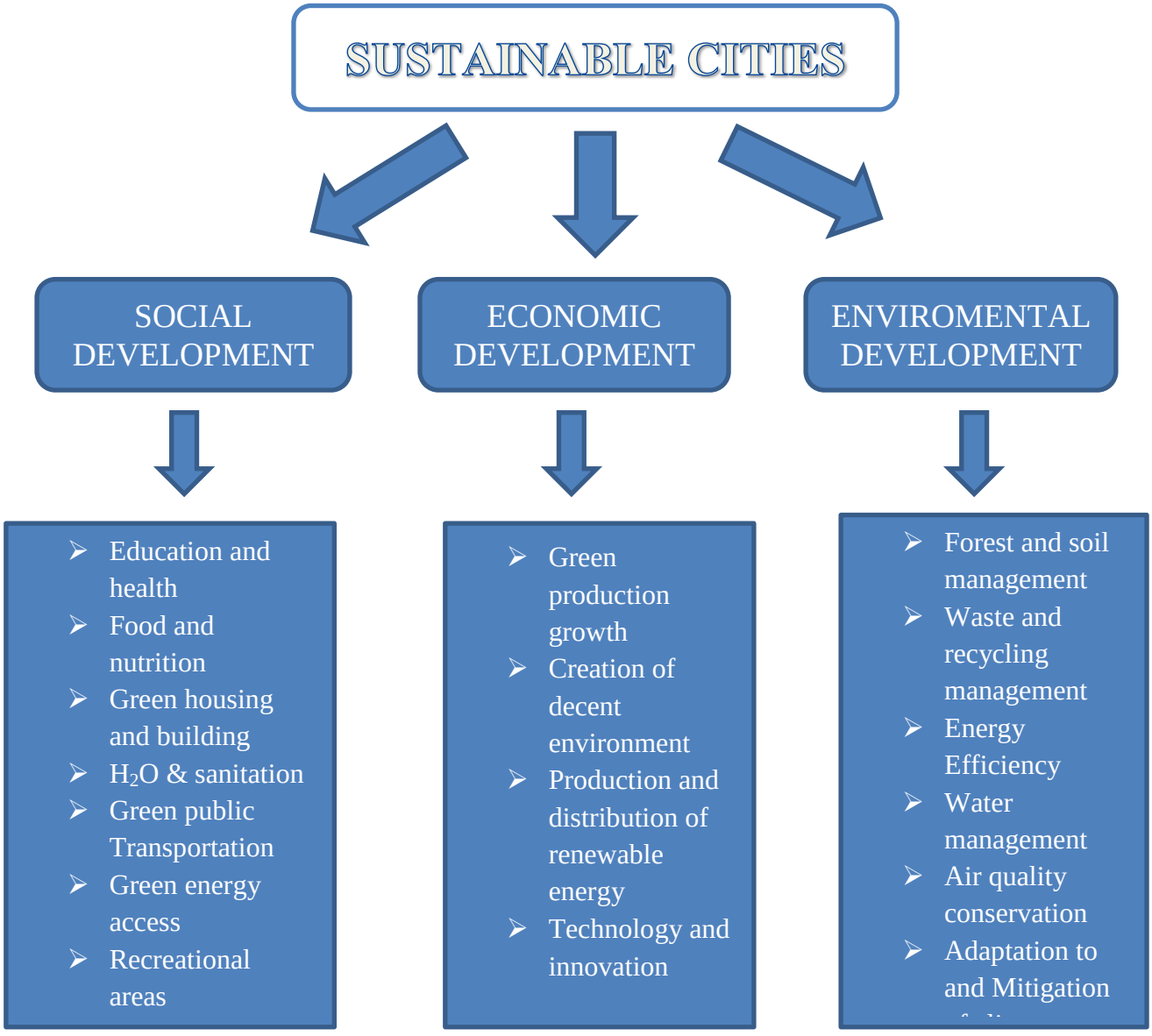
and contribute to renewable energy generation to become "low carbon" or "zero- carbon" cities. On one hand, India has good potential of renewable resources including solar and wind power. Thus, renewable energy technologies can be considered as an integral part of the indian energy policy framework. The following diagram shows the current challenges prevailing in indian economy towards achieving the greener and a carbonless economy.




**NGES :-** It is important that anage their full water cycle

**SUSTAINABLE DEVELOPMENT :-** The notion of sustainable development is currently treasured on the masthead of environment fortnightly featured on 8 lakhs web pages and ensnared in the aspiration of countless programs places and institutions; it should be easy to far-reaching the sentence. Nevertheless the most extensively acknowledged portrayal is creatively envisages "humanity has the ability to make development sustainable- to ensure that it meets the needs of the present without compromising the ability of future generation."

A brief history of the concept along with the interpretive differences and the common ground in definition, goals, indicators, values, and practice, are taken together, which helps to understand what is meant by sustainable development. The bendiness allows one to scrutinize programs of both environment and development; which places from local to global; and institutions of govts, civil society, business, and industry to each venture their interests, hopes and targets on to the banner of sustainable development.



**MITIGATION AND ADAPTATION OF CITIES TO CLIMATE CHANGE** :- To keep away $CO_2$ emissions, all instruments are being mobilized to reduce these emissions at source and to adapt the existing emissions according to climate change policy. Achieving zero carbon cities and contributing to climate protection require a planned change to the way in which cities are spatially configured and served. Both Adaptation and Mitigation measures respond to the effect of climate change, they require cities to be planned differently, (UN Human Settlement Programme, 2013).

The mitigation challenge is to tackle the causes of climate change through the reduction of Greenhouse gas emissions. It aims at reducing the rate of carbon emissions into the atmosphere to manageable sustainable levels through the design, construction, operation and eventual demolition of a building. Mitigation measures include: Promotion of lifestyle less dependent on fossil fuels and releasing less carbon into the atmosphere, more efficient use of energy, less waste and widespread use of Renewable energy as an alternative to fossil fuels.

In the same way, adaptation is adjusting the building to the physical impacts of the surrounding climate and resilience against the current and predicted future effect of climate change. For example, by incorporating green space to provide shading, sustainable drainage systems, designing to prevent overheating and to avoid the need for artificial cooling of buildings.

**WAYS TO ACHIEVE ZERO CARBON CITIES** :- There are many challenges that cities may actually face to set up zero carbon cities or to make the cities more environmentally friendly. There are new innovative renewable energy solutions which can be applied to the construction and operations of these cities to become an epicenter for the development and commercialization of clean energy technologies.

**Urban design element :-** Urban planning adapted to the local culture and climate of the surrounding region. The city reduces the carbon footprint by orienting its building north east to south west. This helps to minimize the amount of direct sunlight on building while still providing natural daylight. Building narrow, shaded passage ways, instead of wide roads, funnels breezes and helps to keep the city cool. That is a cheap way to reduce the need for not only air conditioning system but also for electric lighting.

**Water Conservation Technologies :-** Water conservation is becoming increasingly important as a demand for water increase especially in hot arid regions. Reduction and reuse of water are considered as a main element to achieve zero carbon cities. A number of conservations measures can be used in cities such as rain water collection (water capture technology) and grey water reuse.

**Waste- to- energy technology** :- A small fraction of the energy needed to run the city comes from waste-based fuel. It provides a small portion of the city's electricity through the use of waste reduction measures, reuse, recycling and cohosting solid wastes. Such approaches to waste require new technologies and management systems that integrate public health and environmental engineering with ecologically sound planning. The others are energy conservation, building materials and construction techniques, carbon capture technologies.

**Intelligent Transport Systems** :- Cities are increasingly being designed to use energy sparingly by offering walkable transit oriented options, often supplemented by vehicles powered by renewable energy. Accordingly, there are other sustainability features that relate to the cities transport system. Sustainable transport can be presented in replacing cars and fuel vehicles by electric public transport. Cities with more sustainable transport system are able to reduce their ecological footprint from their reduced use of

fossil fuels as well as through reduced urban sprawl and reduced dependence upon car-based infrastructure.

**Hydrogen Power Plant** :- The hydrogen power plant represents a huge industrial scale installation. It takes natural gas from the grid and converts it to $CO_2$ and hydrogen using an amine process. $CO_2$ is compressed and exported while the hydrogen is fed into a combine cycle gas turbine power island to generate electricity.

**Application on Zero-Carbon Cities** :- Masdar City (Abu Dhabi, United Arab Emirates) Masdar city is a carbon neutral city of 6.5 Km2. It is being constructed 17 Km from the city of Abu Dhabi in the United Arab Emirates. It is the world's first zero-carbon, zero-waste and car-free city which costs U.S 22 billion. The city has net zero greenhouse gas emissions with no oil or gas burnt on site. Masdar is designed in two squares, one large square and a smaller square (Fig. 2) The city is growing to be 1,500 businesses and 50,000 residents. Of this, 30% is zoned for housing, 24% for the business and research district, 13% for commercial purposes, 6% for the Masdar Instituite for Science and Technology (MIST), 19% for service and transportation and 8% for civic and cultural pursuits. - In the first building phase (2009), all major infrastructures are built including the Abu Dhabi Future Energy Technology (ADFEC) Headquarters, Masdar's own University and a large photovoltaic power plant, which represent the main source of energy to provide the city with power (Fig. 3). - The second building phase, the larger square of the city is to be completed. - The third building phase, the smaller square of the city (Fig 4). The whole city of Masdar completed by 2015.

**Culture and Heritage** :- Masdar city draws its inspiration from the Traditional Arabic cities environmental and climate response to climate change (Fig. 5). The city reduces the carbon footprint by developing in a compact area (Fig. 6) that allows for easy pedestrian movement and expands the comfort zone of the city through the control of sun and wind to create the highest sustainable quality of life. Narrow, shaded streets reduce the outdoor temperatures by as much as 20co making it possible to comfortably enjoy the outdoors for a longer period of time (Fig. 7). Carefully planned landscape and water features also aid in reducing the temperature and enhancing the quality of the street.

**Water Conservation (Sustainable Water)** :- Water is an increasingly sparse source in Abu Dhabi. Accordingly, Masdar will be an oasis in the desert through the use of brackish and other local water resources, the application of advanced water treatment technologies, recycling and overall the reduction of water demand (Fig. 9). Masdar city has a solar powered desalination plant; around 80% of water is recycled on-site through different mechanisms. The intention of Masadar city is to reuse water as many times as possible. For case, remnants from watering crops will be captured through irrigation recovery. This mechanism works by collecting leftover

water from the top loam, subsequently irrigation through an underground collection system. The poised water can then be used for other resolutions. Landscaping within the site is irrigated with grey water and treated waste water is produced by the city's water treatment plant. Dew catchers, rainwater harvesting and electronic sensors to detect cracked pipes, are all to be used, and also maximizing the use of local water resources. 6.1.3 Waste-to-Energy Technology: Another objective of Masdar city is zero-waste through the use of waste reduction measures, reuse, recycling, composting and waste-to-energy technology. As a part of the zero-waste strategy, biological wastes are converted into renewable "E-fuel", a fossil fuel replacement or used to create nutrient rich soil and fertilizer while everyday waste is sorted and recycled.

**Energy Conservation** :- According to Masdar, the city requires just 200 MW of installed capacity as opposed to more than 800 MW for a similar-sized conventional city. In addition, the city is entirely self sustaining in terms of energy needs. Masdar has several main power sources to meet the energy that the city demands. To generate zero-carbon energy to build the city, a temporary photovoltaic power plant is installed on-site before any building commences. As the city is near completion, the photovoltaic power plant will be transferred to permanent structures within the city Masdar City is characterized by its landscape and water features Water Conservation desalination Water Reuse & Recycle Water Recapture Zero-Carbon Cities as a New Perception of Sustainable Cities. Masdar's Personalised Rapid Transit (PRT) In addition, there is a solar thermal power plant using parabolic troughs (Fig. 11) which work on the principal of concentrating solar into steam. The tower comprises liquefied salt and the surrounding solar concentrators or mirrors (with heliostats) redirect sunlight to the tower. The tower will engender steam that turns an electricity turbine to create energy. The salt is there to keep power going for about 15 hours even when there's no sun. There is also a wind energy farm located in the land surrounding the city. Any excess energy generated is supplied to the national grid. Abu Dhabi predicts that such technology will reduce electricity by 25% relative to current similar- sized communities.

**Zero-Carbon Concept Versus Sustainability** :- A comparison between zero carbon and sustainability concepts Point of Comparision 1) Zero-Carbon Carbon capture facility and a natural gas reformer, reducing CO2 emissions and increasing oil production N/A 2) Zero-Waste Reduce, reuse, recycle, compact, waste-to-energy Sorting, separating, recycling and reuse 3) Sustainable Transport Zero-cars, walking, biking, light rail, personal rapid transit (PRT) N/A 4) Local Sustainable Materials Very efficient with a high thermal mass Clay or masonry bearing wall construction 5) Local Sustainable Food Compost for soil, grey water irrigation, green belt of agriculture Organic crops, wastes are eaten by animals 6) Sustainable Water 80% of water reused. All water derived from a solar powered desalinization plant A water treatment station has been used to reuse water 7) Natural Habitats and Wildlife Mitigation for any impacted plant and animal as an effective conservation Underwater protection and beach clean-up 8) Culture and Heritage Compact pedestrian walkways, narrow shaded streets, landscape and water features Landscaped courtyards, domes and vaults 9) Equity and Fair Trade Pledging to pay all employees fair wages in accordance with international labour standards Broad range of income levels 10) Health and Happiness Meeting the needs of the people and the environment N/A 11) Energy Conservation Photovoltaic power plants, solar thermal power, large wind turbines, geothermal groundsourced heat pumps and hydrogen plant Wind farms using horizontal wind turbines (HAWT) which are located onshore.

**General Findings and Outcomes** :- A zero-carbon sustainable future is not just an aspiration. Around the world, it is becoming a reality as progressive thinking individuals, businesses and government organizations to change the way they live and work to meet the challenges of resource depletion and climate change. - In the master plan of a zero-carbon city, building designs and the zero-carbon strategies will need to offer an integrated solution in multiple challenges including design for reduced energy demand and for comfort and climate change adaptability, flexibility to integrate future low carbon techniques. - Leading a community towards zero-carbon technologies is ambitious and necessary. Fortunately, many cities have begun this innovative kind of future oriented process (like Masdar city). Based on the experience of zero-carbon projects in many countries, it is important to improve, innovate and modernize policy and management activities. - Achieving zero-carbon cities in Egypt is to compromise between the

sustainability concept and zero-carbon to reach a balanced solution that comply with the capabilities, the economic barriers and the local culture. - A zero-carbon city creates a model for eco-design worldwide. It is characterized by some points of strength such as minimizing the ecological footprint, developing low carbon economy and making people aware of their carbon impact. - Zero-carbon strategies have positive opportunities through self-sustaining in terms of energy needs, development of carbon capture and storage technologies and encouraging energy efficient designs.

**Recommendations** :- There is a call for rethinking of the definition of zero-carbon cities, as in the present era, it is vague in its current format without clear and structured guidelines. - Compulsory adoption and a step to change in building and planning practices are the most suitable ways of achieving the goals of zero-carbon cities. - There is a substantial amount of education that needs to happen for the general public to appreciate the benefits of zero-carbon cities. - It is necessary for the government to act upon this growing demand for zero-carbon cities and legislate to create a national market for zero-carbon technologies in cities.

**Eco-city initiatives in China and India** :- In 1994, China announced its 'Agenda 21' and explicitly stressed the importance of sustainable settlement. By 1996, the then State Environmental Planning Agency issued the policy document 'Guidelines for the Building of Eco-Communities (1996-2050)'. The purpose was to indorse the planning and construction of eco-communities across the country. Under this directive, between 2003 -2008 three Eco-cities were planned in China:Dongtan Eco-city near Shanghai, Tianjin City in northern China, and Huangbaiyu, north-east China. In Japan starting 1997 six eco-cities have been planned: Yokohama, Kitakyushu, Toyama City, Obihiro, Shimokawa and Minamata.

In India discussions on Eco cities started in 2000 and starting 2001 six medium and small Eco-cities were planned by the Ministry of Environment and Forest (MoEF) in association with Central Pollution Control Board (CPCB) and with technical assistance from German technical cooperation (GTZ). The focus of the project is pollution control, improvement of environmental quality, protection of environmental resources like rivers and lakes, improving sanitary conditions, improving the needed infrastructure and creating aesthetic environs in the chosen towns. The cities included Tirupathi, Vrindavan, Kottayam, Ujjain, Puri and Thanjavur.

The Delhi Mumbai Industrial Corridor Development Corporation (DMICDC) has also aimed to develop smart Eco-cities along the Delhi Mumbai Corridor with investment from companies in Japan. The DMICDC and the Haryana State Industrial & Infrastructure Development Corporation (HSIIDC) have planned to develop an eco city at Manesar in Gurgaon, Haryana. This is planned as a pilot model, and if it succeeds similar models will be developed in different regions of the country in the future. This has been planned based on the Japanese Eco cities of Yokohama and Kitakyushu. Sustainable eco villages and towns are also being advocated. The Prince of Wales, through his charity Foundation for the Built Environment, is planning to construct an eco-friendly community for 15,000 people outside either Bangalore or Kolkata. The design of the new shanty town is inspired by the model village of Poundbury in Dorset, which has been the Prince of Wales' pet project for thirty years.

Many of these projects are at various stages of implementation, however planning and developing an Eco-city is a tedious and uncertain process. In China failure of eco-cities (such as Dongton Eco-city) occurred mainly due to Implementation difficulties. Factors like land availability, economic growth, Infrastructure facilities, Investment, political stability and much more will play a critical role in making Eco-cities a success. Barriers and challenges have been experienced with regards to the Eco-Towns in Japan too. It would be difficult to adopt the process of the Eco-Town formation as-is to developing countries and cities because of lack of funds, differences in the social and industrial structures, and low environmental consciousness.

Some of the key aspects to be considered while designing Eco city models particularly in the developing countries are:

- Environmentally sound technology to reduce carbon emission, recycle waste and to create sustainable transport

- Land acquisition and relocation of local people
- Involvement of multi stakeholders in town planning
- Enormous financial requirement

**Way ahead** :- During the last two decades most Indian cities have experienced phenomenal growth which the cities found difficult to cope with and as a consequence they are faced with problems in infrastructure, water and air pollution and other environmental problems. These problems are expected only to grow more in coming years. Social injustice and gap between urban rich and poor is also increasing leading to more urban poor. If we are to absorb and sustain the powerful wave of urbanization, while continuing to manage the existing built stock, we will need a paradigm shift on the approaches towards planning and managing cities.

Ecocities have the potential to address many of the problems associated with urban development and failure of Eco-city models should not dampen the interest levels, however careful planning and implementation is necessary.

The evolution of cities takes many years. Each city has its own socio political, cultural and economic conditions and strategies adopted in shaping a successful eco city at one place may not necessarily work for other cities. Achieving greater sustainability in cities requires an in-depth understanding of the impacts of different urban forms on movement pattern, social conditions, environmental quality, and of their capacities to deliver future benefits. Success of Eco cities truly depends on planning taking, ecological and environmental factors into consideration..

Eco- cities cannot be formed in isolation. These projects: (a) need to ensure inter-linkages to the present city; or (b) should be aimed to develop present cities into Eco cities. Better planned eco-cities cannot be successful unless human development is taking place simultaneously. The socio cultural aspect of sustainability must also be taken into consideration while planning. With increasing economic growth in India, the growth of Indian cities can be expected to be high and it

would be wise to start planning for Eco-cities today for a better sustainable future tomorrow.

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# Critical Factor in Stress Relations in Physical Activity Settings

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The importance of coping has been acknowledged as a critical factor in stress relations in physical activity settings. In sport settings researcher have generally used Lazarus and Folkman's (1984) definition that coping represents "constantly changing cognitive and behavioral efforts to manage specific external and\or internal demands that are appraised as taxing or exceeding the resources of person". An important distinction can be made between problem focused coping refers to cognitive and behavioral efforts used to change the problem causing the distress. These strategies may include problem-solving planning, suppressing, competing activities and increasing efforts. Emotion focused coping, on the other hand, involves strategies used to regulate emotional arousal and distress- include mental and behavioral withdrawal, denial and acceptance (Crocker and Isaak ,1997)

One issue in understanding the role of coping in sports concerns whether or not athletes use a consistent coping style to manage competitive demands (Bouffard and Crocker,1992). A strong dispositional view would advocate that individuals would have a preferred set of coping strategies that applied across time and different situations. An alternative coping consistency position is that individuals use a similar coping style within a specific area such as competitive sports. Some researchers have implicitly assumed athlete cope in a consistent fashion and such style can predict performance (Madden, Kirkby and Mc Donald,1989; Madden,Summers and Brown,1990) with physical disabled persons Bouffard and Crocker(1992) found that they did not use a consistent coping style in three challenging physical activity settings, and they attributed this to the type of sport, athlete may cope in a consistent manner.

Therefore, the purpose of the present study was to examine the consistency of coping in Indian Inter-university level male wrestlers during wrestling competitions and training/practices between competitions.

Carver Scheier, &Weintraub' s (1989) COPE instrument consisting of fourteen coping scales i.e. active coping, planning, suppression of competing activities, positive reinterpretation, venting of feelings, humor, wishful thinking, self blame seeking social support for instrumental reasons, acceptance , increased training effort , denial , and behavioral disengagement . Three other scales (wishful thinking increased training effort ,and self – blame) used in previous coping research were added. These three coping categories, not captured by COPE instrument, have been found to be important coping in sport.Scales were modified slightly for the wrestling context and translated in Hindi were used to assess the coping process used by sixty three inter university level wrestlers, belonging to different weight categories (14 of 50kg, 16 of 55kg, 15 of 60kg & 18 of 66kg) ranging from 18 to 25 years of age and who participated in States competitions, inter university Championships, and training camps during the session 12-13 and 13-14 and volunteered to participate in the study, as the subject of the study. The subjects were from the different parts of the country and belonged to different Socio-economic strata. All the wrestler had been wrestling regularly for number of years.

Each coping scale contained four cognitive and/or behavioral strategies with each item scored on five point Likert-type scale,with scoring ranging from (1)Very little/not at all ,to (5) very much. Each subject was asked how much each of coping strategies was used. The items

were randomly ordered in the questionnaire. Items within each scale were summed and the average of scale on each coping strategies was recorded as the score of subject for that particular coping strategy.

In order to ensure full co-operation from subject, the scholar had a meeting with them in presence of their respective coaches and managers. The purpose of the study was explained to them and doubts if any were classified in order to ascertain that there was no ambiguity among the subjects regarding the efforts, which they had to put in, for the successful completion of the investigation.

All subjects voluntarily extend their full co-operation and the coaches of respective teams ensured that the subjects were made available for the collection of data as and when required.

Wrestlers were assessed during wrestling meets and one week training period following each meet.The first assessment familiarized the participant with the testing protocol. The last assessment was used for the primary analysis to determine coping consistency.

During the competition, each subject was assessed separately. Each subject was asked to identify most important bout for each meet. Within an hour period following the identified meet, coping was evaluated. Each subject was guided through the coping questionnaire and provided with clarification if requested. Participant were asked to indicate how much they had used each of the coping strategies in the period immediately leading up to and including the meet. For competition only the following eight coping scales were assessed: active coping, planning, suppression of competition activities, positive reinterpretation, venting of feelings, humor, wishful thinking, and self blame.

One week following the meet, coping with training demand was evaluated. Participants were asked to indicate how much they had used each strategy from all fourteen coping scales. Only those wrestler assessed in the previous wrestling meet participated. Participants completed the coping questionnaire in groups, with a research assistant providing clarification if requested.

Descriptive statistics for coping during both competition and during the training period followed by competition were computed. Data from the assessment, were used for investigate the consistency of coping across competitions and during training period. The data for each coping scale were analysed separately. A two facet (person by situation) design was used to analysis the data. This procedure allowed estimate of variances due to person, situation (either competition or training) and interaction of person and situation. The level of significance was set at. 05 level.

The statistical analysis of data on various coping scales collected on 63 male Inter-university wrestlers during competition and practice after each competition during the session 2012-2013 and 21013-2014 has been presented in this chapter. The age of subjects ranged between 17 to 25 years,

The data of three assessments was used to find out the coping consistency at various competitions and training after each competition. The data on each coping scale was analysed separately.

Two facet design (Wrestler x Situation ) was used to analyse the data. This procedure allows the estimate of variance due to wrestler, situation (either wrestling tournament or practice) and the interaction of person (Wrestlers) and situation (competition/ practice)

The interpretation of interaction component is that over and above the main effects of wrestlers and situations, at least some

wrestlers score higher in a coping scale in some competitive situations and lower in other competitive situations. For example if wrestler is using a coping strategy in a consistent manner across competition / practice will be reflected by a low wrestler by situation interaction component. If the strategy is not being used consistently then the wrestler by situation interaction component would be high.

The items within each scale were summed unweighted. Descripted statistics (Mean and Standard deviation) for each coping strategy use by Wrestlers during both competition and training period was computed.

The scales of active coping, seeking social support for emotional reasons, positive reinterpretation and growth, training and wishful thinking followed by planning had the highest group means, humor and behavioral disengagement had the lowest group means for coping during competition. For training after competition, the highest mean scores were for active coping, seeking social support for emotional reasons, acceptance and training. Whereas humor and behavioral disengagement had the lowest group means.

Estimated variance components are scale dependent. Therefore the proportion of the total estimated variance accounted for by each source of error (percent of total variance) was calculated .Which equals the estimate divided by the sum of estimates (total variance)and multiplied by 100 to obtain % of variance.

Analysis of coping data during competition in table-III indicated that on almost all the coping scales majority of total variance was due to the interaction component. 92% for active coping; 99% for planning; 77% for suppressing competing activity; 84%for social support for instrumental reasons; 89% for seeking support for emotional reasons; 90% for positive reinterpretation and growth ; 97% for acceptance; 92% for focus on venting of emotions; 88% for denial; 75%for humor ; 65% for training; 92% for wishful thinking; 81% for self-blame; and 98% for behavioral disengagement. As the interaction component was larger (more than 50%) than either wrestler or competition situation components suggestions that wrestlers were inconsistent in their coping styles during competition.

The non-negligible estimated variance components for various coping scales i.e. 8% for active coping; 10% seeking social support for instrumental reasons; 9% for seeking social support for emotional reasons; 8% for focusing on venting of emotions; 12% fordenial; 7% for wishful thinking shows that averaging over competitive situations wrestlers in the sample differed systematically in their coping style for increased training effort only the wrestler component was large (33%).

The primary purpose of the present study was to determine if Inter-university level male wrestlers used consistent coping strategies wrestling competitions and during training after competition. Findings from the competitions and training does not provide support for coping style view i. e., using a consistent coping style by the wrestlers, as was hypothesized at onset of the project.

The result of the study support the process view of coping by Lazarus and Folkman (1984). According to him coping should be conceptualized instead of style.

According to Meichenbaum (1985) and Lazarus and Folkman (1984) effective copers are not consistent across situation. A coping strategy that may prove effective in one situation may no longer be in another. Further, an effective strategy used in a previous encounter with a challenging situation may no longer be effective because the “same” situation is now different, in that the individual may have some change due to learning or task demand has changed. This latter case is

most relevant when the task involves a living opponent.

In dynamic physical activity a style with flexibility to change responses with changing circumstances seems more appropriate (Carveretal 1989).

Competition, in higher interaction components for almost all the coping scale i.e. 99% for active coping ;85% for planning ;96% for suppression of competing activities; 84% for seeking support for instrumental reasons ; 99% for seeking social support for emotional reasons ; 94% for positive reinterpretation and growth and acceptance; 99% for focus on venting of emotions; almost 99% for denial ; 85% for humor; 96% for training; 93% wishful thinking; 97% for self - blame and; 92% for behavioral disengagement indicating inconsistent coping pattern for all the coping scales as all the scales had interaction components greater than 50% i.e. the non-negligible variance components of the total variance wrestlers i.e. 14%for planning;12% for seeking social support for emotional reasons; 4% for acceptance; 6% for humor and 5% for behavioral disengagement indicated that averaging over competitive situations wrestlers differed in their coping style even during training / practice for coming competition.

**Recommendations :-** In the light of the conclusion drawn following recommendations are made:

(1) In present study subjects of different weight categories were studied together. It is suggested that a study may be undertaken with subjects of same weight category.
(2) A similar study may be under taken with male and female wrestlers of different weight categories.
(3) This work may be replicated and extended with different sports and level of competitions.

**Conclusions :-** Within the limitation of the present study following conclusions were drawn:

(1) Inter-university level male wrestlers preferred problem focused coping (planning, active coping, and positive affective state to manage their competitive situations
(2) Inter-university level male wrestlers preferred active coping, seeking social support for emotional reasons, acceptance and social support coping strategies to manage their training\practice situations during training\practice between different competitions.
(3) Indian Inter-university level male wrestlers were inconsistent in their coping style during competition and training\practice between competitions thus results do not support the style view of coping.

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# Expansion in the Field of Food Processing Industry in Bihar

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**Abstract :-** Industries are major tools for developing and increase the viability of a society. Under the influence of the customs law industries can change and a lot of things. Food processing is the adding value to the agricultural produce by using various techniques like grading, sorting, packaging, etc., which enhances the shelf life of food products. Overall economics set-up of a country would accelerate by a strong and dynaming food processing sector. Food processing is a large sector that covers activities such as agriculture, horticulture, plantation, animal, husbandry and fisheries. Agro-based food processing is defined as a set of techno-economic activities, applied to all the products originating from agricultural farm, aqua cultural sources, livestock and forest for their conservation, handling and value-addition to make them usable as food, feed, fibre, fuel or industrial raw materials. There are many advance technique also used in this new era that is much effective in the case of production and to maintain hygiene because it is also a big problem in the food processing. We can use the recombinant enzyme which isolate by various method and used for increasing production.

**INTRODUCTION :-** Husbandry is the Back bone of Indian Economy. It is the biggest private segment occupation in Bihar. The primary focal point of the farming generation framework is vocation security, land change and improving the most extreme pay of landless country populace ought to be the greatest salary of landless provincial populace. As per the 2011 registration, 88.70 percent of populaces live in rustic regions where agribusiness is the fundamental occupation. The populace is required to achieve 20 crore by 2025.Therefore, increment popular for sustenance should be met through higher rural efficiency or by expanding nourishment imports. Advancement of Agricultural is a necessary piece of by and large improvement. At the season of freedom, horticulture was the fundamental wellspring of national salary and business in India. Along these lines, it is a base of any improvement.

Farming yet frames the foundation of advancement. A normal Indian spends practically 50% of his/her complete use on nourishment, while generally 50% of India's work drive is as yet occupied with farming for their employment. Being both a wellspring of job and nourishment security for a dominant part of low pay, poor and helpless segments of the general public, its execution accept more prominent centrality cc from BRICS (Brazil, Russia, India, China and South African) nations demonstrates that a one rate development in farming is no less than a few times more successful in decreasing destitution than a similar development exuding from the non-agribusiness areas.

On the planet India is the second biggest maker of sustenance grains with their capacity to achieve the primary spot held by china till date .Being world's biggest maker of organic products, milk, oat and animals and second biggest maker of vegetables but then the nourishment handling area is at its early stage. In any case, there is dependably an incredible breadth in nourishment preparing part because of progress in the salary structure of individuals and furthermore developing sustenance handling division because of wealth of crude materials required for this segment. This paper gives a diagram to the extent of sustenance preparing industry in Bihar with major obliges, preferred standpoint, framework and openings.

**MATERIALS AND METHODS :-** The study is based on both primary and secondary data. The study examines the extent the use of modern technology and increase the productivity the research will cover the entire state of Bihar. For the purpose of the study, four districts have been selected as the place of origin, Samstipur, Muzaffpur, Purnia, Bhagalpur.These districts have been selected keeping in mind the objective to have a representative sample that adequately captures the diversity in data.

It is envisaged that both primary as well as secondary data will be used in the study. For collecting primary data, the study will use interview questionnaires/schedules. The secondary source of information will consist of relevant books, journals, seminar papers, websites, and Ph. D works, Census Reports, Economic Survey of Bihar, Statistical Handbook of Bihar and NSSO Reports etc.

Primary data were collected from the sample units. For drawing samples from the universe, researcher adopted the method of judgment sampling. The universe in the study covers all agro-processing units which are working at the time of survey and are registered with District industries Centre.

The data so collected were analyzed with help of various statistical techniques which included percentages, averages and coefficient of correlation. The tabular analysis was intensively used.

**RESULTS AND DISCUSSION :-** Bihar is an industrially backward place. This type of kingdom such as growing a meals processing area in the shape of natural development for commercial development in Bihar, the country Government has gave focused front-loaded for brand spanking new gadgets in the quarter. This column assesses the modern coverage surroundings and the strengths and weaknesses of the establishments. Repeats primary survey approximately column industry.

Bihar ideal consequences consisting of employment creation, with the intention to pave the way for Bihar business improvement, along industrialism of the economist to obtain the industrial base of the nation like clear desires and mechanisms, preserving meals processing a local vicinity for commercial growth is a herbal alternative from the factor of view of the blessings of the sources. Favorable weather, ample water, fertile, and soil are the principle focusable natural sources for the kingdom. Additional Conditions for cultivation of a multitude of agricultural objects which include royal litchi and nutritious Makhana (fox nuts or gorgon nuts) and corn, rice, wheat, vegetable and end result within the nation, foreign geographically-particular gadgets. Therefore, industries which produce food processing, packing and advertising with agricultural sub-sectors commonly have the specific blessings of employment, on a massive scale, in addition to extra than 505 full-time artists, a mid-sized dairy more than 110 complete time non-public for operation. It is tough to get such employment numbers with standardized and mechanized manufacturing unit-bused industries for the kingdom.

Bihar has the rich hereditary qualities alluvial soil with plentiful water assets including ground water assets empowering ranchers to create an assortment of harvests. The state has an all out land region of 9.4 million ha out of which 84 percent is gross trimmed region which gives a lot of crude materials the territory under vegetable yield is 7% and organic product is 3%. Rice, Wheat, Maize are the real grain crops. After West Bengal and Uttar Pradesh Bihar is third vast maker of vegetables in the nation. Mango, Guava, Litchi and Banana are the significant products of Bihar while potato, onion, tomato, cauliflower, okra and Brinjal are some real vegetables.

**Table 1:- Crop wise production in Bihar (2007-10) lakh MT**

| CROP | 2007-08 | 2008-09 | 2009-10 |
|---|---|---|---|
| Rice | 44.73 | 55.90 | 36.21 |
| Wheat | 49.75 | 44.10 | 46.23 |
| Maize | 18.57 | 17.14 | 17.139 |
| Coarse cereals | 18.96 | 17.51 | 17.50 |
| Pulses | 4.73 | 4.68 | 5.14 |
| Sugarcane | 40.27 | 49.60 | 50.00 |
| Oilseeds | 1.44 | 1.38 | 1.49 |

Without stopping the further hand, among in this area 2 lakh tones of litchi production, vis-?-vis 45 percent bill on behalf of Bihar's state fabrication equally as well its single of the brand name Muzaffarpur Litchi is well demanded at home the breezy to the same degree in any case at the same time as processed fruits segments. The creation of fruits afterward vegetables in the field of the glory of Bihar are agreed voguish board 2.

**Table 2:- Fruits production in Bihar (2009-10) lakh MT.**

| Fruit | Bihar | India | % of national production |
|---|---|---|---|
| Banana | 14.35 | 264.7 | 5 |
| Citrus | 1.31 | 96.38 | 1 |
| Guava | 2.31 | 25.72 | 9 |
| Litchi | 2.15 | 4.83 | 45 |
| Mango | 9.96 | 150.27 | 7 |
| Papaya | 0.36 | 39.13 | 1 |
| Pineapple | 1.25 | 13.87 | 9 |
| Others | 2.95 | 72.01 | 4 |
| Total | 34.65 | 715.16 | 5 |

Source : Nation Horticultural Board (2010)

**Table 3:- Vegetables production in Bihar (2009-10) lakh MT.**

| Vegetables | Bihar | India | % of national production |
|---|---|---|---|
| Brinjal | 11.99 | 105.63 | 11 |
| Cabbage | 6.9 | 72.81 | 9 |
| Cauliflower | 10.8 | 65.69 | 16 |
| Okra | 7.67 | 48.03 | 16 |
| Peas | 0.63 | 30.29 | 2 |
| Tomato | 10.44 | 124.33 | 8 |
| Onion | 9.72 | 121.59 | 8 |
| Potato | 53.87 | 365.77 | 15 |
| Sweet potato | 0.07 | 10.95 | 1 |
| Others | 26.98 | 311.68 | 9 |
| Total | 139.07 | 1337.38 | 10 |

**Preferences and openings in Bihar** :- Bihar is all around fitted with characteristic assets, for example, land and water, it is imperative for agribusiness and yields. Investigation of farming creation in Bihar demonstrates that there is a requirement for interest in all divisions from institutional to trim administration practices to altogether build crop generation. Bihar is the fourth biggest agricultural maker in the entire nation. Foods grown from the ground are developed in almost 10% of trimmed region, delivering 3.2 million tones of products of the soil million of vegetables. Bihar has upper hand in Makhana, Litchi, Mango, Spices, Cereals and Pulses, Sugar industry, Livestock items.

**CONCLUSION :-** In the agro processing various method used like banking, fermentation, drying, and other preservative method like freezing, thermal processing etc but it may Effect economical aspects, for the removing contamination biosorption technique usewd that can be remove heavy metal from aqueous solution and against the pest we used pesticide , herbicide but it can remaning in the processing technique that is harmful to us for this we can probiotic substance which will active only specific condition, which is present only in specific micrgransim ex. Bt cotton . The pesticide residue in food commodities can be influenced by storage, handling, and processing.

AS Stated earlier inspite of the problems, agro-processing technology in India has continued to make steady progress towards modernisation. For future growth, new initiatives need to be called for.

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