Compilation of existing best Practices of Climate Change Adaptation in Industrial Parks– National & International scenario

November 2016

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List of abbreviations

HRI	- Heat Reflective Index
I.P	- Industrial Park
SBS	- Small Bore Sewer System
EIA	- Environmental Impact Assessment
CCA	- Climate Change Adaptation
APSEZ	- Andhra Pradesh Special Economic Zone
IDCK	- Infrastructural development Corporation Karnataka
IGBC	- Indian Green Building Coad
CII	- Confederation of Indian Industry
AER	– Advocacy for Environmental Restoration
JET	– Journalists for the Environment of Tanzania
TBD	– The Blacksmith Dept. Zambia
LEED	- Leadership in Energy Efficient Design

Introduction to Compilation of existing best Practices of CCA– National & International scenario

The Ministry of Commerce and Industry (GoI), the Departments of Industries and Commerce of the then Govt. of Andhra Pradesh and APIIC along with GIZ took a decision in the year 2013 to take up the project of "Adaptation to Climate Change in Industrial Areas in India" to address the challenges of climate change with a focus on Andhra Pradesh and Telangana.

Andhra Pradesh Industrial Infrastructure Corporation Limited (APIIC), an undertaking of Government of Andhra Pradesh, is a premier organization, vested with the objective and responsibility of building and holding land banks, developing Industrial Parks/Estates and Special Economic Zones by providing necessary Industrial infrastructure. Over 201 Industrial Parks have been established throughout the State in eight (8) industrial zones covering an extent of 57, 836 Acres. These industrial parks are prone to various types of extreme climate events such as Cyclones, Drought, Floods, Heat Waves, etc.,

Telangana State Industrial Infrastructure Corporation Limited (TSIIC), an undertaking of Government of Telangana State, is a premier organization in the state, vested with the objective of providing Industrial infrastructure through development of Industrial Parks and Special Economic Zones. Over 131 Industrial Parks have been established throughout the State of Telangana covered under 6 zones of the TSIIC. Telangana state is threatened by disasters like floods, drought, heat waves,

This document of CCA best practices for Climate Change Adaption part of a set of documents prepared by collecting various CCA best practices measures being implemented in various Industrial Parks/ Areas, Special Economic Zones in developed and developing countries including Andhra Pradesh and Telangana (Government and private) in view of various disasters like cyclones, floods, lightening, drought and heat waves. The following sections of **document 5** / 3rd part of document gives the details of these best practices during selection of industrial sites, planning of new IPs, plantations, cleaner technologies, Eco-Concepts, soil erosion, landscaping, IP resilient measures etc., are elaborated / explained in this document in detail.

TSIIC/APIIC, in cooperation and with support from GIZ-INTEGRATIN has developed a set of documents targeting adaptation to climate change of existing and upcoming industrial areas in Telangana States / Andhra Pradesh, India. The following table gives an overview on the various documents and their scope.

Table1: Documents for adaptation to climate change in industrial areas in [Telangana State / Andhra Pradesh]

	Document	**Scope**
1	Policy for Climate Change Adaptation in Industrial Areas	The policy is setting the frame for TSIIC's/APIIC's strategy to promote and implement adaptation of existing and upcoming industrial areas in TS/AP to make the State's industry and economy more climate resilient.
2	Guideline for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change	The guideline provides orientation and develops a standard approach and methodology on how to plan for adaptation and increasing resilience of existing and upcoming industrial areas.
3	Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change	Part 1 of the manual includes the tools required to execute a climate risk analysis for existing and upcoming industrial areas. The results of the risk analysis provide a sound baseline to further plan and implement concrete adaptation measures, both in terms of infrastructure and operation, management and maintenance of the industrial parks.
4	Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change – Part 2: Tools for planning adaptation and resilience measures	Part 2 of the manual includes the tools required to translate the results of the risk analysis in concrete adaptation measures. According to the prevailing climate hazards in the state the tools focus on adaptation to heavy rainfalls and related impacts, and to heat waves and droughts and related impacts.
5	**Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change – Part 3: Best practice examples**	**Part 3 of the manual presents a collection of national and international best practice examples and lessons learnt on adaptation of industrial areas, urban areas and infrastructures to the impacts of climate change.**
6	Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change – Part 4:	Part 4 of the manual includes a collection of financing instruments and best practices for financing of adaptation measures in existing and upcoming industrial parks.

	Financing of plans and measures	
7	Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change – Part 5: Legislative, regulatory and operational framework	Part 5 of the manual providers an overview on the existing polices, legislation, rules and standards relevant for assessing risks and planning of adaptation in measures. In addition, this part gives an overview on relevant actors and stakeholders and provides orientation on how the planning steps described in the guideline document are embedded in existing planning and working processes of TSIIC / APIIC.
8	Manual for Adaptation and increasing Resilience of Industrial Parks to the Impacts of Climate Change – Part 6: Baseline studies in TS and AP	Part 6 of the manual presents the results of a pilot risk analysis and baseline study executed in selected industrial areas TS / AP.
9	Training modules on execution of a climate risk analysis for existing and upcoming industrial parks and their adaptation to the impacts of climate change	To successfully implement the guidelines and even more important the respective adaptation measures in planning and refurbishment of industrial parks, TSIIC / APIIC has to develop the respective capacities in planning and operational departments. Furthermore, external capacities have to be supported and developed to be able to provide the required services to the infrastructure corporations and to individual industries and companies, particularly to (M) SMEs.

1. Location and site layout of Industrial Parks

1.1 Site selection for new Industrial Parks

Abstract:

Site selection indicates the practice of new facility location, both for business and government. Site selection involves measuring the needs of a new project against the merits of potential locations. The practice came of age during the 20th century, as governments and corporate operations expanded to new geographies on a national and international scale. The procedure for the site selection is different from country to country and may also vary from the policies that the country poses. In this part various case studies and respective experiences are discussed briefly.

1.1.1 Cases from Andhra Pradesh and Telangana state

1. APSEZ, Andhra Pradesh Special Economic Zone (Siting and layout planning of IP, pg.5)

http://www.hrdpidrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf

Location	- Achutapuram and Rambilli, Visakhapatnam, A.P
Year of construction	- 2007
Area	- 5595 Acres
Climatic Conditions	- Warm and Humid
Industrial Profile	- Multi Product

Introduction:

APSEZ is located at Visakhapatnam popularly known as the second largest city in Andhra Pradesh, the city is located at the coast of Bay of Bengal, with developed industrial base, excellent connectivity through air, rail, road and sea. This industrial layout boasts Common effluent treatment plant, CC Storm water drainage system, STP, recycling facility, Provision of dedicated gas connectivity and Lush green landscape.

Salient features

- Site selection aspects have been considered through various parameters of available sites like – Disaster Risk assessment, Air pollution sensitivity, Surface Pollution Sensitivity, Ground pollution Sensitivity.
- Shortlisting of Government lands which are in the industrial land use for planning industrial park.
- Identification of ecologically / environmentally sensitive zones within 10 km of the project radius and assessment of environmental baseline conditions.
- Preparation of environmental management plan and environmental monitoring plan for the construction and operation phases of the project for the best suitable site.
- Preparation of EIA according to the present environmental conditions and identification of eco sensitive areas. Zoning the entire plan with respect to the pollution levels. Creating natural green buffer zones which is resistant to the

pollution levels caused by high pollution zones in order to make the green buffer sustainable.

1.1.2 Cases from India

1. Wipro Campus,

http://www.slideshare.net/somajotm/green-presentation-3926808

Location	- Gurgaon, Haryana, India
Area	- 70 Acres
Climate	- monsoon-influenced humid subtropical climate
Industrial Profile	- Software development

Introduction:

Wipro Campus, Gurgaon is a Platinum Rated LEED certified Green Building by IGBC (under the umbrella of USGBC). The main focus of the design is the inverted cone, strategically located at the cross junction of two roads to give visibility to the building. A key highlight of the building is a controlled, open to sky landscape courtyard that will contribute towards keeping the building cool during summers. All open office spaces overlook the courtyard, thus allowing good access to daylight.

Salient features:

- Selection of site is well suited to taking advantage of mass transit.
- Protect and retain existing landscaping and natural features. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and mulches. This will save water and time.
- Recycled content paving materials, furnishings and mulches help close the recycling loop.

1.1.3 Cases from Developing countries

1. Eastern Seaboard Industrial park,

Green design and planning resolutions for an eco-town, pg.4
http://www.scirp.org/journal/PaperInformation.aspx?PaperID=25056

Location	- 120 km west direction from Bangkok**,**
Year of construction	- 2003
Climate	- Tropical monsoon climate (mostly hot and dry)

Introduction:

The Eastern Seaboard Industrial Park is located in Rayong Province, only approximately 120 km east of Bangkok. Rayong is a medium-sized province with an area of 3552 km^2. and a population approximately 615,000. National policy has designated Map Ta Phut as the major industrial area under the Industrial Estate Authority of Thailand (IEAT). However, at the same time, the National Environment Board (NEB) declared the Map Ta Phut municipality and vicinity in three other sub-districts heavily affected by serious environmental problems as “pollution control zones” to control, reduce and eliminate toxic waste in accordance with guidelines contained in the National Environment Quality Act.

Salient features

- Preparation of Environmental impact assessment (EIA), Preparation of Health Impact assessment (HIA) and Preparation of Social impact assessment (SIA), for the selected area to develop as an industrial estate.
- "Green Belts" can be both natural and manmade, selection of site with adequate green buffer zone which can protect the city from the industrial emissions.
- Site has been selected as per the required amount of natural green buffer i.e.,required as per the upcoming industries.
- Green belts have be maintained around the periphery of the designated industrial site.

1.1.4 Cases from Developed countries

Boxwood Business Park,

(Guide to eco- zone planning & development, pg. 4)

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Location	- Cambridge, Ontario, Canada.
Year of construction	- 2012
Area	- 220 Acres
Climate	- Cold and dry

Introduction:

The Boxwood Subdivision is located just east of the Toyota Motor Manufacturing Canada assembly plant and is easily accessible from Highways 401, 24, 8, and 7. Over 200 acres of small to medium sized fully serviced industrial lots are now fully functional by the various Corporates of the City of Cambridge. What makes the campus unique are the sustainability features that fit eco-conscious businesses. A number of "green" features make this campus an eco-friendly industrial campus. The campus design incorporates large buffers and pedestrian pathways adjacent to wooded areas, wetlands, and ponds to be enjoyed by nearby employees and citizens. The road layout is oriented to allow buildings to maximize solar energy. Energy efficient LED street lights illuminate the sidewalks and roadways for pedestrians and vehicles. Attractive Connections between buildings and trail system to encourage walking and cycling. Share Driveway and/or Parking Facilities where possible

Salient features

- Protection of the woodlots and creek valleys, also incorporate buffers to protect these sensitive areas.

1.2 Climate Resilient Planning of New and existing Industrial Parks

Recent rapid changes in the Earth's climate have altered ecological systems around the globe. Global warming has been linked to changes in physiology, phenology, species distributions, interspecific interactions, and disturbance regimes. Projected future climate change will undoubtedly result in even more dramatic shifts in the states of many ecosystems. These shifts will provide one of the largest challenges to natural resource managers and conservation planners. Managing natural resources and ecosystems in the face of uncertain climate requires new approaches. Here, the many adaptation strategies that have been proposed for managing natural systems in a changing climate are reviewed. Most of the recommended approaches are general principles and many are tools that managers are already using. In this part various regulations and practices for adapting the changing climate are discussed.

1.2.1 Cases from Andhra Pradesh and Telangana

APSEZ, Andhra Pradesh Special Economic Zone,

(Siting and layout planning of IP, pg.5)

http://www.hrdpidrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf

Introduction: (refer 1.1.1)

Salient features

- For reduced environmental impact, a systematic Environmental Impact Assessment (EIA) was undertaken, proper zoning of the site was done for different types of polluting industries, and adequate environmental infrastructure was planned.
- *Imposing of Emission Restrictions and benchmarking* **–** Very high emission industries that are not compatible to the site were restricted from the industrial park.

ALEAP GRIP,

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf

(Siting and layout planning of IP, pg.5)

Salient features

- Storm water drains are planned considering future drought as well as flood predictions and recycling of water for gardening.
- Green buildings are proposed in the industrial park
- Roof-top Solar cell for each industry and common buildings to support the frequent power cuts and to ensure consistent
- Introduced Wastewater Recycling system for better management of water
- Solid waste management as win-win model for reuse and recycling
- Use of Green Spaces for economic activities like floriculture and horticulture, which ensure adaptation measures as well as of economic significance.
- Capacity Building of all stakeholder and plot allotment guidelines ensuring better operation and management of the services in the industrial park.

1.2.2 Cases from India

Gujarat International Finance Tec-City http://giftgujarat.in

a. Water Supply sewerage System

- Water Sources:
  - Narmada Main canal
  - Recycling and Reuse of Wastewater
  - Rainwater Harvesting

- **24 x 7 Water Supply**
  - Concept of Zero Discharge City
  - Perennial Water Front ensured through construction of three barrages on river Sabarmatik

b. Estimated Power Demand

- Total Demand : ~740 MW
- Underground cabling for p ower distribution within GIFT
- Substation and Distribution Automation
- Indoor Substations
  - Gas Insulated Switchgears (GIS) substation for Sub-transmission and Distribution within GIFT city
  - Compact substation (CSS) in buildings
  - Dedicated Green Service Corridor

c. All infrastructure networks (trunk) shall pass through a common service corridor

- Space optimisation
- Ease in maintenance
- Safe operations

1.2.3 Cases from Developing Countries

1. **Shanghai Chemical Industrial Park (SCIP):** SCIP is on the north coast of Hangzhou Bay with an area of 29.4 km^2. It is located on the southern waterfront of Shanghai, on the boundary between Jinshan and Fengxian districts. SCIP is the first industrial zone in Shanghai specialized in the development of petrochemical commodity and fine chemistry plants, together with supporting supply and service industries. It is one of the city's four industrial production bases.

Development of Shanghai Chemistry Industry Park as a circular economy EIP is based upon the three-level model of circular economy theory. The park's managers seek to guide this industrial park according to the "three-circle circular economy", discussed as three levels in our introduction to these two case studies.

- At the level of enterprises, apply cleaner production to internal processes and product design.
- At the level of industrial parks, establish symbiotic-enterprise groups to organize production according to more ecological principles and to form an EIP. (This level corresponds to action at the level of both eco-industrial parks and eco-industrial networks.)
- The third level is to integrate different production and consumption systems in a region so the resources circulate among industries and urban systems. This level requires

development of municipal or regional by-product collection, storage, processing, and distribution systems.

SCIP investments in moving toward an eco-industrial park will focus on several first projects: a constructed wetland sewage treatment project, an ecological forest shelter project, a gray water recycling project a sludge dehydration and utilization project, a sludge recycling project, a residual heat electricity generation project and a hydrochloric acid by-product project in order to improve utilization of resources and lower pollution.

1.2.4 Cases from Developed Countries

Clarington Technology Park, (eco- zone planning & development pg. 2)

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Location	- Bowmansville, Ontario, Canada,
Year of construction	- 2006
Area	- 352 Acres
Climate	- Moderate and dry (Extreme climatic conditions 6^{o}C to 40^{o}C)

Introduction:

Clarington Official Plan that provides guidance for the development of 352 hectares of lands located. Development Charge Incentives are reduced by 50% for LEED certified buildings and 100% for research facilities to encourage the establishment of target industries. The zoning is primarily based on sustainable storm water and landscape management, they also established a Network of Connected Open Space, which includes storm water pond, trail system, re-established creek system, with highlighting the storm water ponds as focal points. Zoning also consisted of large green open spaces on the periphery to create a sense of buffer zone between the industrial area and surrounding other areas

Salient features

- Using insulation cladding materials with in the buildings and use of low HRI index paving materials hence reducing the heat absorption and radiation.

- Passive Solar Landscaping by locating and selecting plants to provide climate protection for buildings and employees, for example, using deciduous trees planted on south sides of buildings and periphery of parking lots to reduce and redirect sun exposure in summer. Hence reducing the energy required for air conditioning purposes.

Green warehouse – Testa Produce Inc.

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Location	- Chicago. Illinois
Year of construction	- 2011
Area	- 131 Acres
Climate	- Humid Continental (temperature variations from 18^{o}C – 43^{o}C)

Introduction:

Test a Produce Inc. has a various variety of multi-product facility located industrial land use activity in Illinois. This park offers production, storage and various logistic features for its products. The special feature for this industrial area is all the buildings are LEED platinum rated in order to achieve maximum power conservation.

Salient features

- White concrete surface pavement instead of blacktop asphalt
- Green screens at the front of building

1.3 Eco sensitive and climate resilient Site Planning aspects of I.P

Abstract:

Recent institutional changes, marketization, and globalization have combined to bring about rapid economic growth in contemporary world. One of the direct outcomes is the rapid expansion of large cities and the recurring birth of new cities from small towns and rural villages. One of the noticeable city landmarks is the specialized economic development district, such as a hi-tech park, industrial park, commerce park, high-standard apartment complex, and designated port district. Along with the development of these new types of urban blocks, practices of urban planning and city design have been dramatically reshaped. Coping with the climate resilience planning at site level and plot level planning plays a very crucial and vital role. This part gives a glimpse regarding the site planning experiences regarding the various case studies.

1.3.1 Cases from Andhra Pradesh and Telangana

GIP Jedcherla:

A scientific as well as a participatory process was followed for 'Greening' the Site Master Plan. The process started with a training workshop with the TSIIC team, conducted by GIZ's international consultants including the German Sustainable Building Council (DGNB) and BuroHappold Engineering, Berlin. The training workshop lead to the identification of some of the potentials for 'Greening' of the GIZ Site Master Plan, as put forward by the participants from APIIC as well as by the consultants. In addition to these identified potentials and suggestions, the GIZ-IGEP team further reviewed the standards, rating systems, guidelines, and bench marks for industrial parks within India as well as those from outside the country. Accordingly, the GIZ-IGEP developed concepts for a revision of the preliminary Site Master Plan and discussed it with APIIC officials through an elaborate workshop to finalize the conceptual plans for the 'Greening' of GIP Jadcherla in February 2014.

The next step was to develop to-scale-drawings incorporating the identified 'Green' aspects. This required derivation of norms and design concepts to assess land requirements and appropriate placement within the Site Master Plan. The drawing scale and components of the Site Master Plan were fixed as required by the URDPFI2 and Andhra Pradesh Building Rules 2013. The overall approach followed consists of German Green Building Council Code covering Environmental, Economic, Social Technical, and Process Quality of industrial park. Layers were generated on the Site Master Plan in AutoCAD and a draft Site Master Plan was developed.

ALEAP Nandigama

A-GRIP at Nandigama is envisioned to provide an environment conducive for women entrepreneurs and employ state-of-the-art technologies, including clean technologies, renewable energy technologies, environmental technologies and cost-effective common infrastructure. ALEAP decided to include the following elements in A-GRIP: Page 12

- Efficient circulation system;
- Environment friendly site master plan;
- Rainwater harvesting;
- Proper signages;
- Green factory buildings;
- Standard fencing design;
- Solid waste treatment, reuse;
- Waste water treatment, recycle/reuse;
- Environment friendly building materials;
- Green rating for buildings and industrial park ;
- Efficient industrial plot layout and building layout;
- Concept based landscaping (eg. green spine, organic farms);
- Green energy master planning (eg. PV roof tops; solar street lamps);
- Women employee friendly services (e.g., crèche, toilets, rest rooms for extended work, first aid, centralised catering/canteens, kiosks, common toilets, battery operated internal shuttle service, external connection to public transport, water
- Safety measures (eg. secured fencing, access control, CC cameras, fire alarms & fighting systems etc.,);
- Cost Effective common services, e.g. common effluent treatment plant, vermi-compost plant (for organic waste), handmade paper unit (for paper waste), incubator facilities etc., and
- Micro entrepreneurships for common services, e.g., Business centres, warehousing, manning access control entry/exit, canteens/ cafeteria, outdoor functions / events, Battery operated vehicles for internal transport, cafeteria, telephone booth, horticulture/floriculture, space for outdoor events etc.,

Sricity, Tada Andhra Pradesh

http://www.sricity.in

Sri City is envisioned and conceptualized as a world-class 'Integrated Business City'. Master planned by renowned urban planners Jurong Consultants of Singapore, Sri City meets all the standards of a world-class city right from its physical infrastructure to its social, educational and recreational facilities, and use of alternative sources of energy. These factors make Sri City unique in India, and a model for any new urban development project in India. Sri City aims to become a carbon neutral city, and one of the best places in India to live and work in.

Sri City has been divided into zones for serving the diverse needs of the manufacturing and service industry, apart from designated areas for education, lifestyle, housing and healthcare. The industry-specific zones include a Special Economic Zone (SEZ), a Domestic Tariff Zone (DTZ), and a Free Trade and Warehousing Zone (FTWZ). The social, recreational and educational zones will provide world-class support infrastructure that strengthens and nurtures human capital. Sri City's vision is to provide a holistic and balanced lifestyle for its residents. The non-industrial and lifestyle zones within Sri City will allow its residents to find this balance, which creates the genesis for a vibrant and thriving community. These zones will cater to people's housing, social, recreational and personal development needs

with a range of homes, shops, theatres, cultural and religious centres, hospitals, schools, and colleges.

1.3.2 Cases from India

Wipro Technologies,

http://www.slideshare.net/somajotm/green-presentation-3926808

Introduction: Refer 1.1.2

Salient features:

- All building and orientation is towards north and south, which leads in absorption of less radiation.
- Passive solar design
- Use of natural light for all buildings.

Mascot Industrial Park, Gujarat
http://www.mascotinfra.com/industrialpark.html

Mascot is Government of Gujarat Approved **Industrial Park** Project in Gujarat, which includes all set to Launch our new venture **Industrial Park, Warehouse, Industrial Shed, Industrial Plots at kadi**, Mehsana, Gujarat. This advantage makes ideal location for automobiles vendor companies to setup their manufacture and logistics base. This project will not only add value to state's ever growing transport network, but will also provide much needed support to agricultural and industrial growth of the vicinity. The new park has been one-stop solution, storm water drains, sewage treatment plant, security and CCTVs, Green cover, residential complex, commercial centres, 24 x 7 power supplies, parking systems, disaster management system, and other amenities.

1.3.3 Cases from Developing Countries

TaigaNova Eco-Industrial Parks

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Location - Fort McMurray, Alberta
Year of construction - 2005
Area - 131 Acres
Climate - Dry Continental

Introduction:

Site Size: 131 acres Greenfield site, subdivided into 26 lots. Lots range in size 0.83 acres to 5.52 acres. Located 7 km north of Fort McMurray's town centre on the east side of Highway 63, which connects the site to the major oil sands operations and the City of Edmonton. Use by-law to allow for a variety of light industrial, manufacturing, R&D, recycling and commercial uses, include health service and childcare facility. This development has explored various opportunities that were considered to Reduce Resources Needs and Waste Generation, such as recovering waste heat and water, recycling / reusing storm water.

Salient features

- Provide preferred parking for car-pool or low emissions vehicles.
- Reduce environmental impacts during construction such as generating high amount of dust, using more pre fab materials, reduced deforestation.
- Strategies to reduce resource use, reduce waste generation and increase land use efficient

Chong Yuan, China:

Agro-industrial project connected to immense maize production in that area - all by-products of the maize industry are re-used in different companies producing oil, pellets, starch, and ascorbic acid

Helwan Industrial Site, south-east of Cairo

Energy and by-product exchanges for enhanced resource efficiency were planned - however, the project is still at the level of implementing very basic steps like material flow analysis, promotion of environmental conscious management and material balancing within the companies

1.3.4 Cases from developed countries

Boxwood Business Park, Cambridge, Ontario, 2009

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Introduction: Refer 1.1.4

Salient features

- Street layout design with southern exposure to facilitate alternative energy options for landowners.
- The most significant portions of development constraints for this site include two water stream corridors run through the site and a large wetland. These lands are dedicated to open space or to be maintained for ecological value, instead of developing into high-impact uses.

1.4 Strategies to reduce Soil erosion in I.P

1.4.1 Cases from Andhra Pradesh and Telangana

Telangana Haritha Haaram has initiated to improve the soil conditions of Industrial park, the government has initiated to plant 10 million trees within the industrial parks to improve the soil condition, water recharging capacity and green cover.

1.4.2 Cases from India

Shendra Mega Industrial Park

http://environmentclearance.nic.in/writereaddata/modification/PreviousTOR/0_0_200820155710QAnnexure-AddendumtoECforShendraMegaIndustrialPark.pdf

In the Concept Plan, water bodies were reshaped to allow the road structure to fit the site. Additional storm water holding ponds were created for storm water management. However, as per the revised plan, key water bodies are being retained in their original form particularly the ones in the western part of the site, which are connected with a natural stream that flows down from the hill to the north of the site. The stream has a natural buffer of 15 meters on each side, which will be planted with local shrubs and grasses to prevent soil erosion and to allow percolation of surface storm water that flows into it

1.4.3 Cases from Developing Countries

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The Tianjin Economic Development Area (TEDA) is a special development zone located on Bohai Bay in North China. Solid waste management is one of TEDA's priority issues as it relates to the protection of the environment and conservation of natural resources. Another example is that an industrial symbiosis cluster will be developed at TEDA, based upon the existing sludge reuse of the Danish pharmaceutical company Novozymes. The core company of this cluster is the local landscaping company (LC), providing landscape service to the park, such as greening the land and watering the local gardens.

The landscaping company will utilize biological sludge from the Novozymes, organic wastes from local food producers and local communities to produce organic fertilizer for landscaping purpose. Novozymes will be blended with other organic fertilizer for local soil quality improvement.

1.4.4 Cases from Developed Countries

Abstract:

Soil erosion is a major threat to soil functioning. Soil erosion is one of the most important watershed processes in nature, yet quantifying it under field conditions remains a challenge. The lack of soil erosion field data is a major factor hindering our ability to predict soil erosion in a watershed. We present here the development of a simple and sensitive field method that quantifies soil erosion and the resulting particulate nutrient movements in a landscape.

1. TaigaNova Eco-Industrial Park, Fort McMurray, Alberta, 2005

Introduction: Refer 1.3.3

Salient features

- Adopt Low Impact Design responding to natural drainage patterns.
- Low Maintenance Landscaping: choose native and drought-tolerant species that reduce the need for maintenance, pesticide use and irrigation. Planning Bio Swales and exploiting the natural drain contours with minimum economic and material interventions.

2. Innovate Eco-Industrial Park,

(A guide to eco- zone planning & development pg.5)

Location	- Hinton, Alberta,
Year of construction	- 2009
Area	- 108 Acres
Climate	- Humid Continental

Introduction:

Main attraction of this Eco industrial park is that Site is located at the dedicated eco industrial planning district 108 acres Greenfield site, with 32 acres of parks and ecological reserves.

Salient features

- Planning beautiful walkways and bio swales as a Continuity of Landscaped Areas with adjacent lots, storm water ponds and natural features reduces a lot of soil erosions.
- Bio swale system borders the building to encourage rainwater infiltration.
- Each individual plot has bio swale system located in the periphery next to the compound wall. Plot is gently sloped towards the Bio swale and these swales are later connected to the storm water collection system. However major part of the water will seep into the ground due to the presence of natural grass preventing the maximum flow of storm water. The water flow possess high runoff during the heavy rainy days by which these bio swales allows us to collect excess amount of water.

3. Dunoon,

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf

Introduction:

An older macadamia orchard with a nearly closed canopy had been established with little regard for natural watercourses. As a result there was extensive sheet erosion with exposed tree roots, and gullies had formed where water flows concentrated in the orchard. The damage to the orchard floor meant machine-harvesting in those areas of the orchard was ineffective. A new owner wanted to reduce the dramatic soil loss and improve machine-harvesting while maintaining existing production levels.

Salient features:

- Gullies running down the inter-rows were filled with large gravel. Some trees were removed and others pruned to assist grass cover to be established over the top of the gravel, permitting machine-harvesting. The filled gully functions as both a subsurface and surface drain.
- Where water flowed across the tree rows small rock check dams were installed to slow the water down and encourage sediment deposition.
- Selected trees growing in natural flow lines were removed.
- Windbreak trees causing excess shading were removed.

Benefits –

- Active gully erosion through the orchard has been greatly reduced.
- Extra light has improved groundcover, reducing sheet erosion.
- Sediment is being trapped within the orchard, rather than ending up in dams and watercourses.
- The orchard's production has not been interrupted or set back by the erosion control works.

4. Brooklet, Georgia

(http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf **)**

Introduction:

Two neighbouring macadamia orchards had erosion problems from concentrated water flowing onto them from different parts of each orchard. There were especially deep gullies down the tree rows on Brooklet Farm from the run on water. An old windbreak on the boundary separating the two orchards had become a weedy rat haven, and made managing the water difficult. Both landholders worked together to resolve the drainage problems.

Salient features:

- The windbreak between the two properties was removed and mulched.
- A broad shallow diversion bank was constructed along the boundary to divert water to the farm dam and into a nearby stable watercourse.
- Excavated soil was used to form low profile mounds along the adjoining eroded tree rows.
- Jute erosion control matting was installed in the high flow area of the new drain to give immediate protection.
- Carpet grass and winter ryegrass were sown in all disturbed areas.
- Benefits:
  - Run-on water has been safely directed to the dam or watercourse.
  - There is less erosion within the orchards.
  - Water quality leaving the orchards has improved.
  - There is now better access along the boundary, and more turning room at the end of the rows

5. Macleans Ridges, Australia

(http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf)

Introduction:

This mature macadamia orchard had limited light reaching the orchard floor. Gullies had formed along the inter-rows leaving the trees with exposed roots. Soil was also being scoured out of orchard watercourses that had become shaded and lost grass cover.

Salient features:

- Trees next to watercourses were pruned heavily to allow more light through for grassed waterways.
- Trees were hedged on one side to increase light availability on the orchard floor.
- The inter-row soil was re-profiled to cover tree roots and form wide shallow spoon drains.
- Compacted soils were improved with a spike aerator.
- Smother grass plugs were planted at each tree.
- Millet seed was sown over all disturbed soil areas.
- Benefits:
  - The reshaping of the orchard floor has halted the gullies that had been scouring out along the tree lines.
  - Grassed waterways allow water to move through the orchard with less damage.
  - Sediment loss to the creek has been reduced.
  - Fewer exposed roots have made harvesting easier.

6. Fernside, Cincinnati, USA

(http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf)

Introduction:

An intermittent watercourse, containing a series of dams, runs through this grazing property. Cattle traffic was eroding the banks.

Salient features:

- The dam and sides of the gully were fenced to exclude stock.
- Trees and shrubs were planted in the fenced area.
- New trees and shrubs were watered and maintained until established.
- Benefits:
- Eroding areas are now grassing over
- Less soil is ending up in the dam.
- The newly planted trees and shrubs will provide shelter for stock and improved wildlife habitat.
- The more stable environment will improve the quality of the water flowing into the downstream watercourse.

2. Infrastructure planning in Industrial Parks

Abstract:

Infrastructure planning is one of the most important part of industrial planning process. Level of services of an Industrial park is directly proportional to the quality of infrastructure. This has become the main driving force for the industrialists to invest in any given industrial park. The quality of the infrastructure planning methods and techniques plays a vital role in coping with the climate change adaptation. This part discusses the infrastructural levels showing various case studies.

2.1 Rehabilitation, Proper Drainage

2.1.1 Cases from Andhra Pradesh and Telangana

APSEZ, Andhra Pradesh Special Economic Zone, 2006

http://www.hrdpidrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf

Introduction: Refer 1.1.1

Salient features

- For effective waste water management, separate piping was provided for high and low total dissolved solid effluents. Common effluent treatment plants and sewage treatment plants were kept separate. Online monitoring systems were provided for key pollutant parameters at industry outlets as well as at the treatment plants

GIP Jedcherla

Page No: 64

The storm water management system provided for the Site Master Plan of GIP Jadcherla includes:

- Storm water drainage will be provided in the Site Master Plan to collect rainwater. The slopes/contours of the
- Industrial park have been assessed and accordingly the entire site has been divided into various zones. Storm water drains should be provided along the roads accordingly.
- The storm water collected from each zone will be collected in lined tanks, tested and treated if required, and then sent for recycle/reuse. The storm water collection would be based on 1-hour peak rainfall with 85% coefficient of runoff.
- The rainwater over and above 1-hour peak rainfall will flow to the recycle/reuse tanks or ponds. Rainwater from areas without any contamination risks would only be diverted for rainwater harvesting.

- Rainwater, after treatment if necessary, will be collected in ponds that will be integrated within the green landscape to serve in aesthetics as well as microclimate control. Additionally, it will also be used for gardening/ horticultural purposes and for industrial uses, if there is a demand.

- Seven locations have been identified in GIP Jadcherla for ponds. As per the volume of water expected to be collected in the watershed, the pond areas were calculated. This area has been integrated into the green areas to co-create storm water management and recreational zones, which can be visually attractive, cost effective, as well as socially functional.

- The services for storm water management will be taken up through appropriate business cases (e.g. PPP).
- Individual industries should be required to recycle/reuse storm water collected from their premises, after treatment.

2.1.2 Cases from India

Filter strips and swales (CIRIA, 2012): Filter strips and grassed swales are vegetated surface features that drain storm water evenly off impermeable areas like roads, parking lots and building clusters. Swales are long shallow channels and filter strips are gently sloping areas of ground and both provide opportunities for slow conveyance and infiltration (where appropriate). Both these techniques mimic the natural drainage patterns by allowing rainwater to run in sheets through vegetation, slowing and filtering the flow.

Filter drains and permeable surfaces are devices that have a volume of permeable material below ground to absorb and percolate surface water to increase infiltration of rain and storm water. Permeable surfaces can include grass (if the area will not be trafficked), reinforced grass, gravelled grass, solid paving blocks with large vertical holes filled with gravel, solid paving blocks with gaps between individual units, porous paving blocks with a system of voids within units, porous asphalt and continuous surfaces with an inherent system of voids.

2.1.3 Cases from Developing Countries

Eastern Seaboard Industrial park, 120 km west direction from Bangkok, 2000

Introduction: Refer 1.1.2

Salient Features of Industrial area:

- Between the years 1988, 1991, and 2003, there were significant changes to the use of the area, shifting from agriculture (green) to industrial (purple), and the existing residential area (yellow) became gentrified, changing from agriculture-based to Industry-based communities. In addition, one of the communities was replaced with an industrial estate and relocated.

- **Gentrification** is a trend in urban neighbourhoods, which results in increased property values and the displacing of lower-income families and small businesses. It refers to shifts in an urban community lifestyle and an increasing share of wealthier residents and/or businesses and increasing property values.

- **Industrial activity that has come up has brought the significant change in the land values which lead the present land owners of neighbouring villages has made profits by selling land in demand to the higher income group and hence moved to the places which suited for their life style. Most of the land owners were farmers and moved to the neighbouring villages and continued farming activities.**

2.1.4 Cases from Developed Countries

Lynbrook Estate

It is a greenfield residential development south-east of Melbourne.

- Initial hesitancy by local government was overcome by Melbourne Water, who provided an underwriting of the project, committing to retrofit to traditional drainage design, if the system failed within 5 years.
- Being a greenfields site made the design process easier than retrofitting.
- Hydraulic standards are same as conventional systems (ie. 5 year ARI event conveyed within system, designated flow path for 100 year ARI event). Stakeholders involved in design process. Site management practices during construction included sediment fences, protective use of geotextile, etc.,

Byford Village

- Located in Perth, within the catchments of the Serpentine River and Peel-Harvey Estuary (which is subject to blue-green algal blooms), Byford Village is constructed on an old munitions site.
- The site had a number of pre-existing and potential flooding issues, and the design needed to achieve both environmental and flood protection. The prevalence of long dry periods meant that the storm water treatment techniques used had to be able to remain 'sustainable', with extended periods of low or zero inflow. For this reason, ephemeral wetlands were chosen, rather than the more commonly-used wetlands with some permanent water.
- To maintain pre-development water quality. In particular, the aim is to reduce sediment and nutrient loads in the Peel-Harvey estuary. Mitigate flooding threats.
- A site constraints and opportunities workshop was used by the design consultants, along with detailed site and data investigations, to select a range of potential storm water management scenarios. Each scenario was then modelled using MUSIC (Wong et al., 2002), to identify the optimal solution. The approach involved trying to reduce pollutant loads discharged to downstream receiving waters not only by treatment techniques, but by facilitating opportunities for re-use (for local irrigation on-site).
- Integrating public open-space, through the use of linear corridors, was adopted as a principle, to integrate storm water management and urban design objectives.
- Includes a multi-function drainage corridor, incorporating a number of storm water treatment wetlands, with vegetated swale pre-treatment and flow conveyance. Bio-retention systems are used within the streetscape. Wetlands are contained within a number of retarding basins, which attenuate flows to downstream receiving waters.

2.2 Separation of storm water from sewage

2.2.1 Cases from Andhra Pradesh and Telangana

1. Mallapur and Nacharam Effluent Treatment Plant (Mana ETP) has a separate network for storm water drains and sewerage network. Both has been constructed by TSIIC as part of eco-industrial Park.

2. APSEZ (Andhra Pradesh Special Economic Zone), Visakhapatnam, developed by APIIC has constructed separate Storm water and effluent networks. They have installed a separate effluent network for low and high TDS lines.

2.2.2 Cases from India

Vatva Effluent Treatment Plant: The 680 member units, which are scattered in different parts of the complex, are covered by 92 Sump Rooms from where the wastewater flows by gravity to 6 Pumping Stations. The effluent is pumped from these Pumping Stations into CETP for treatment. All the member units discharge their effluent from their overhead discharge tank into respective sumps. The butterfly valves and magnetic flow meters are provided in each sump room for measuring flow rate of effluent from each member unit. It is obligatory on the part of every member to install overhead effluent collection tank having enough holding capacity to facilitate gravity flow to the respective sump. A separate storm water drainage network has been constructed to carry out rainwater.

2.2.3 Cases from Developing Countries

1. Zheng counsels the city to rebuild wastewater transport networks so they do not leak, and so that sewage and storm water flow in separate pipes.
2. Many developing countries across Asia, Africa and southern America have separate drainage systems for both Effluents and Storm water drains.

2.2.4 Cases from Developed Countries

Boxwood Business Park, Cambridge, Ontario

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Introduction: Refer 1.1.4
Salient features

- Consolidated techniques, such as rainwater capture, vegetated swales, porous surfaces for pathways and parking lots, green roofs, grey water reuse, renewable energy and cogeneration.
- Separate pipe lines for waste water and storm water capture.
- Storm water separated from the roof tops, porous surfaces and pathways has been collected in the separate water harvesting sump and this can be utilized in various purposes later (ex: for landscaping, toilet flushing etc.,)

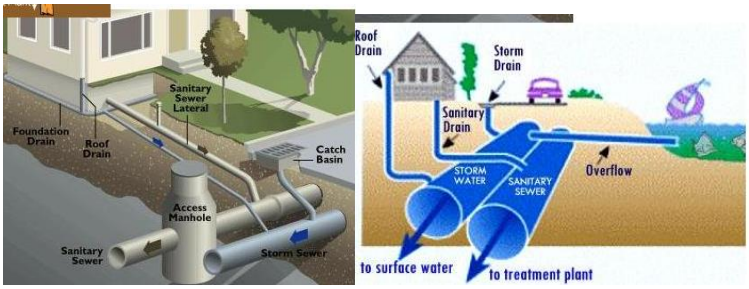


Figure 1: Showing the separate pipe lines for rain water collection and sewage

Clarington Technology Park, Bowmansville, Ontario, Canada, 2006

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_to_Eco-Business_Zone_Planning_and_Development_Appendix_B.pdf

Introduction: Refer 1.2.4

Salient features

- Establish a Network of Connected Open Space, which includes storm water pond, trail system, re-established creek system, with highlighting the storm water ponds as focal points.

2.3 Decentralized Power by Renewable Energy resources

Fast depletion of conventional energy sources made us to look after alternate energy sources such as wind Energy and other non-conventional methods of power generation. Every building in the earth should be energy conscious and energy efficient. Some of the examples which relied on renewable energy for their energy requirements are briefly discussed in this part.

2.3.1 Cases from Andhra Pradesh and Telangana

APSEZ, Andhra Pradesh Special Economic Zone, 2006

Introduction: Refer 1.1.1

Salient features

- Solar street lamps were proposed in the park. A common co-generation plant is in the planning stage. Disaster risks were taken into consideration.

GIP Jadcherla, (greening of GIP Jadcherla, Telangana, pg. 81)

Location	- 80 Km South direction From Hyderabad, Telangana
Year of construction	- 2007
Area	- 954 Acres
Climate	- Hot and Dry

Introduction:

The site is located approximately 83 km from the city of Hyderabad in the South Indian state of Telangana. The total area of the site is 3.86 km2 (954.23 acres) with certain areas already under development. The development of the Green Industrial Park (GIP) at Jadcherla had commenced in 2007. This industrial park has incorporated many green features to reduce the environmental impacts. Master planning this Industrial park also included more than 10% of green spaces and analysis of micro level watersheds for better storm water drains.

Salient features

- 25% of the installed external lighting load should be solar powered
- 100% of internal & external lighting fixtures are BEE star rated. The usage of incandescent lamps has been avoided.
- All common spaces, including street are equipped with “LED”
- To save energy and night sky pollution, shielded lights have been used.

Figure 1: showing shielded flood lights

2.3.2 Cases from India

ITC Bangalore
Introduction: Refer 3.5.2
Salient features

- 18.9 MW wind turbines, Results Catering to all ITC properties in Karnataka
- Provision of Photo Voltaic Cells catering 20% of Energy needs.

Suzlon One Earth,
Introduction: Refer 3.6.2
Salient features

- Wind Solar Hybrid decentralized energy resources
- Wind turbines within site
- Buildings integrated with photo voltaic cells

Figure 2: Photo voltaic cells and Wind turbines using within site area

2.3.3 Cases from Developing Countries
Page 14

1. Algeria has become in February 2004 the first North African Country to implement national incentive premiums for the market introduction of integrated solar combined cycle plants (ISCC). The agency New Energy Algeria (NEAL) will develop and tender a first 160MW plant for domestic supply.
2. TANZANIA: Tanzania's recent reform in the power sector created a more preferable climate for larger-scale employment of privately funded off-grid electrification schemes. Arusha region was identified due to already existing contacts to the local partner organisation Kakute Ltd.

2.3.4 Cases from Developed Countries

Green warehouse Testa Produce Inc. Chicago, Illinois

Introduction: Refer 1.2.4

Salient features

- Industrial park consist of wind field consisting of 180 wind turbines where a single Wind Turbine generates 880,000 kWh of energy, roughly 30% of the building's power needs 108 Solar Panels installed at parking lot supply electric car charging station
- Solar Hot Water System located on the roof produces 100% of the building's non-potable hot water

2.4 Recycling of water, Grey water supply and water storage

Abstract:

Grey water is gently used water from your bathroom sinks, showers, tubs, and washing machines. It is not water that has come into contact with feces, either from the toilet or from washing diapers. Grey water may contain traces of dirt, food, grease, hair, and certain household cleaning products. The utilization of gray water for some of the buildings functions effectively results in increase of water efficiency. Some of the case studies have been discussed in the chapter.

2.4.1 Cases from Andhra Pradesh and Telangana

GIP Jedcharla, Telangana

Introduction: Refer 1.2.2

Salient Climate Change adaptation features:

- Collection and treatment of run-off of first rains at 1 hour peak rainfall to avoid any contamination risks.
- Recycle/reuse provisions for industrial, horticulture/irrigation uses
- Pooling of water and integration into green landscape

ALEAP Gajularamaram

ALEAP has developed Phytoremediation measure for treating effluents from their industrial park. The treatment plant has been designed to carry out effluent treatment generated from the industrial park and the treated water has been used for gardening.

Introduction: Refer 3.2.1

Salient features

- Provisions for rainwater harvesting
- Provisions for recycle/reuse of treated wastewater

2.4.2 Cases from India

GIFT City, Gujarat:

Tirupur: Tamil Nadu Water Investment Company Limited (TWIC)7, which is a pioneering developer of the projects at Tiruppur. TWIC is promoted by IL&FS (54%) and Government of Tamil Nadu (46%). ZLD is a requirement in the area in order to protect the quality of water in river & ground water. The ZLD system comprises of pre-treatment, reverse osmosis and evaporator & crystallizer. Under the project, TWIC has developed and established 9 textile dyeing CETPs with a capacity ranging from 3 MLD to 11 MLD (combined capacity 53 MLD) in Tiruppur based on zero liquid discharge with recycling of >98% water and reuse of >90% salt.

2.4.3 Cases from Developing Countries

http://www.iddkarnataka.gov.in/docs/79_dma_pfr_wastewaterrecyclingmysore_final.pdf

(Page 26)

1. Industries in Beijing have reclaimed water for a variety of processes. From 1978 to 1984 the percentage of reused industrial water rose from 46 to 72 percent. Manufacturing sectors, such as metal refining, metal products and chemicals, had higher than 80percent reuse. The experience of Beijing industry shows that water recycling can be less expensive than transporting water over long distances.

NAMIBIA: Ujams, industrial wastewater reclamation

Industrial park in Windhoek – urban reuse of industrial effluent

About 5,200 m3 per day for the capital of Namibia Windhoek lies in the middle of Namibia, the driest nation south of the Sahara. Apart from two existing water reclamation plants, a third has been added for the Ujams Industrial Park. This plant handles the wastewater from five different production companies by means of the latest technologies. The cleaned water is then available for the watering of public parks and sport facilities in the capital.

2.4.4 Cases from Developed Countries

Boxwood Business Park, Cambridge, Ontario

Introduction: 1.1.2

Salient features

- Planning of on-site measures that enhance infiltration, or re-use storm water for non-potable plumbing requirements or for irrigation.

Honda Campus, Canada 2012 (A guide to eco- zone planning & development pg.15)

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf

Location - Along Highway 404 in Markham,
Year of Construction - 2011
Area - 105 Acres
Climate - Humid Continental
Introduction:

The Honda Canada Campus incorporates a number of Innovative Low Impact Development (L.I.D.] technologies with the goal of addressing fundamental storm water management, water quality Improvement, water and energy conservation and other environmental objectives. The project is the largest of its type to rely solely on landscape-based storm water management techniques, including a system of bio-filters to treat runoff emanating from over 1/2 million square feet of building area and a parking area accommodating over 1000 vehicles. The design incorporates rainwater harvesting and recycling, permeable pavement and other techniques to exceed provincial storm water management objectives.

Salient features

- Rainwater is collected and stored for use in the irrigation system
- Rain water from parking lots is drained through bio filters before being released to public sewer systems
- Permeable Pavers the walkway and parking lot

Green warehouse – Testa Produce Inc. Chicago, Illinois
Introduction: Refer 1.2.2
Salient features

- Retention Pond is connected to the building for water utilization

2.5 Integrated Transportation of Goods and Services

2.5.1 Cases from Andhra Pradesh and Telangana

1. ALEAP industrial park has planned battery-operated vehicle for transportation of employees within industrial park. A dedicated area for Truck Parking facility and warehouse has been created for the entrepreneurs.

2.5.2 Cases from India

BRT and AMTS form a seamless integrated public transit service for the convenience of citizens of Ahmedabad. The operations plan developed not only provides route structure for BRT operations but also the rationalised routing plan for AMTS operations. This is necessary so that the two systems complement each other rather than compete with each other.

- BRT Trunk Routes
- Complementary Routes (AMTS)
- BRT Feeder Routes

Based on an assessment of the existing routes and travel desires, alternate set of BRT trunk routes, BRT feeder routes and complimentary routes have been analysed. Of this following set has been adopted. In this set, there are 10 BRT trunk routes, 21 BRT Feeder and 60 complimentary services have been identified for operation. These BRT routes also feeds to about 10 industrial parks in Ahmedabad.

2.5.3 Cases from Developing Countries

The Swedish firm Ikea has now become the world's largest furniture retailer. It also carries an extensive range of goods for the modern household, and its minimalist Scandinavian design sensibilities have become a de facto standard for interior design in many countries. Ikea is known for its focus on product design and on finely managing its supply chain with a relentless focus on cutting costs. The company pioneered flat-pack designs for furniture. Every piece of furniture it sells is designed to be packed flat into the smallest space possible for shipping, lowering its distribution costs.

2.5.4 Cases from Developed Countries

Testa Produce Inc

Introduction: Refer 1.2.2

Salient features

- Eco friendly transportation vehicle facilities and Traffic and Transportation plan was integrated. Use of Battery driven vehicles and rechargeable electric stations for automobiles are also integrated in the campus design.
- Use of eco-friendly vehicles to reduce the carbon foot print.

Figure 3: Solar power driven trucks, Solar power carging station, Methanol fuel cell powered moving machines

2.6 Preventive Maintenance of Drainage

2.6.1 Cases from Andhra Pradesh and Telangana

APIIC and TSIIC maintain the drainage networks of their industrial parks through regular maintenance, especially before the onset of monsoon for proper channelization of storm water and avoid flooding.

2.6.2 Cases from India

ALEAP Green Industrial Park,

Introduction: Refer 3.2.1

Salient features

- All the storm water drains have considered natural drain slopes. All the roads have Bio Swales which have groundwater recharge pits, which helps in penetration of huge amount of rainwater resulting in the resulting in less amount of runoff.

2.6.3 Cases from Developing Countries

http://ietd.iipnetwork.org/sites/ietp/files/Japanese%20Technologies%20for%20Energy%20Saving.pdf

Japanese Technologies for Energy Savings/ GHG Emissions Reduction

2.6.4 Cases from Developed Countries

1. Boxwood Business Park, Cambridge, Ontario

Introduction: Refer 1.1.2

Salient features

- Innovation Sewer Treatment Systems such as Small Bore Sewer System (SBS) that uses small diameter pipes to collect pre-treated wastewater from each lot and reduces effluent volume reaching municipal system.

Monitoring services of Pollution levels in I.P.

- Kentuky

The Routine Hydraulic Cleaning Program includes annual inspection and maintenance cleaning, warranty inspection and cleaning of new gravity sewer lines, and Preventative Maintenance cleaning of Gravity Sewer Lines with chronic operational problems. The DWQ has established a goal of inspecting 650,000 linear feet (LF) of Gravity Sewer Lines on an annual basis under the Routine Hydraulic Cleaning Program. Line segments requiring maintenance will be cleaned as-needed. The Preventative Maintenance cleaning activities are a proactive approach to addressing chronic problem areas within the Gravity Sewer Line system. The cleaning frequency is established based on the past history of operational problems and condition as sessments by the cleaning and inspection crews in the field. The cleaning frequency ranges from one month to 36 months. A root cause analysis of operational or structural problems associated with the various line segments will be conducted by the DWQ to address defects and reduce the required Preventative Maintenance cleaning frequency.

3. Buildings in Industrial Parks

3.1 IGBC / GRIHA certified Industrial buildings

Abstract:

The Green Rating methodology consistently assesses the environmental performance of buildings at two separate levels, Intrinsic and Actual. The Intrinsic assessment evaluates the building design and equipment and the Actual assessment evaluates the building according to current activities and operations. This part deals with the Green rated case studies and their environmental performance levels.

http://www.cseindia.org/userfiles/green_building_rating.pdf

3.1.1 Cases from Andhra Pradesh and Telangana

The following buildings are IGBC certified located in Hyderabad

1. Google office Hyderabad
2. HSBC Electronic Data Processing India Pvt.Ltd-Office, Hyderabad
3. VIMTA-Labs, Hyderabad
4. CA (India) Technologies –Hyderabad
5. Mind tree-office Hyderabad
6. K Raheja-Rajeja vistas –Hyderabad
7. Infosys-Commercial Hyderabad

Eg: Case study: Infosys – Commercial Hyderabad

https://www.infosys.com/newsroom/press-releases/Pages/LEED-ratings-hyderabad.aspx

3.1.2 Cases from Developed Countries

1. UNIDO Green Industry Policies for supporting Green Industry

https://www.unido.org/fileadmin/user_media/Services/Green_Industry/web_policies_green_industry.pdf

http://www.breeam.com/case-study-south-gate-industrial-park-domodedovo-moscow

South Gate Industrial Building Certified in Russia (The first Industrial Building Certified in Russia)

Location	:	Domodedovo, Moscow
Year of Construction	:	2014
Area	:	53,159 Sq.Mt.
Landuse	:	70% of all available credits
Waste	:	66%
Health wellbeing	:	64%
Energy Efficiency	:	63%
Green Strategy	:	The certification strategy relied on improvement of local biodiversity, which was particular challenging as the amount of built up areas increased significantly during project realisation. A biodiversity management plan was created based on a local biodiversity management strategy

Environmental Features

Energy efficiency – energy saving internal and on-site lighting with automated lighting control save up to 40% of building energy consumption, walls and roof from structural insulated panels, insulated with high density mineral wool, a building management system (BMS) with energy meters for all devices and tenants

Health and wellbeing- high quality office space and indoor environment for staff with adequate views from window, access to fresh air, occupant lighting and temperature controls

Ecology – Biodiversity enhancement upon phased development completion (approximately 250 native features planted on 14 hectares)

Transport – Wide range of transport opportunities for users, including a dedicated transport service, with encouragement to cyclists through provision of storage and changing facilities

Water reduced water consumption, mitigation of impact on local water courses, provision of local water treatment facilities (sewage)

Management – sustainable construction practices. The contractor had learned and adapted best practices of construction site management from the first phase of construction.

Materials – waste reduction through use of structural insulated panels, sustainable materials- steel, aluminium and mineral wool, all parts of the building are designed for robustness and protected from damage of internal and external vehicles.

Materials – waste reduction through use of structural insulated panels, sustainable materials - steel, aluminium and mineral wool, all parts of the building are designed for robustness and protected from damage of internal and external vehicles.

3.1.3 Cases from India

Top energy efficient green buildings in India

http://indianeer.in/top-energy-efficient-green-buildings-india/

India has over 2380 registered green building projects and over 60 LEED platinum certified constructions (the highest certification for energy efficient green construction). India is amongst the few countries spearheading the green building movement worldwide.

There are three primary Rating systems in India.

1. **GRIHA**

Green Rating for Integrated Habitat Assessment (GRIHA) is India's own rating system jointly developed by TERI and the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system where buildings are rated in a three-tier process.

The process initiates with the online submission of documents as per the prescribed criteria followed by on site visit and evaluation of the building by a team of professionals and experts from GRIHA Secretariat. GRIHA rating system consists of 34 criteria categorised in four different sections

2. **Indian Green Building Council (IGBC)**
The Leadership in Energy & Environmental Design (LEED) is the rating system developed for certifying Green Buildings. LEED is developed by the U.S. Green Building Council (USGBC), the organization promoting sustainability through Green Buildings. LEED is a framework for assessing building performance against set criteria and standard points of references. The benchmarks for the LEED Green Building Rating System were developed in year 2000 and are currently available for new and existing constructions

3. **Bureau of Energy Efficiency (BEE)** BEE developed its own rating system for the buildings based on a 1 to 5 star scale. More stars mean more energy efficiency. BEE has developed the Energy Performance Index (EPI). The unit of Kilo watt hours per square meter per year is considered for rating the building and especially targets air conditioned and non-air conditioned office buildings

Hitech Gears Ltd (http://www.kamalcogentenergy.com/CaseStudies.aspx)

Location - Bhiwadi, Rajastan
Year of Construction - 2013
Area - 51 Acres
Climate - Hot and Dry

Salient Climate Change Adaptation:

- All the buildings are IGBC Certified buildings.
- Main office building is IGBC Gold certified building.

Cummins Generator Technologies,

(Green Building Concepts & Retrofitting of Existing Buildings, pg. 36)

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf

Location - Ranjangaon, Pune
Year of Construction - 2003
Area - 12 Acres
Climate - Hot Semi Arid

Introduction:

Cummins group have constructed their industrial buildings as per the GRIHA standards in India. All the buildings are green rated buildings having efficient use of energy and various other resources. All the cooling and lighting needs are energy efficient and consumes less energy than traditional industrial buildings. The campus has lesser carbon foot print.

Salient Climate Change Adaptation:

- Highly efficient water conservation and less potable utilization within buildings.
- IGBC Gold rated green factory building.
- On-site waste water treatment
- Efficient irrigation systems, Energy efficient lighting system, Ventilation system using wind tower ¬ 41% energy savings, Building Management System, 100% naturally lit building

Figure 4: IGBC Gold rated factory building Cummins

RMZ Millennia Business Park,

Introduction: Refer 3.6.2

Salient Climate Change Adaptation:

- All the buildings are IGBC Gold rated, LEED Gold Rated buildings.
- Optimal use of Local material
- Zero Discharge Campus
- Results achieved are Consumes 10% less Energy, 30% less water consumption.

3.1.4 Cases from Developing Countries

Indonesia's 5 (five) Best Green Industrial Estates

http://www.slideshare.net/dduhamel/indonesias-green-industrial-estates-and-best-practices

1. **East Jakarta Industrial Park(EJIP)**
   Located in south cikarang with total land size of 320 ha. Populated by 101 tenants

2. **JABABEKA Industrial Estate**

   Located in Kawasan Industr 1, Cikarang West Java. Total land size is accounted for more than 2,000 ha. And filled with more than 1,600 local and multinational companies

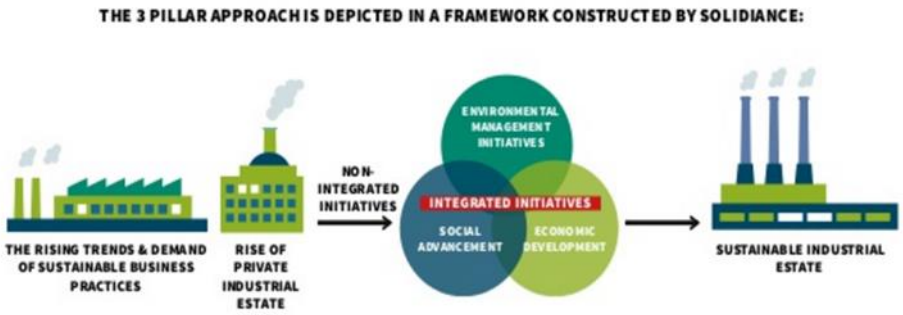
3. **KOTA BUKIT INDAH Industrial City**

   Located in Puwakarta with a total land area of 2,000 ha. And populated with more thank tenants.

4. **2100 INDUSTRIAL TOWN**

   Located in west cikarang and is one of the closest industrial estate to Jakarta area. Total land size is accounted for more than 800ha and filled with more than 170 local and multinational companies

5. **SURYACIPTA City of Industry**
   Located in Karawaga Area with total land size of 1400 ha. Total tenants are 100 local and multinational companies



Green Industrial Estates Objectives & Key Aspects

1. Government Regulation Compliances
2. Green Production
3. Good Environmental Governance Implementation
4. Integrated Initiatives of Environmental Management Initiatives, Social Advancement & Economic Development, sustainable Industrial estate

Key Aspects:

1. Water & sea water pollution management
2. Air pollution management
3. Sod & Hazardous toxic waste management

3.3 Storm Retrofitting of Buildings

3.2.1 Cases from Andhra Pradesh and Telangana

Climate Resilient infrastructure services Case study brief: Visakhapatnam

http://www.teriin.org/eventdocs/files/Case-Study-Vishakhapatnam.pdf

This document is a result of a yearlong study conducted by The Energy and Resources Institute (TERI) granted by USAID as part of their Climate Change Resilient Development (CCRD) project's climate adaptation small grants program. This grant was in support of the Climate Resilient Infrastructure Services (CRIS) program within the CCRD project. The work was reviewed by ICF International and Engility which is leading USAID's small grants program under the CCRD initiative. The goal of this study was to help the cities of Panaji and Visakhapatnam to plan for and implement climate risk management strategies as an integral part of city development. The aim was to understand the kind of infrastructure that Panaji and Visakhapatnam house and their vulnerability to climate change and sea-level rise, in particular. The study focused on the following thematic components:

1. Develop and demonstrate an urban infrastructure inventory and linkages along with other considerations to support climate resilient planning efforts

2. Develop and demonstrate a rapid climate vulnerability assessment approach for infrastructure services this case study presents the learning and project outcomes from Visakhapatnam.

3.2.2 Cases from India

https://law.resource.org/pub/in/bis/S03/is.15498.2004.pdf

Indian Standard GUIDELINES FOR IMPROVING THE CYCLONIC RESISTANCE OF LOW RISE HOUSES AND OTHER BUILDINGS/STRUCTURES

Though the cyclonic storms always approach from the direction of the sea towards the coast, the wind velocity and direction relative to a building remain random. Hence, reduction coefficients for directionality and orientation of buildings in a preferential direction are not feasible. The detailed guidelines for construction of buildings at coastal areas are elaborated at above link.

3.2.3 Cases from Developing Countries

http://www.adpc.net/v2007/IKM/ONLINE%20DOCUMENTS/downloads/ADUMP/PSB.pdf

The imperatives for promoting safe building construction in the context of disaster related structural and non-structural risks are:

a) Saving of precious lives of human beings and animals;

b) Saving of limited, costly and scarce resources of building materials and money (finances) for the loss of buildings, properties and infrastructure;

c) Reduction in economic loss to the community / nation(s) due to its negative impact on economic/industrial activity and social and welfare areas like health, education and community wellbeing;

d) Reduction in huge loss of time element in planning, design, reconstruction phase lasting from 1 to 5 years or more;

e) Reduction of trauma, physical and mental ill-being of the affected community due to shock/fear psychosis of rebuilding life amidst the mound of ashes and rubble; and finally

f) providing confidence level among the community about the safe, strong, durable conditions of the houses, schools, health centres, community centres, offices, commercial establishments, industrial production units in normal times and disaster times (during and after).

3.2.4 Cases from Developed Countries

https://ncseagrant.ncsu.edu/coastwatch/previous-issues/2002-2/early-summer-2002/hurricane-storm-shutters/

Storm shutters may not be the highest priority for hurricane retrofitting. But as the wind-resistance of a building is improved, shutters become a top priority in high-wind zones. For some homes, threatening sources of debris may make shutters the first priority.

3.3 Green retrofitting of rooftops, facades

Abstract:

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over waterproofing. It may also include additional layers such as a root barrier and drainage and irrigation systems. Gardens on roofs, where plants are maintained in pots, are not generally considered to be true green roofs, although this is debated. Rooftop ponds are another form of green roofs which are used to treat grey water. This part deals with the development of green roofs and advantages out of green roof tops based on some proven case studies.

3.3.1 Cases from Andhra Pradesh and Telangana

ALEAP Green Industrial Park

Introduction: Refer 3.2.1

Salient features

- Provision of 'Green' roofs, combined with photo voltaic cells, has been proposed for all industrial buildings as well as common facility buildings. The roof top will therefore become a source of renewable energy and at the same time will provide shade to the roof to minimize heating, thereby reducing cooling loads.

3.3.2 Cases from India

Planet Green, (Green Building Concepts & Retrofitting of Existing Buildings, pg. 9)

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf

Location - Vadodara, Gujarat

Climate - Hot and dry

Salient features:

- High Solar reflective Index (SRI) Coated Roofs.
- Cavity walls were constructed in the west façade of the building
- No openings in East and West directions of the buildings with in campus

Figure 5: Use of High HRI coat on roof top and Use of Cavity wall on the western side of the buildings

3.3.3 Cases from Developing countries

1. Green roof urban farming for buildings in high-density urban cities of China
http://www.mech.hku.hk/bse/greenroof/110318_WGRC2011_Hainan_SamHui_fullpaper.pdf

Major benefits of green roof urban farming Environmental Sustainability:
- Reduce food transportation
- Reduce wastes by generating less packaging
- Recycle organic wastes by composting
- Mitigate urban heat island
- Increase biodiversity
- Improve air quality

- Improve urban storm water management
- Sound insulation and noise absorption

Social Sustainability:
- Active community participation
- Community green space and gardens
- Social inclusion: provide fresh food to the poor
- Education
- Local employment
- Amenity space for exercise and recreation
- Aesthetic value

Economic Sustainability:
- Increase local food production and sale
- Increase local food security
- Sell organic vegetable and food
- Access to open space/views increases property value
- Improve roof durability
- Reduce building cooling load and energy costs
- Increase roof life span
- increase availability of biofuels

3.3.4 Cases from Developed Countries

Jalan Bahar Clean Tech Park

(Greening of GIP Jadcherla, Telangana, pg.81)

Location	- Singapore
Year of Construction	- 2012
Area	- 120 acres
Climate (Temp. Range 19^{o}C to 35^{o}C)	- Tropical climate, with high rainfall

Introduction:

Situated east of the existing residential developments in the sub-zone, this is an Industrial zone that has been steadily developing since 2012. It will be part of the *two* West Integrated industrial townships, which includes the neighbouring NTU, Clean Tech Park. *This clean tech park is a multi-product based industrial park.*

Salient features

- Construction of terrace gardening helps the roof tops to reduce the penetration of heat radiation through slabs, hence reducing the cooling loads on air conditioners and provide a chance to develop recreational green spaces on the slabs of the buildings.
- Provision of photo voltaic cells, has been develop on all industrial buildings as well as common facility buildings. The roof top will therefore become a source of renewable energy and at the same time will provide shade to the roof to minimize heating, thereby reducing cooling loads

Figure 6: Roof garden along with Photo voltaic cells

3.4 Preventing flooding

Abstract:

Flood control refers to all methods used to reduce or prevent the detrimental effects of flood waters. Flood relief refers to methods used to reduce the effects of flood waters or high water levels. Flooding being a common phenomenon, it can lead to many kinds of disasters. This part deals with the various flood coping methods from some case studies.

3.4.1 Cases from Andhra Pradesh and Telangana

Sri City, an integrated business city (http://www.sricity.in/ **)**

Location	- Chittoor district, Andhra Pradesh.
Year of construction	- 2013
Area	- 2500 Acres
Climate	- Tropical monsoon climate

Introduction:

Sri City is envisioned and conceptualized as a world-class 'Integrated Business City'. Master planned by renowned urban planners Jurong Consultants of Singapore, Sri City meets all the standards of a world-class city right from its physical infrastructure to its social, educational and recreational facilities, and use of alternative sources of energy. These factors make Sri City unique in India, and a model for any new urban development project in India. Sri City aims to become a carbon neutral city, and one of the best places in India to live and work in.

Salient features

- The storm water drainage network runs along all roads that border customers` units, enabling efficient drainage and discharge of rain water. The water passes through rain water harvesting pits before the surplus water empties into storm water drains/creeks. The capacity and coverage of the system has been designed taking into account the past 50 years' rainfall data.

3.4.2 Cases from India

Wipro Technologies

Introduction: Refer 1.1.2

Salient features:

- Properly sized and energy efficient Heating/ cooling system in conjunction with a thermally efficient building shell.
- Maximum light colors for roofing and wall finish materials,
- High R value walls and ceiling insulation
- Using minimal glass on and west exposure.

3.4.3 Cases from developing countries

Prevention and Mitigation plan for flooding problems from Bangpa-in Industrial Estate, Thailand.

http://www.bldc.co.th/ckfinder/userfiles/files/%E0%B9%81%E0%B8%9C%E0%B8%99%E0%B8%AD%E0%B8%B8%E0%B8%97%E0%B8%81%E0%B8%A0%E0%B8%B1%E0%B8%A2%20English.pdf

In order to prepare for the sustainable prevention and improvement, Bangpa-in Industrial Estate has prepared prevention and mitigation plan based on study from 2011 flooding situations to be used as a manual for preparation, work plan, decision making and observation. In cooperation with flooding prevention system designer, operators as well as other work units for data sharing so that the prevention plan could reach its highest efficiency and benefits.

Flood disasters can lead to loss in production industry and directly impact on economic, employment and investors's confidence. In order to prevent and improve the aforementioned problems, it is necessary to prepare from stage of survey, design, construction, operation and maintenance. The dike must be in a good condition with high efficiency.

Flood prevention and mitigation plan consists of 5 steps namely

1. Preparation plan (Before flooding),
2. Encounter plan (when flooding),
3. Evacuation Measurement,
4. Salvage Plan,
5. Reconstruction Plan and measurement on reduction of environmental impact

3.4.4 Cases from developed countries

Flood Risk Reduction in Germany

http://www.dkkv.org/fileadmin/user_upload/Veroeffentlichungen/Publikationen/DKKV_29Lessons_Learned.pdf

Lessons Learned from the 2002 Disaster in the Elbe Region

3.5 Landscaping with native plants and water conservation measure

Abstract:

Native plants are plants indigenous to a given area in geologic time. This includes plants that have developed, occur naturally, or existed for many years in an area (trees, flowers, grasses, and other plants). Hence, these native plants requires less maintenance. Less potable water is required for watering these plants. These plants also have potential to be alive even in some extreme climatic conditions of that particular geographical area. This part show cases some of the case studies which have adopted these native species in their landscape planning.

3.5.1 Cases from Andhra Pradesh and Telangana

GIP Jadcherla, Telangana

Introduction: Refer 1.2.2

Salient features

- Limiting the use of lawns to an extent of 20% of the landscaped area.
- Design landscape with plant species which consume less water, to an extent of 25% of landscaped area.

3.5.2 Cases from India

ITC Bangalore

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf

Location	- Bangalore
Year of construction	- 2009
Area	- 16 Acres
Climate	- Composite

Introduction:

ITC campus is designed with well-balanced built space and landscape features. The campus is composed with good amount breakout spaces for employments. This has lead the way for pockets of green spaces within the campus. Use of eco-friendly building materials with excellent amount of day lighting, ITC building is one of the best GRIHA rated green campus in India.

Salient features in Water conservation:

- Rain water harvesting ponds, Total Capacity of 8700m^3.
- Low Flow water Fixtures, 35% reduction in potable water use.
- Water efficient management techniques for irrigation of landscape. Resulting in the 'CII National Award for Excellence in Water Management 2010'.

Figure 7: Rain water harvesting pond

Hi-tech Gear Ltd,

Salient features

- 100% of the roof and non-roof rainwater is sent to the water harvesting plant.
- Water efficient fixtures used.
- 100% of non-process water treated and reused for landscaping.

Olympia Tech Park, (Green Building Concepts & Retrofitting of Existing Buildings pg. 12)

Location - Pallavaram, Chennai
Area - 45 Acres
Climate - Warm and Humid

Introduction:

Olympia Tech Park is one of the oldest and most desirable IT office locations in Chennai. It is located in the Inner Ring Road, Chennai just near the TANSIDCO Industry and the Kathipara Junction. It consists of three towers (phases) which are Citius, Altius & Fortius. All the buildings in the campus including landscape has planned and designed in eco sensitive manner.

Salient features

- Upto 70% reduction in use of potable water for landscaping purposes.
- 100% utilization of Native species in the Landscape Design.
- Use of local Grass in the lawns and totally avoiding turf for better water efficiency.

Figure 8: Use of local trees in landscaping and Local Grass used in Lawns

3.5.3 Cases from Developing Countries

Eastern Seaboard Industrial park, Bangkok

Introduction: Refer 1.1.2

Salient features

- Using Native trees for the landscaping purposes so as to reduce the potable water needed for the landscape maintenance purposes, resulting in the 80% reduction in the use of potable water.
- Identifying and classification of plant species into climate by forming a climate change adaptive index i.e. sensitive to tolerant. Whereas more tolerant plants can be used for buffering purposes and more sensitive plants can be used as bio indicators (which are sensitive to the changing ambient air quality)

3.5.4 Cases from Developed Countries

OSHUS, Port Land, OR

https://www.nrdc.org/buildinggreen/casestudies/ohsu.pdf

Introduction: Refer 3.6.4

Salient features:

- 100 %onsite rainwater reuse system; rainwater reclamation system keeps all rainwater on site.
- The cooling tower and landscape irrigation systems use non-potable water from rainwater, a small amount from ground water and a large volume of treated sewage (courtesy of the bioreactor).

3.6 Improved indoor environmental quality

Abstract:

Indoor environmental quality (IEQ) refers to the quality of a building's environment in relation to the health and wellbeing of those who occupy space within it. IEQ is determined by many factors, including lighting, air quality, and damp conditions. This part helps in understanding the various practices which involved to improve the IEQ from some of the following case studies.

3.6.1 Cases from Andhra Pradesh and Telangana

CII Sohrabji Godrej Green Business Centre Hyderabad –A CASE STUDY

A Wind catcher, Wind scoop or Badgir is a traditional Persian architectural element to create natural ventilation in buildings.

- Energy savings are achieved by the GBCs two wind towers
- Air, cooled by upto 8 ^C, is supplied to the AHUs, substantially reducing the load on the air conditioning system.
- A heavily insulated roof further reduces the cooling load.

http://www.indiaenvironmentportal.org.in/files/file/CII_Sohrabji_Godrej_Green_Business_Centre-Case_Study.pdf

3.6.2 Cases from India

RMZ millennia Business Park,

(Green Building Concepts & Retrofitting of Existing Buildings pg.17)

Location - Pallavaram, Chennai
Year of construction - 2007
Area - 62 Acres
Climate - Warm and Humid

Introduction:

RMZ millennia Business Park is the Platinum rated SEZ in Chennai, It is located in the Pallavaram a prime IT development location in Chennai. This Project has focused many green practices and got succeeded incorporating them.

Salient Features to improve Indoor environment quality:

- Enhanced Utilization of Day lighting
- Utilization of Task lamps rather than using high voltage ambient lighting.
- Results achieved – Lighting power Density (0.5-0.75 which is 40% better efficient).

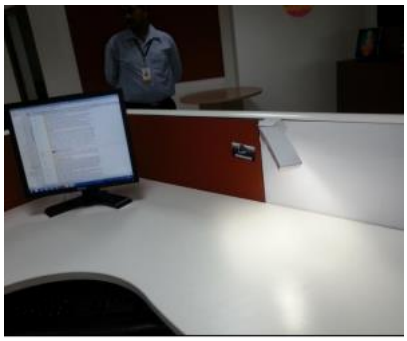


Figure 9: Task lighting

Suzlon One Earth, Pune

(Green Building Concepts & Retrofitting of Existing Buildings pg:20)

Location - Hadapsar, Pune

Year of Construction - 2006
Area - 10 Acres
Climate - Hot Semi arid

Introduction:

Suzlon's global wind installations help in reducing over 32 million tons of CO^2 emissions every year. The Company has 14 manufacturing facilities spread across India, China (Joint Venture) and America. The building is one of the pioneer in the design of LEED platinum rated office buildings in India.

Salient Features to improve Indoor environment quality:

- Low Height Partitions which helps in enhanced day light performance within office working space. Clear stories and elongated fenestration design allows more amount of light into the interiors.
- Low VOC (Volatile Organic Compounds) materials during building operations.
- Installation of Digital Energy Meters ¬ Monitoring energy use.
- Use of Carbon dioxide meters to monitor the quality of air indoor.

Figure 10: Low height partition walls

Cummins Generator Technologies

(Green Building Concepts & Retrofitting of Existing Buildings pg.36)

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf

Location - Ranjangaon, Pune
Year - 2006
Area - 15 Acres
Climate - Hot Semi Arid

Introduction:

Office spaces are well designed to allow natural lightings into the buildings. However use of LED lights and low mercury level CFL lights have been used. There was a decent amount of decrease in utilization of energy upto 30 to 40 %.

Salient features to improve Indoor environment quality:

- Energy Efficient Lighting systems
- Ventilation system using wind tower
- Wind tower Resulting in 41% of energy savings
- 100% naturally lit buildings

Figure 11: Wind tower of Cummins Generator Technology

ITC Bangalore

Introduction: Refer 3.5.2

Salient Features to improve indoor environmental quality:

- Use of eco-friendly building materials
- Eco friendly housekeeping chemicals
- Break out space for all employees
- 100% Day light utilization for indoor illumination needs.

Wipro Technologies,

Introduction: Refer 1.1.2

Salient features:

- Use of High efficiency lighting systems with advanced lighting controls.
- Motion sensors tied to dimmable lighting controls.
- Task lighting reduces general overhead light levels.
- Minimizing the electric load from the electric appliances.
- Use more of natural light
- Less noise by using sound absorption materials and methods.
- Views to outside for passive recreations for employees.
- Air quality and thermal comfort.

3.6.3 Cases from Developing Countries

http://eres.scix.net/data/works/att/eres2015_133.content.pdf

EQ is a key component in the evaluation for meeting the concept of green building that aims towards sustainable development.
There are four main elements in IEQ, which are

- thermal (temperature and humidity);
- noise comfort;
- indoor air quality (air

- movement CO2 concentration); and
- lighting. The main purpose of applying the IEQ element is to prevent from experiencing sick building syndrome

3.6.4 Cases from Developed Countries

OSHUS, Port Land, OR

https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf

Introduction: Refer 4.3

Salient features

- Natural ventilation in stairwells.
- Displacement ventilation systems in exam rooms to increase patient comfort.
- MERV-13 filters throughout.
- Low VOC finishes throughout.

NRDC, (https://www.nrdc.org/buildinggreen/casestudies/nrdcsm.pdf**)**

Location	- Santa Monica, California
Area	- 19 Acres
Year of Completion	- 2003

Introduction:

For its Southern California office, NRDC chose to renovate a 1920s-era structure in Santa Monica's pedestrian centre to take advantage of existing services like transit and to avoid building on undeveloped land. To reduce the flow of storm water and cut potable water use, the project includes an advanced system to retain, filter and recycle rainwater and wastewater. Through the use of recycled water for toilet flushing and landscape irrigation, drought-resistant plantings and water-efficient plumbing, the building is projected to use 60 % less potable water than a comparable non-green building. Energy savings are expected to reach 70 % with the help of light wells, clerestories and other day lighting techniques; energy-efficient computers and equipment; dimmable electronic ballasts; occupancy and photo sensors; and tank less gas heaters.

Salient features:

- Operable windows bring fresh air into the work space.
- Paints, adhesives and other materials emit zero or low levels of volatile organic compounds.
- The building is free of added urea formaldehyde and nearly free of vinyl.
- Areas where harmful emissions are present, such as copy rooms, were designed with negative pressure and vent outside the building.
- Carbon dioxide levels are constantly monitored.
- Cleaners use products that are bottled in recycled containers and are free of chlorinated solvents, and vacuums that are equipped with filters that prevent the release of particulate matter into the air.
- Indoor air quality is regularly monitored and tested.

4. Industrial processes

4.1 Reduce exposure to flooding and cyclones

Flood events are a part of nature. They have existed and will continue to exist. As far as feasible, human interference into the processes of nature should be reversed, compensated and, in the future, prevented. Flood strategy should cover the entire river basin area and promote the coordinated development and management of actions regarding water, land and related resources. This part provides information about the approach and experience in flood management throughout world.

4.1.1 Cases from Andhra Pradesh and Telangana

(Please Refer 3.2.1)

4.1.2 Cases from India

Damodar Valley river region (global warming potential Assoc. Programme on Flood management – Damodar valley Summery)

Location state.	- Damodar vally region, Jharkand and West Bengal
Area	- 22,000 Sq.Km (19,000 Upland, 3,000 Fertile land)
Climate	- Humid (extreme climatic conditions)

Introduction:

The catchment area of the Damodar riv er experiences seasonal rains due to the South-West Monsoon every year and depending upon the intensity of the storms, floods occur. During the monsoon season, the rainfall in the area is mainly due to either the passage of depressions over and near the area or active monsoon conditions. The normal track of the monsoon depression from Bay of Bengal towards the West Bengal lies to the south of the Damodar valley. The maximum flood in the Damodar River recorded in the pre-dam period was in August 1913 with a peak flow of 18,406 m^3/s (before the implementation of the Damodar Valley Scheme). The all-time high combined inflow to the dam system observed in the valley occurred in September 1978 with a peak flow of 21,900 m^3/s; needless to say that without these dams which comprise the above scheme the whole area would have been devastated.

Salient features:

- The main dams comprising the Damodar Valley Scheme have served their purpose of moderating the flood flows, showing that a tangible reduction to the extent of 53 to 80% has been achieved in the high flood years. However, as indicated before the reduced channel of the lower Damodar in cases is not capable of carrying the regulated discharge.

- The Government of West Bengal realised the importance of the productive value of the flood plains of Damodar, given the density of population and high level of investment on flood plains; in addition, that such protection can only be imparted at great expenses and at the cost of denying the productive use of flood prone land. While there are losses in the high flood years, the flood plains are utilised gainfully by the people living in the area during the low flood years. The approach,

therefore, has been to “bear the losses” at the time of flood disaster while enjoying the benefits of the land during the rest of the time.

4.1.3 Cases from Developing Countries

Zhang Hal-lun Flood management

Location - China
Climate - Eastern Asian Monsoon Climate

Introduction:

China has frequently been hit by floods and suffered from flood disasters. The critical issue is that about 8% of the land area located in the mid-and downstream parts of the seven major rivers of the country (namely: Yangtze, Yellow, Soughua, Liaohe, Haihe, Huaihe and Pearl River Basin) are prone to floods. These areas are distributed over the eastern and southern part of China. However, in these areas live 50% of the total population of the country, and they contribute over two-thirds of the total industrial product value.

Salient features:

- storing the flood-water in upstream areas to the extent possible;
- protecting the flood prone areas against ordinary flood in middle and downstream reaches of major rivers;
- making joint use of the levees and storage and detention basins for handling the extraordinary floods;
- Flood preparedness and flood fighting before and during flood season relying on the well-organized emergency management system.

4.1.4 Cases from Developed Countries

Tokai heavy rain and flood management:

http://www.apfm.info/publications/casestudies/cs_japan_full.pdf

Location - Japan

Introduction:

Due to the country’s mountainous topography, many rivers in Japan are of the torrential type, having steep riverbed gradients. Hence, they are dangerous at the time of a flood because of the fast arrival of the flood wave. Furthermore, the embankments are generally built above the protected lowland. Thus, when the floods overtop the embankments the inundation of the protected lowlands has the potential to cause serious damage to the urban area where assets concentrate. On the other hand, the rapid urbanization in the floodplains has been inevitable, because of continuous population growth and less percentage of available area (as much as 80% of Japanese territory are mountains), and that most of productive/available lands are floodplains.

Salient features:

- In Japan there are structural and non-structural measures for flood protection. The structural ones include embankments, excavation of riverbeds, dams and retarding basins, diversion channels, etc.,
- The non-structural measures are of two types;
  - the first are geared to decrease the run-off by means of storage of water in the basin (infiltration of rainwater, storage in each house)
  - second is related to disaster prevention through local prevention plans (including information on disaster prevention), local ordinances (construction regulations, etc.,) and the distribution of hazard maps.

Parrett catchment project

http://www.apfm.info/publications/casestudies/cs_uk_sum.pdf

Location - United Kingdom
Area - 1680 Km^2
Climate - Cold and rainy

Introduction:

The Parrett Catchment is located in the southwest region of the United Kingdom. It is the largest river system in the County of Somerset, covering about half of that county and incorporating five major rivers, which discharge via the Parrett into the Bristol Channel. The area includes the urban areas of Bridgewater and Taunton, as well as the internationally known wetlands of the Somerset levels and Moors. It has a surface of 1,680 km^2, with most of the lower catchment below high tide level. Due to this topography, regular flooding of the lower lying land is expected, and the communities, local industries and the landscape have evolved together over the centuries to cope with these conditions. In consequence, the area has a long history of flooding, as well as of serious contention over flooding and water management issues. Much of the catchment receives higher than average rainfall and the capacity of the river channels in the lower reaches is often exceeded. In addition, besides the risk from fluvial (rainwater flooding), this is often compounded by high tides preventing evacuation of floodwaters.

Salient features

- Creating temporary flood storage areas in designated areas on farmland in the upper and mid-catchment until after the peak flow has passed in flood plain water courses
- Storing storm water temporarily in designated flood storage areas for creating new wetland habitats throughout the catchment to intercept and store flood water during flood events
- Restoring flood plain river banks to planned designed levels and in tidal reaches to protect against rising sea level
- Upgrading pumping stations to ensure their reliability and efficiency in operating the flood management system
- Upgrading channels to enhance gravity drainage to increase the volume of flood water that can be evacuated by gravity
- Restricting new development on the flood plain to avoid allocating land for development in floodable areas of the upper and lower catchments

4.2 Water management: Increase water efficiency, water recycling, Use of grey water

Abstract:

Global water scarcity is intensifying. Economizing on water use will be an important aspect of any effective response. Water recycling and reuse technologies offer possibilities for more extensive use of water, depending on cost. Institutional responses, such as the use of rational pricing and the creation of water markets or exchanges, promise to improve water-use efficiency. Consumer education is a simple and inexpensive means of economizing on water in the urban and agricultural sectors. Following such water management techniques are effective in managing short-term interruptions such as drought. Point-of-use technology will also offer opportunities for economizing on many water uses. This part deals with the case studies on the water efficiency techniques in India and around the world.

4.2.1 Cases from Andhra Pradesh and Telangana

CII,Hyderabad

(http://www.indiaenvironmentportal.org.in/files/file/CII_Sohrabji_Godrej_Green_Business_Centre-Case_Study.pdf)

Location	- Hyderabad, Telangana
Area	- 6 Acres
Climate	- Hot and dry

Introduction:

CII building is first platinum rated LEED building in India. This building has many sustainable techniques involved in its design. This campus is located in Hi-tech City which is known for the IT industry development. The climate it possess is mostly warm and dry with hazy winters.

Salient features:

- Some rainwater goes into the soil by the use of permeable grid pavers.
- The remaining rainwater follows existing flow patterns and is collected in a water pond another traditional method of rain water harvesting, constructed at a lower end of the site.
- In addition, the building achieves a 35 % reduction of municipally supplied potable water, in part through the use of low-flush toilets and waterless urinals.
- Use of Root Zone Treatment – Artificially prepared wetlands comprising of clay or plastic lined excavation and emergent vegetation growing on gravel/sand mixture.
- All the waste water is recycled by the Root Zone Treatment, simultaneously irrigates the vegetation. This provides low cost and attractive landscape.
- 1) Root Zone Treatment Of Waste Water 2) Rain water harvesting 3) Water-less urinals in men's restroom 4) Water-efficient fixtures: ultra-low and low-flow flush fixtures 5) Water-cooled scroll chiller 6) Secondary chilled water pumps with variable frequency drives 7) Swales for storm water collection
- Zero Discharge Building
- 35% reduction in potable water consumption

Figure 12: root zone treatment

4.2.2 Cases from India

Wipro technologies,

Introduction: Refer 1.1.2

Salient features:

- Design for dual plumbing to use recycled water for toilet flushing or a grey water system that recover rainwater.
- Minimize waste water by using ultra low flush toilets, low flow shower head and other water conserving fixtures in landscapes.
- Use re-circulating systems for centralized hot water distribution.

Chinnakarai Common Effluent Treatment Plant

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e61172/e63630/20150522_CETP_RefDocument_i.pdf

In this CETP there are primary, secondary, Tertiary treatment systems with Membrane filtration technology adopted to achieve the ZLD. The CETP has taken up modification works in the pre-settler, equalization tank and also has taken up installation of new aeration system with air blowers and diffusers and softeners, ultra filtration, reverse osmosis system and thermal evaporation system etc.,

Reliance Petrochemical industry,

(http://www.wabag.com/wp-content/uploads/2012/04/Industrial-Water-Reuse.pdf)

Location	- Jamnagar, India
Landuse	- Industrial
Climate	- semi – arid

Introduction:

At Jamnagar in India, the Reliance Petroleum Limited operates the world's largest grassroots refinery. The approximate capacity of the naphtha-based, cracker refinery

is 18 million t/a. The wastewater reclamation plant has a capacity of 48,000 m³/d, which makes it the biggest effluent treatment plant in India

Salient feature:

- The reclamation plant is designed for the maximum reuse of the wastewater coming from the operational units of the refinery.
- Basically, the process consists of oil removal (API-separator and dissolved air flotation), biological treatment (bio towers with plastic packing and activated sludge process), tertiary filtration (dual media filters) and polishing with granular activated carbon. Plant operation has shown that the treated water standards can be met without any problems.
- The treated water is reused as make up in the fresh water cooling tower, as fire water make up and for local green belt development and irrigation.

ITC Green Centre

(http://www.slideshare.net/somajotm/green-presentation-3926808)

Location - Gurgaon, Hariyana, India
Area - 30 Acres
Climate - Monsoon Semi Arid

Salient features:

- Zero water discharge system
- Use of treated grey water for flushing and landscaping
- Well-designed water and green utilization within building
- 40% reduction in potable water use.

4.2.3 Cases from Developed Countries

Ak-Chin,

http://www.whitewater-wi.gov/images/stories/public_works/wastewater/Whitewater_WWTP_ADS_Final_Report-May_2010.pdf

Location - Arizona, USA
Land Use - Industrial
Climate - Arid

Introduction:

The Ak Chin Indian Community of the Maricopa (Ak Chin) Indian Reservation is a Native American community located in the Santa Cruz Valley in Arizona. The Maricopa Reservation was founded in 1912 and has been reduced from 47,600 acres to its current 22,000 acres. The reservation is located in Pinal County, Arizona within the Sonoran Desert. Averaging an elevation of 1,186 feet, this reservation located 37 miles south of Phoenix. Much of the land is good for farming, and 15,000 acres are irrigated

Salient features:

- Construction of waste water treatment plant of 246000 I with activated sludge and extended aeration, extended summer plant consists of 668500 L of treatment plant.
- Water storage pond for the Irrigation and non-edible vegetation within the area.
- Removal of approx. 250 salt cedar trees and plantation of 93 cottonwood poles around pond.
- Retention of native tree species.

Du Pont Production centre Chemical Industry

(http://www.wabag.com/wp-content/uploads/2012/04/Industrial-Water-Reuse.pdf)

Location - Hamm-Uentrop, Germany
Landuse - Industrial

Introduction:

Company always pushing the limits of what's possible, leading the way in technology advances and new understandings in safety, health and environmental science. They also continuously strive to improve our own practices. Each year, publish an update on our global goals and performance in our annual Sustainability Progress Report.

Salient features:

- Biologically pre-treated chemical wastewater including nitrogen and phosphorous removal is reclaimed and then mainly reused as process water for fibre production and as boiler feed water.
- Reclamation plant comprises tertiary filtration with ultrafiltration (NORIT), activated carbon adsorption, UV disinfection, reverse osmosis and ion exchange in mixed bed filters.
- This represents an annual reduction of 540,000 m^3 and provides corresponding savings in water from the municipal network (drinking water). Positive environmental effects stem from reductions in chemical oxygen demand (15%), nitrogen (60%) and phosphorus (67%).

OSHUS, Port Land, OR

https://www.nrdc.org/buildinggreen/casestudies/ohsu.pdf

Introduction: Refer 3.6.4

Salient features:

- Onsite bioreactor for sewage treatment.
- Lower-water-using fixtures for sinks, toilets, urinals and showers.

NRDC, Sata Monica,

(https://www.nrdc.org/buildinggreen/casestudies/nrdcsm.pdf**)**

Introduction: Refer 3.6.4

Salient features:

- No potable water is used outdoors.
- Water recycling system stores, filters and disinfects water reclaimed from rainfall, showers and sinks for use in flushing toilets and irrigating landscaping.
- Drought-resistant landscaping and outdoor potted plants, including many native to Southern California, minimize irrigation needs.
- A drip irrigation system emits measured amounts of water through small tubes to each plant's root ball, limiting water loss due to evaporation.

4.3 Use of Renewable energy and decentralized power

Abstract:

Use of conventional energy sources like coal has been creating a lot of negative impacts on the environment including surrounding residential areas. As such energy sources are renewable energy sources, conservation of energy comes into picture. Hence using renewable energy sources and reducing the load on conventional energy should be encouraged. In this part various experiences have been listed out on renewable energy utilization.

4.3.1 Cases from Andhra Pradesh and Telangana

http://tnredcl.telangana.gov.in/Biomassenergy.aspx

In Telangana, 67 Nos. of Biomass based power projects of 404 MW capacity were sanctioned based on the availability of Biomass resources such as Agro residues, Forest residues, Energy plantations and Agro based industrial residues. The projects were sanctioned by inviting proposals from Private Entrepreneurs duly issuing notification in the leading newspapers during the years 1998 & 1999. Later as per the directions of Ministry of New and Renewable Energy (MNRE), no further biomass power projects were sanctioned in the state. As the developers have failed to implement the projects as per the terms of Agreements and as they have not shown any progress towards implementation of the projects, 18 projects of total capacity 133.75 MW were cancelled. 40 Nos. of Biomass power projects with an aggregate capacity of 219.75 MW have been commissioned so far

4.3.2 Cases from Developing Countries

https://www.usea.org/sites/default/files/event-/Indonesia%20Country%20Presentation_0.pdf

Ministry of Energy and Mineral Resources Republic of Indonesia Directorate General of New, Renewable Energy, and Mineral Resources

ENERGY CONDITION OF INDONESIA

1. The average of growth rate of energy consumption is 7% per year;
2. High dependence on fossil energy while it reserves are more limited;
3. Utilization of renewable energy is still low (6.9%) and implementation of Energy Conservation is not optimal;
4. Public access to energy (modern) is still limited: a. Electrification ratio of year 2011 is 72.95 % (27.05 % of households not yet electrified); b. Less of development of energy infrastructure particularly in rural / remote areas and outer islands.
5. Linkage to environmental issues: a. Mitigation of climate change; b. Carbon trading; c. National commitment to reducing emissions 26% by 2020;

4.3.3 Cases from India

NEG Micon

http://www.slideshare.net/somajotm/green-presentation-3926808

Location **- Chennai**
Area **- 60 Acers**

Introduction:

NEG Micon is a former Danish wind turbine manufacturer. It was formed in 1997 as a result of a merger between Nordtank Energy Group (NEG) and Moerup Industrial Windmill Construction Company (Micon). The company was merged with another Danish wind turbine manufacturer, Vestas, in 2004, and it is now operating under that name. The company produced wind turbines for many different countries including Germany, Denmark, Sri Lanka*, India and* USA.

Salient features:

- Vermi composting to treat canteen wastes, the compost is used within the premises.
- Installed wind turbines of 950 KW offsite to cater to 100% of energy requirement.
- Uses of low mercury content bulbs which case less environment pollutions when discarded. These bulbs are also less power hungry hence supports wind turbine power.

4.3.4 Cases from Developed Countries

https://courses.cit.cornell.edu/crp384/2009reports/Bissinger&Bouraee_Comparing%20Renewable%20Energy%20Planning%20Efforts.pdf

Freiberg is located in the southern region of the country and is considered by many to be the "sunniest and warmest city" in Germany (Saloman, 2009). The 150 km2 city has a population of 220,000 of which 23,000 are local university students. The city has a square area of 150, comprised of 40% forestlands, part of Germany's famous Black Forest (Saloman, 2009). Freiberg is known as Germany's "solar city" as its commitment to utilizing the region's abundant sunlight to generate solar power is very apparent and can be seen from the thousands of Photovoltaic panels PV) on the city's rooftops, to its myriad of solar research institutions, and successful solar industry. Furthermore, the city of Freiberg has embraced sustainability and solar power (among other renewable sources as well) on a community and political level in creating legislative and programming with the goal of becoming "Europe's most prominent solar city" (Dauncey, 2003).


Figure 2 http://www.young-germany.de/uploads/pics/Solarsiedlung_von_oben.jpg
Figure 3 http://www.solarserver.de/images/LR07-SCStadion1_low.jpg

Centre for Heath and Healing,

(https://www.nrdc.org/buildinggreen/casestudies/ohsu.pdf **)**

Location	- Portland, OR
Area	- 90 Acres
Climate	- cold and arid

Introduction:

The Oregon Health & Science University's 16-story Centre for Health and Healing, opening in fall 2006, anchors a new urban district that is rising on abandoned industrial land on Portland's south riverfront. OHSU's building, which will house a bioscience research facility, clinic space, outpatient surgery and a wellness centre, is reaching for the highest level of green building certification while being engineered on a conventional budget.

Salient features:

- On site micro turbine electric plant
- Use of Solar Power generators.
- 61% of Project energy savings
- Building-integrated solar electric panels on the building's south-facing sunshades, with a total of 60 kW of photovoltaic modules.
- A large 6,000-square-foot solar air heating system uses low-iron glass in front on the south-facing wall of the 15th and 16th stories.
- Solar air heater: the solar electricity generation panels on the 15th and 16th floors create a giant solar air heater, 190 feet long by 32 feet high, to preheat water for the building.
- 66000 kWh Annual Output

NRDC, Santa Monica

(https://www.nrdc.org/buildinggreen/casestudies/nrdcsm.pdf)

Introduction: Refer 4.3

Salient features:

- A 7.5 kW grid-connected solar electric array produces approximately 37.5 kWh of electricity per day, enough for about 20 % of the building's electricity demand.
- To meet the rest of their energy needs, San purchases renewable energy credits for wind generation. As a result, the office operates on 100 % renewable energy.

Blair Town

https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjltujj6pPLAhXCc44KHUF6DDMQFggcMAA&url=https%3A%2F%2Fwww.nrdc.org%2Fbuildinggreen%2Fcasestudies%2F&usg=AFQjCNHT_Gx9DVEXmXP_0F3zoeZSFfwoZw&sig2=GltvN2yf5zwT_GwLm2fpow&cad=rja

Location - Silver Spring, Maryland
Area - 90 Acres
Climate - Arid

Introduction:

Blair Towns consumes 30 % less water than conventional apartment buildings through the use of highly water-efficient showerheads, faucet aerators and Energy Star dishwashers and clothes washers. To cut energy use by 20 %, the complex features a combined furnace and water heater in each unit, high-performance windows, high-efficiency ceiling fans and fluorescent lights, and a well-insulated thermal envelope. To help maintain indoor air quality, the builders used nontoxic paints, sealants, adhesives and carpets. Of the building materials, 63 % were sourced locally within 500 miles of the project and 40 % were made from recycled content.

Salient features:

- Photo voltaic cell roofs oriented towards the southern direction.
- Purchasing one third of power from the renewable wind energy grid.

4.4 Implementation of Zero Waste Cleaner technologies

Abstract:

Zero Waste is a philosophy that encourages the redesign of resource life cycles so that all products are reused. No trash is sent to landfills and incinerators. The process recommended is one similar to the way that resources are reused in nature. The internationally recognized definition of ZERO WASTE adopted by the *Zero Waste International Alliance* (ZWIA) is:

"Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use.

Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health".

4.4.1 Cases from Andhra Pradesh and Telangana

Design guidelines of Proposed Green Industrial Park, ALEAP Nandi Gama, Andhra Pradesh

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e61137/e61497/e61517/15-ALEAPGreenIndustrialPark@Nandigama,Hyderabad.pdf

Objectives of Zero waste management:

- To ensure proper disposal of solid waste with efficient management systems
- To encourage one of the tenant to take up the solid waste management of the entire site.
- Provision of storage areas for re-usable industrial waste & on site sale & provision of appropriate & controlled waste disposal areas entrepreneurial possibilities for waste management:
- Vermi-compost plant
- Handmade paper unit
- Treatment and reuse of used drums/containers • sale of recyclables

4.4.2 Cases from India

NEG Micon,

(http://www.slideshare.net/somajotm/green-presentation-3926808 pg.18)

Location - Chennai
Climate - Warm and humid
Salient features:

- Vermi composting to treat canteen wastes, the compost is used within the premises.
- Use of grey water is treated and used for irrigation instead of being released into municipal drainage.
- 95% of waste recycled.
-

4.4.3 Cases from Developing Countries

ZERVAS Group:

(http://sustainableconnections.org/bizdev/tzw/casestudies#bellingham-roller-betties-waste)

Location - Austria
Year - 2009
Climate - Cold and Semi Arid

Introduction:

As design leaders in a rapidly growing region, Zervas Group Architects advocates urban connection where infrastructure exists, planning that preserves our natural resources and design that adds to the community experience as the best way to achieve responsible and inspiring growth. Zervas is building a legacy of beautiful, timeless architecture, and hold their firm to the highest standards for sustainable

design as well as sustainable business practices. Through the challenge to move towards zero waste, they have made a few simple changes that have yielded an impressive 90% waste reduction. 100% of paper waste recycled, clear and comprehensible recycling labels and bins set up for workers and clients to follow, and paper hand towels and food leftovers are composted.

Salient features:

- Clearly marked recycling areas for newspaper, e-waste and bottles, cans or plastic items
- Each desk has a cardboard “recycle” box Paper towels and food waste are composted
- 100% of ink cartridges recycled
- 100% of proposal materials for new projects can be recycled
- Usable computers and peripherals are donated to charities, while “techno-trash” is recycled through approved programs
- 100% of plastic and bubble wrap is recycled once a month, or re-used for shipments going out of office
- 700+ kg of paper recycled every year
  90% waste diversion from landfill

4.4.4 Cases from Developed Countries

Hammarby Sjostad

(http://communitiesgroup.org.uk/eco-standards/waste-management/item/57-case-study.html **)**

Location	- Sweden
Climate	- Cold
Year	- 2005

Introduction:

This is a layout consists of 1500 dwellings and some commercial pickets. Sludge that is separated from waste water is used to produce biogas. Most of the biogas is currently used as fuel in eco-friendly cars and buses, and also in approximately 1,000 gas stoves. It is estimated that the waste water from a single household produces sufficient biogas for the household’s gas cooker. All storm water, rainwater and snowmelt is treated locally. Solutions include the use of a set of three canals that run through the district and channel water to treatment locations, designed to also provide a pleasant visual effect. The ‘water ladder’ received a prize from the Swedish Association of Architects in 2005.

Salient features:

- Three waste management levels operate in Hammarby: building based, for separating waste at source and operated through vacuum-operated and centrally connected chutes to an underground waste collection system; block-based recycling rooms; and area-based hazardous waste collection points.
- Sludge that is separated from waste water is used to produce biogas. Most of the biogas is currently used as fuel in eco-friendly cars and buses, and also in approximately 1,000 gas stoves. It is estimated that the waste water from a single household produces sufficient biogas for the household’s gas cooker.

- All storm water, rainwater and snowmelt is treated locally. Solutions include the use of a set of three canals that run through the district and channel water to treatment locations, designed to also provide a pleasant visual effect. The 'water ladder' received a prize from the Swedish Association of Architects in 2005.

Warwickshire County Council's:

Introduction:

This is Country council office campus located in UK. The New Communities Group (NCG) is a group for and led by local authorities and other groups planning and delivering large-scale sustainable new communities. The NCG encourages a sharing of knowledge and best practice between the different locations to help them achieve the highest standards of sustainability and design.

Salient features:

- Unwanted electrical items come from the Warwickshire County Council's waste recycling centres or are collected, free of charge, by charities involved in the Goods Again project. Some Coventry schools encourage pupils learning about waste to bring in small, unwanted electrical items for collection by Goods Again.
- Once processed, re-usable electrical goods are transported to charitable organisations for redistribution to needy people who can't afford new items.
- Goods Again charges a nominal amount per item, averaging around £35 for white goods such as cookers, fridges and freezers. The charities then decide what charge to pass on to the end-user.

Samson

(http://sustainableconnections.org/bizdev/tzw/casestudies#bellingham-roller-betties-waste)

Location	- Sweden
Year	- 2014
Climate	- Cold

Introduction:

For well over 100 years, Samson has been recognized as a worldwide leader in the development and manufacture of high-performance ropes. Samson had a vision to expand their recycling in their manufacturing business of 150 employees. Samson's initial goal was to reduce the amount of solid waste by 50% in the first year of the program. This goal was achieved in the first two months! Their next step will be to implement FoodPlus!, further their lean manufacturing processes, participate in the Community Energy Challenge and continue their Toward Zero Waste journey!

Salient features:

- One year recycling goal met in 2 months
- Removed equivalent weight of 12.5 cars out of the landfill in first 2 months
- Support from Management and Kaizen Governing Committee and employees
- Created a recycling committee & developing an official recycling policy
- Created metrics to monitor recycling progress
- Recycle ALL metal, cardboard, electronics, batteries, toner cartridges, clean poly & nylon fibres, stretch film, wood, and all bottles and cans

- Promotes the use of reusable cups and implemented paper reduction strategies

Adelaide Convention Centre:

(http://www.zerowaste.sa.gov.au/upload/REAP/ZWSA%2091392%20UpClose%20Adelaide%20Convention%20Centre%20WEB.pdf)

Location	- SA, South Australia
Year	- 2007
Climate	- Arid – Semi Arid

Introduction:

Adelaide Convention Centre has been working with external agencies to strengthen its green program and obtain independent recognition of its achievements. The centre has registered with Green Globe, an international sustainability benchmarking program for the travel and tourism sector. In 2008 the centre achieved bronze certification and in July 2009 it was the first convention Centre in Australia to be awarded Green Globe silver certification. Centre was a pilot participant in Ecotourism Australia's Climate Action certification program to rank the efforts of organizations in reducing their carbon footprint. Adelaide Convention Centre reached Climate Action Innovator level, demonstrating it has introduced emissions reduction actions.

Salient features:

- Composting system – Every month about 9 tonnes of food scraps are processed using the SA-developed BiobiN in-vessel composting system. BiobiN collects the contents, mixes them with shredded garden waste and sells the resulting compost to the public or uses it on council gardens.

- Event waste – Staff use colour-coded bins for collecting event waste for recycling. From one event alone, staff stopped about 50 cubic metres of waste from ending up in landfill.

5. Supply chain

5.1 Shading of storage facilities

Abstract:

Storage facilities should be kept under care and should regularly monitored. Development of various strategies for coping up with the climate change process is highly recommended and desired. Storage facilities are most vulnerable to the natural disasters, and there is always chance for products stored in getting contaminated because of the varying climate and unappropriated care. Hence shading and of storage facilities and making it resilient for climate change is highly desirable. Some of the cases mentioned in shading the storage facilities are as followed.

Hoffmann-La Roche Ltd.,

http://bigtopshelters.com/building-products/environmental/warehousing-bulk-storage/

Location	: Nutley, NJ, USA
Year of establishment	: 1896
Climate	: Hot and humid climate

Introduction:

F. Hoffmann-La Roche AG is a Swiss global health-care company that operates worldwide under two divisions: Pharmaceuticals and Diagnostics. Branch in New Jersey is a green building and many measures has been taken for the climate change. The storage of the products have been shaded with shading devices from the sun and to maintain the reduced temperature in the interior than the exterior ambient temperature.

Salient features:

- Use durable yet breathable PVC fabric that is translucent enough to allow light flow to enter the fabric structure, eliminating the need for additional light during daytime hours for most applications.
- Along with advanced solar panel packages, this able to offer significant opportunities to reduce energy use and save money.
- These fabric structures have been tested and prove successful withstanding even the harshest weather conditions. Wind gusts exceeding 100 miles per hour, heavy rains can be problems for some fabric structures.

Synagro inc.

http://www.bigtopshelters.com/wp-content/uploads/2014/05/Big-Top-Environmental-Applications.pdf

Location	: Charlotte County, Florida
Year of establishment	; 1986
Climate	: Humid subtropical climate

Introduction:

Syn-agro executes the integrated solutions for the waste and wastewater challenges. With rows of bio solid waste covering acres and acres of paved land, open air composting, a common process, is a bit more challenging in the rainy summer months of southwest Florida. The aerobic process halts when the material gets wet, thus causing an unforeseen delay. Hence the development and Utilization of space frames and durable PVC fabric tensile structure has given the storage a great durable solution.

Salient features:

- Roof suitable for all kinds of seasons
- Offices storages where additional space is needed to store and process packages.
- Warehouse equipment supplies during disaster relief

Insurances against disasters

Abstract:

Climate change has been a serious issue in the modern era. Various practices are evolving in order to adopt the changing climate, but use of insurance is always preferable for recovering from an unexpected disaster. Some of the agencies which have got succeeded in insuring properties and were proven successful in the time of disasters have been mentioned.

National Flood Insurance Program,

http://www.lse.ac.uk/CATS/Publications/Publications%20PDFs/Surminski-geneva-report-7-CaseStudy)May-2013.pdf

Location : USA

Year of Establishment : 1968

Introduction:

The National Flood Insurance Program (NFIP) was created by the U.S. Congress in 1968 to provide flood insurance protection associated with hurricanes, tropical storms and heavy rains. As of March 2011, approximately 5.6 million properties were insured by the NFIP. Until 2006, NFIP paid out almost 95 per cent of its claims from Hurricane Katrina.

Salient features:

- Preparation of flood maps through various geospatial surveys of various river basins. Hence building the awareness among the insurance holders about their project site's disaster prone vulnerability.
- Premiums have been decided on the risk factor based on the identified areas as per the published surveyed maps.
- Frequently updated flood maps gives reliable and updated data regarding the risk factor of clients.

National Catastrophe insurance fund, Thailand

Location : Thailand
Year of establishment : 2011

Introduction:

Beginning in July 2011, the combination of the remnants of tropical depression Haima and tropical Storm Nok-ten caused severe flooding in 65 of Thailand's 77 provinces, mostly in the Mekong and Chao Phraya basins (AFP, 2011), and led to major manufacturing disruptions by the end of October. The total economic damages and losses of the Thai floods, according to the World Bank, were THB1,425bn (US$45.7bn) (The World Bank, 2011). National Catastrophe Insurance Fund (NCIF), to offer catastrophe insurance to households, small and medium enterprises (SME) and industrial factories.

Salient features:

- Mandatory purchase requirements has ensured households and medium scale industries, later got protected from the catastrophe disaster in the same year.
- Enhanced risk awareness by:
  - Implementing strict zoning and building code standards and providing subsidies for mitigation practices undertaken.
  - Promoting early warning systems etc.,

Interaction with Communities around Industrial Parks

Abstract:

Communities or settlements around Industrial Parks are highly effected by the actions and activities those are taken in industrial parks. People who are residing around the Industrial Parks are highly prone for the various effects of pollution emission or any other external effect caused by the Industrial Park. Hence there is an urge for the various stakeholders to get into the field and should make sure that the communities around Industrial parks are safe and unaltered. Glimpse about such issues are given by the following examples.

Joint initiatives:

JET – Journalists for the environment of Tanzania,

http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf

Location : Tanzania
Aim of Project : Raising public awareness of environmental threat through media

Salient features:

JET is working to raise public awareness around the sustainable management of natural resources around the Industrial areas. They publish two monthly newspapers, one in English and other in Kishwahill. JET also manages an environmental resource library where the NGO and CBO communities and other journalists are invited to gather and share information. This has become a success and communities around Industrial areas are now well aware of their environmental conditions.

TBD – The blacksmith Dept. Zambia

http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf pg.17

Location : Zambia

Aim of Project : Solving Lead smelter situation in Kabwe

Salient feature:

The city of Kabwe is suffering lead pollution from the local smelter. The remains and effluents of lead have affected a community of about 250,000 for decades. Blacksmith Institute has started a collaborative work with the important people of community and been working with the World Bank on this issue and is in the process of creating a watchdog group to oversee the problem, the plans, and the solutions from various fields and disciplines.

5.2 Development of resilient transportations and options for change of routes:

Abstract:

Supply chain and Financing are important aspects of industries. These aspects are highly responsible for the development and maintenance of industries through various responsible forward and backward linkages. Making these market forces resilient to the effects of climate change is a crucial task in framing Climate Change Adaptation strategies. There are various aspects and strategies followed by various agencies in and around the globe are stated below.

5.2.1 Cases from Andhra Pradesh and Telangana

1. ALEAP Nandigama

ALEAP Nandigama has planned to cover majority of the estate through battery operated vehicles, which will reduce the carbon foot prints and also serve as an business model for entrepreneurship.

2. Amaravathi

Amaravathi is the Greenfield Capital City developed for the State of Andhra Pradesh after bifurcation. The capital region comprises of approximately 7,420 sq. km. of area spreading along both sides of river Krishna, while the capital City is developed on the banks of the river which spreads over 212 sq.km. The proposed capital is in close proximity to the existing city of Vijayawada on the southern side of the river Krishna, hence sharing common treats.

The upcoming city of Amaravathi should value diversity, flexibility and redundancy in its plan. A grid network accompanied with transit-oriented development would develop a multi modal transport infrastructure. Which is sufficient to provide alternate route and modes to commute. Instead of depending on prescribed arterial roads, a grid network would disperse the traffic with providing multiple links to each destination.

Boost Transportation Options, particularly for transportation choices and services that help provide basic access. Support development of diverse and competing transportation services, such as Ridesharing, Telework, Delivery Services, etc., Insure that transport planning take into account people with special needs (physical disabilities, low incomes, inability to speak the local language, etc.,). Develop plans to provide basic access to persons with disabilities, and under unusual conditions. Develop operative ways to maintain information and communication systems among transportation system managers, staff and users under normal and extreme conditions. Develop ways to warn travelers of problems and let travelers know their transportation options.

5.2.2 Cases from India

Ahmedabad: Ahmedabad is a city of five million in the western state of Gujarat. In 2009, the city set the benchmark for high-quality transit in India with the Janmarg bus rapid transit (BRT) system. Janmarg, which means “the people’s way” in Gujarati and moves more than 130,000 people per day, was a major improvement to a city that previously had few options for the 90% of residents that do not own cars.

Today, Ahmedabad is a regional leader in transport and urban planning, with progressive legislation on parking and Transit-oriented Development, dense, mixed-use development, parking reform, and improvements for walking, cycling, and even better public transit.

http://www.earthshare.org/2015/05/smarttransport.html

5.2.3 Cases from Developing Countries

1. Buenos Aires

In 2013, Buenos Aires transformed their iconic 9 de Julio avenue, one of the widest avenues in the world with 20 lanes of car traffic, into an efficient, modern public transit corridor. The project is part of a citywide mobility plan initiated in 2009, which includes the pedestrianization of more than 100 blocks of the city center, an extension of the eco- bike share program, a 300 km cycling network, and intersection treatments to improve safety for pedestrians.

This megacity on the Pearl River Delta is home to the highest-performing BRT system in the world, carrying more than 850,000 passengers per day through 26 stations with speeds equal to metro. The achievements of Guangzhou, however, go well beyond the bus. They have one of the largest bike share systems in the world, and have transformed underused areas, such as the often-derelict space under overpasses, into beautiful public spaces.

ITDP China, based in Guangzhou, hosts upwards of 50 government, NGO, and academic site visits every year, and has inspired replication projects in cities across China and Southeast Asia.

5.2.4 Cases from Developed Countries

Hillington Park is already very well connected to a plethora of travel networks, as shown below in the Public Transport Facilities Plan and the Connectivity of Hillington Park.

He Bus Rapid Transit route will be in place in Glasgow in 2015 and is predicted to be extended to Braehead. There is already a bus service from Hillington Park to Braehead which takes 7 minutes, and which runs at A frequency of one bus every 30 minutes during the daytime.

1. Arizona Department of transportation,

http://www.fhwa.dot.gov/environment/climate_change/adaptation/resilience_pilots/2013-2015_pilots/index.cfm

Location : Phoenix, Arizona, USA
Year of establishment : 1974
Climate : Semi Arid

Introduction:

The Arizona Department of Transportation (ADOT, pronounced "A-Dot") is an Arizona state government agency charged with facilitating mobility within the state. In addition to managing the state's highway system, the agency is also involved with public transportation and municipal airports. ADOT was a pioneer in the use of rubberized asphalt as a method to increase durability and reduce road noise on state highways while providing an opportunity to recycle scrap tires. Now the agency is looking forward to promote climate resilient routes for various logistic purposes.

Salient features:

- The ADOT team conducted a study to identify hotspots where highways are vulnerable to associated hazards from high temperatures, drought, and intense storms.
- The project focused on the Interstate corridor which includes a variety of urban areas, landscapes, biotic communities, and climate zones and presents a range of weather conditions applicable to much of Arizona.
- Finally came up with the recommendation of routes with optimized travel time and with routes with least effects from high temperatures, drought, and intense storms.

2. Capital area metropolitan planning organization,

http://www.fhwa.dot.gov/environment/climate_change/adaptation/resilience_pilots/2013-2015_pilots/index.cfm

Location : Austin City, Texas, USA
Year of Establishment : 1973
Climate : humid subtropical

Introduction:

The Capital Area Metropolitan Planning Organization (CAMPO) is the federally mandated metropolitan planning organization (MPO) responsible for comprehensive transportation planning in the Austin, Texas area. Organization is responsible for the planning of route selection for fright movement and heavy vehicle movement plan.

Salient features:

- The CAMPO team used a data and stakeholder-driven approach to assess risks to nine critical assets from flooding, drought, extreme heat, wildfire, and ice.
- The project team conducted a criticality workshop, developed local climate projections, and performed risk assessments for each asset.

- Finally developed the route plan for transporting goods and decided the fright moments for various industries on the existing road networks.

3. Connecticut Department of Transportation,

http://www.fhwa.dot.gov/environment/climate_change/adaptation/resilience_pilots/2013-2015_pilots/index.cfm

Location	: Connecticut, USA
Year of establishment	: 1965
Climate	: Moderate Climate

Introduction:

The Connecticut Department of Transportation (ConnDOT) is responsible for the development and operation of highways, railroads, mass transit systems, ports, waterways and aviation facilities in the U.S. state of Connecticut. Various vulnerability assessments will be carried out and development of Comprehensive mobility plans for the state will be carried out by the organization.

Salient features:

- Connecticut Department of Transportation (CTDOT) conducted a systems-level vulnerability assessment of bridge and culvert structures from inland flooding associated with extreme rainfall events.
- The assessment included data collection and field review, hydrologic and hydraulic evaluation, criticality assessment and hydraulic design criteria evaluation.
- Final report has the recommendations for the development of new bridges and types of vehicles those are recommended to take a particular road for minimum impact in the case of natural calamities.

6. Joint Initiatives

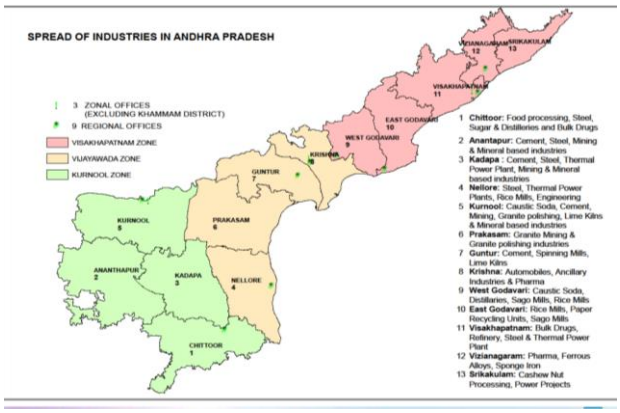
Pollution of surface water and other natural water resources has been common since many decades through the poor waste managements of Industrial areas. Hence there is always a need for the initiatives to take control over the solid and liquid waste generated by the industries. Here are some examples where the joint initiatives taken by the collaboration of Industrial officials and people of various communities around to improve the environmental conditions.

6.1 Joint water and waste management

6.1.1 Cases from Andhra Pradesh and Telangana

Environmental Pollution and Control Status in Andhra Pradesh

http://www.cseindia.org/userfiles/APPCB%20presentation.pdf



ISSUES FOR SEWAGE MANAGEMENT

1. Centralized treatment systems to be planned for next 100 years for the coming up capital of the State.
2. Decentralised Treatment Systems to be adopted to reduce load and functional problems.
3. Advanced treatment Systems i.e., extended aeration, tertiary treatment etc., to be adopted
4. Conservation of water to be adopted by recycling the treated water for flushing, gardening, irrigation and industrial usages.

ISSUES FOR PLASTIC WASTE MANAGEMENT

1. Strict enforcement of Plastic Waste (Management & Handling) Amendment Rules, 2011
2. Strategic planning for plastic free towns and cities. ϖ Prohibiting entry of plastic carry bags (less than 40 microns) into the state.
3. Total prohibition of Plastic Carry Bags in Pilgrim/Historical Centers.
4. Using plastic waste in laying of roads, conversion of plastic waste into fuel, Using in Cement Kilns
5. Encouraging usage of cloth / jute bags instead of plastic carry bags

6.1.2 Cases from Andhra Pradesh and Telangana

Conservation of Hussain Sager Lake Hyderabad city funded by Japan Bank for international Cooperation (JBIC)

http://wldb.ilec.or.jp/data/ilec/wlc12/P%20-%20World%20Case%20Studies/P-56.pdf
Objectives:

1. To improve the lake water quality by preventing pollutants entering into the lake both point source and no-point sources of pollution, besides removal of the nutrient rich sediments
2. Interception & Diversion of dry weather flows, improvement of nalas in catchment area to check the entry of polluted waters into lake
3. To improve the overall lake environment and its surroundings for enriched biodiversity
4. Increasing the potentiality of eco-tourism and economic status of local people
5. Improving sanitary conditions of people living in the catchment area and vicinity of the lake.

6.1.3 Cases from India

Urban Solid Waste Management in Indian cities (Regional Solid Waste Management)

https://www.wsp.org/sites/wsp.org/files/publications/WSP-Municipal-Solid-Waste-Management-India.pdf

The main objective of this RSWM Guidance Note is to propose an enabling policy framework that would provide guidance and direction in planning, development, implementation and management of such Regional MSW Projects in the country. It is expected that Regional MSW Projects will enable:

- Authorities to aggregate the waste quantities generated across their respective jurisdictions to take advantage of economies of scale in transportation, processing and disposal of MSW;
- Reduce the financial and technical burden on each individual Authority and help the Authorities discharge their obligation for MSW management in a cost-effective manner with better technologies;
- Result in more efficient use of land and other scarce natural resources within the region; and
- Enable better management and easier monitoring, with an optimal number of MSW management projects

http://pearl.niua.org/sites/default/files/books/GP-IN3_SWM.pdf

The National Institute of urban affairs is the national Coordinator for the PEARL Initiative (Peer Experience and Reflective Learning). The PEARL program ensures capacity building through cross learning and effective sharing of knowledge related to planning, implementation, governance and sustainability of urban reforms and infrastructure projects – amongst cities that were supported under the JNNURM scheme.

Public Private Partnerships in Municipal Solid Waste Management

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/186990/ReportPPPMunicipalSolidWasteManagement270812.pdf

Despite the increasing focus on MSW management by state and central governments, providing affordable and sustainable waste management services is among the largest municipal challenges in India. The presence of a large informal sector that remains un-integrated into the formal waste management system coupled by inadequate mechanization owing to the poor financial health of the ULBs has made the management and delivery of a well-structured MSW system a herculean task. In order to overcome the technical and financial deficiencies associated with the current system, state and local governments in India are increasingly resorting to the use of private contractors for collection, transportation and disposal and private capital to supplement the mechanization/improvisation process. In fact, private participation in the provision of MSW services is not new to India and several corporation/municipalities have

employed private contractors for secondary transportation from the communal bins or collection points to the disposal sites since 1985. However, the services provided for by the private sector then were contractual in nature and were confined to one or two segments of the MSW value chain.

6.1.3 Cases from Developing World

ARE – Advocacy for environmental restoration

http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf pg. 18

Location : Zambia
Aim of Project : Environmental Restoration and Sustainability of the Kafue River Basin

Salient features:

This is the collaboration between industrial areas, people from various communities around the industrial areas who are associated with the river basin Kafue. ARE is committed to cleaning the Kafue River in Zambia, the largest river in that country, and currently polluted from industrial and other wastes. Cleaning and initiatives of developing various treatment plants for both solid and liquid waste generated from the industries.

EnviPro – Environmental professionals' organization

http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf pg. 17

Location : Tanzania
Aim of the Project : Environmental Restoration of Msimbazi River and its catchment

Salient features:

Envi pro is the special initiatives taken by the collaboration among the industrial areas and communities around those industrial parks. Envi-Pro has been working on an outline of engineering design options and implementation costs for the environmental restoration of the Msimbazi River and its catchment in Dar es Salaam. They have also been holding meetings with the Municipal Council and Communities around the industrial area to discuss the proposed technical solution and how the Council will be involved in the implementation, which concerns the management of liquid and solid wastes from the industrial areas. As of October, 2001, the Municipal Council has supported EnviPro's proposed solution, and has accepted the proposal report and agreed to contribute part of the implementation cost.

National Solid Waste Management Programme (NSWMP)

https://www.giz.de/en/worldwide/22230.html

Title: National Solid Waste Management Programme (NSWMP)
Commissioned by: German Federal Ministry for Economic Cooperation and Development (BMZ)
Country: Egypt
Lead executing agency: Ministry of Environment (MoE), represented by the Integrated

Solid Waste Management Sector (ISWMS)
Overall term: 2012 to 2016

https://www.giz.de/en/worldwide/29020.html

Energetic utilisation of urban waste

Title: Energetic utilization of urban waste in Mexico
Commissioned by: German Federal Ministry for Economic Cooperation and Development (BMZ)
Country: Mexico
Partners: Mexican Ministry of the Environment and Natural Resources (SEMARNAT); Mexican Ministry of Energy (SENER)
Lead executing agency: Mexican Agency for International Development Cooperation (AMEXCID)
Overall term: 2014 to 2018

6.2 Community dialogue:

6.2.1 Case Studies from Andhra Pradesh and Telangana

http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf

A-GRIP at Nandigama is envisioned to provide an environment conducive for women entrepreneurs and employ state-of-the-art technologies, including clean technologies, renewable energy technologies, environmental technologies and cost-effective common infrastructure. They are coming up with entre Green Industrial Park considering local communities, providing training to them and also taking project

6.2.2 Case Studies from India

http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf

Location : Surat, India

Introduction:

Surat is one of the largest industrial cities in the western Indian state of Gujarat, and a major producer of synthetic textiles, with over 200 factories and dyestuff manufacturers consuming 10 million gallons of water daily and releasing more than 7 million gallons of effluents into local waterways. Most of these plants are small or medium enterprises with limited wastewater treatment facilities. As a result of excessive extraction of groundwater, the local water table has fallen from 60 feet to 180 feet. The poor state of Surat's environment aggravated the effects of a plague, which struck the city in 1994, after which authorities came under pressure to enforce strict pollution control standards.

Salient features:

- This increased enforcement, along with the pressures of dwindling natural resources and cost considerations, prompted Surat's textile industry to take voluntary action. In 1994, a waste management group (WMG) was set up to promote the benefits of pollution prevention and minimize waste and chemical

usage through re-use, recycling, and substitution. The WMG distributed information on the benefits of waste minimization, prepared safety data sheets for chemicals and dyes used by local manufacturers, conducted environmental impact studies, prepared energy and water conservation manuals, and launched waste minimization pilot projects.

- These initiatives brought both financial and environmental savings. One textile mill installed an effluent reuse system, and now reuses up to 80 per cent of effluent discharge, as well as using recycled water for cooling machinery. A dye manufacturer saves over 1 million liters of water every month through automation of equipment and water re-use, reducing pollution by 90 per cent, energy consumption by 40 per cent, and chemical use by 85 per cent.

- These practices lead to the happier communities around the industrial estate and hence the health conditions of the communities have been improved. As 20% of the illness among the people in India is because of the environmental pollution and degradation caused by various industrial practice

2. Naroda Industries Association

http://www.narodaassociation.org/nepl

Under the Ahmedabad Industrial Cluster Development Projects, GIDC Estate, Naroda has been selected under the Government of India's Industrial Infrastructure Upgradation Scheme (IIUS). Under this Scheme the Estate got financial Grant for the up gradation of Roads, Storm Water Drainage facilities Disaster Management, Gypsum Washery, Common Testing Lab etc.,

The Company is working as a Nodal Agency between Industrial Units and various Government agencies. The Company has two main Projects; the Common Effluent Treatment Plant (CETP) which is giving services to the polluting industries of Naroda GIDC Estate and Treatment, Storage and Disposal Facilities (TSDF), giving services to Industries of Gujarat to dispose their hazardous waste in scientific manner.

NEPL have developed a Paryavaran Mandir on the exhausted TSDF/Hazardous Waste Landfill Site at a cost of Rs.6.00 Crores having facility of Auditorium (250 seats), Cafetaria, Rest Rooms, Library and Conference Rooms.

NEPL have developed "Waste Museum" first of its kind in the World where nearly 1500 industrial units hazardous waste will be displayed showing characteristics, quantity and name of the generator to encourage Industrial Symbiosis to reduce the dumping of waste on land and creating products and to support the vision of our Chief Minister Shri NarendraModi to make Gujarat free of Waste by 2020.

To achieve the goal NEPL have signed the MoU with CEE to develop Waste Knowledge Center to make Eco-friendly products from waste and thereby to reduce use of land for the purpose of disposal of hazardous waste.

The only CETP to install Wind Mill of 1.25 MW at Varwala near Dwarka. The installation is earning nearly 2 lakh units per annum of electrical units and the same will be compensated against energy consumption of our CETP. This is an example to promote Renewable Energy to reduce Global

6.2.3 Case Studies from Developing Countries

http://www.caribank.org/uploads/publications-reports/staff-papers/SquiresSWMpaper.pdf

In the 1990's, it was decided by countries in the Caribbean and in the Mediterranean to establish new SWM systems and to close dump sites in an effort to upgrade the SWM operations. This gave the officials a good opportunity to involve the population in the planning and designing processes. These include: selecting sites for the location of critical SWM facilities; and in the operations, viz. the delivery of services such as waste picking, recycling, composting, collecting and transporting and LF management. More importantly, the population would have had some oversight of the performance in SWM activities in terms of collection schedules and routes and the effectiveness and efficiency of operating the system.

6.2.4 Case Studies from Developed Countries

http://www.gwp.org/Global/ToolBox/Case%20Studies/Asia%20and%20Caucasus/EEA%2003%202014%20Public%20participation.pdf

The first successful ECI, titled Right2Water (accepted in March 2014), invited the Commission to propose legislation that ensures access to water and sanitation across the EU, excludes water services and water resources management from liberalization and single market rules respectively, and increases EU engagement in the pursuit of universal access to water and sanitation. This initiative could evolve into a good example of public engagement leading to improved water management and increased transparency in the water sector with significant implications for users, utilities and authorities alike. In March 2014, the Commission responded to the initiative with a communication (EC, 2014). Alongside reinforcing existing activities, the communication identifies a number of remaining gaps and areas where more efforts — at EU or national level — are needed.

- In the context of PP, some of the most relevant points are the following:
- step up efforts towards full implementation of EU water legislation by Member States;
- launch an EU-wide public consultation on the Drinking Water Directive (DWD) 98/83/EC), to assess the need for improvement and how this could be achieved;
- improve information intended for citizens, by further developing streamlined and more transparent data management and dissemination for urban wastewater and drinking water;
- promote structured dialogue between stakeholders on transparency in the water sector;
- Cooperate with existing initiatives to provide a wider set of benchmarks for water services, improving the transparency and accountability of water services providers b y giving citizens access to comparable data on key economic and quality indicators.

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7. Compiling Best Practices for CCA and related topics in Industrial Areas

Literature and Web Search for Best practices for Policies, Planning, Implementation Measures in Industries, in Industrial Areas from around the World

	For:	Scope	Title of publication	Authors, Organization	Location, Date	Download Address
1	Location, Site layout of Industrial Parks					
1.1	Site Selection	1.1.1 Cases from Andhra Pradesh and Telangana	Siting and Layout planning of Industrial Parks	IGEP, ASEM German Technical corporation.	Hyderabad, 2009	http://www.hrdp-idrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf
		1.1.2 Cases from India	Wipro Campus case study	FRDC Pvt.Ltd	May 2014, Bangalore, India	http://www.slideshare.net/somajotm/green-presentation-3926808
		1.1.3 Cases from developing countries	Green design and planning resolutions for an eco-town	Laura Saikku, Research Institute for Social Sciences, University of Tampere	Bangkok, 2012	http://www.scirp.org/journal/PaperInformation.aspx?PaperID=25056
		1.1.3 Cases from developing countries	Green Design and Planning Resolutions from Eco town	Ariya Aruninta	Aug 2012, Bangkok	www.scirp.org/journal/PaperDownload.aspx?paperID=25056

		1.1.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmansville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
		1.1.4 Cases from developed countries	Boxwood business park	Partners in project green	Bowmansville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
1.2	Climate Resilient Planning of New and Existing Industrial Parks (Retrofitting, Zoning, Avoiding Heat Islands, Erosion, etc.,)	1.2.1 Cases from Andhra Pradesh and Telangana	APSEZ, Andhra Pradesh special economic zones	N Raghu Babu, Siting and layout planning	May 2012, Hyderabad, India	http://www.hrdp-idrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf
		1.2.2 Cases from India	Wipro Technologies Case study		May, 2014	http://www.slideshare.net/somajotm/green-presentation-3926808
		1.2.2 Cases from India	Design guidelines and feasibility report on Development of Industrial Park in VADA, Bellary District, Karnataka, India	IDECK, Infrastructure corporation, Karnataka	Bangalore, India, 2009	http://www.iddkarnataka.gov.in/docs/3.Prefea_VADA.pdf

		1.2.3 Cases from developed countries	Soil erosion Solutions	Helping north coast landholders reduce soil erosion. NRCMA	2007, Australia	http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf
		1.2.4 Cases from developed countries	Guide to eco-zone planning & development	Partners in project green	Bowmansville, Ontario, Canada 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
1.3	Training of planners	1.3.1 Cases from Andhra Pradesh and Telangana	Greening of GIP Jadcherla, Telangana Planning and Design of ALEAP Green industrial Park (AGRIP)	GIZ GIZ	2014 2015	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62973/20150630_GIPJadcherlacaseexample.pdf http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf
		1.3.2 Cases from India	Planning and design guidelines of Green Industrial Parks a white paper for India	Auroville infrastructure consultation	Kottakarai, Irumbai, Auroville, 2009	http://www.slideshare.net/AurovilleConsulting/green-industrial-park-a-white-paper-for-india

			Planning for integrated solid waste management at the industrial Park level: A case of Tianjin, China	ELSEVIER Publications	Waste Management 27 (2007) 141–150	https://uwaterloo.ca/planning/sites/ca.planning/files/uploads/files/Geng_Zhu_Haight_Tianjin.pdf
		1.3.3 Cases from developed countries	Strategic sustainability performance plan	Dept. of Energy, New York City, USA	NYC, 2014	http://energy.gov/sites/prod/files/2015/11/f27/DOE-SSPP-2015.pdf
		1.3.4 Cases from developed countries	Guide to eco-zone planning & development	Partners in project green	Bowmansville, Ontario, Canada 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
1.4	Strategies to reduce Soil erosion in I.P	1.4.1 Cases from Andhra Pradesh and Telangana				
		1.4.2 Cases from India	Shendra Mega Industrial Park	EIA		http://environmentclearance.nic.in/writereaddata/modification/PreviousTOR/0_0_200820155710QAnnexure-AddendumtoECforShendraMegaIndustrialPark.pdf

		1.4.3 Cases from developed countries	Tianjin Economic Development Area		As on 21.04.2016	http://en.teda.gov.cn/html/ewwz/aboutteda/findingteda/default.htm
		1.4.4 Cases from developed countries	TaigaNova Eco-Industrial Park Innovista Eco-industrial Park Dunoon Macleans Ridges, Australia Fernside, Cincinnati, USA			http://www.sprucegrove.org/Assets/pdf/plans/eco_industrial_plan.pdf www.hinton.ca/DocumentCenter/Home/View/1596 http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/254622/Soil-Erosion-Solutions-Case-Studies.pdf
2	Infrastructure in Industrial Parks					

2.1	Rehabilitation, proper Drainage, etc.,	2.1.1 Cases from Andhra Pradesh and Telangana	Siting and Layout planning of Industrial Parks Greening of GIP Jadcherla, Telangana (pg.64)	IGEP, ASEM German Technical corporation. IGEP, German Technical Corporation	Hyderabad, 2009	http://www.hrdp-idrm.in/live/hrdpmp/hrdpmaster/idrm/content/e6547/e23356/e23372/infoboxContent23374/RaghuBgtzprstn.pdf http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62973/20150630_GIPJadcherlacaseexample.pdf
		2.1.2 Cases from India	Page 16	Sustainable Urban Drainage Systems - A possible solution to the problems of Flash		https://web.sbe.hw.ac.uk

				Floods in New Delhi, India.		
		2.1.3 Cases from developing countries	Design guidelines and feasibility report on Development of Industrial Park in VADA, Bellary District, Karnataka, India Shanghai Chemical Industry Park's Plan to Become an Eco-Industrial Park Implementing the Circular Economy	IDECK, Infrastructure corporation, Karnataka *Indigo Development **Tongji University, School of Economics and Management, doctoral students	Bangalore, India, 2009 Shangai, China, 2005	http://www.iddkarnataka.gov.in/docs/3.Prefea_VADA.pdf www.indigodev.com/documents/SCIP_report06.doc
		2.1.4 Cases from developed countries	A Review of Storm water Sensitive	Department of Civil Engineering &	Monash University, January 2004	http://www.clw.csiro.au/publications/awcrrp/AWCRRP_6_Final_28Apr2004.pdf

			Urban Design in Australia	Institute for Sustainable Water Resources, Monash University		
2.2	Separation of Storm Water from Sewage	2.2.1 Cases from Andhra Pradesh and Telangana				
		2.2.2 Cases from India				
		2.2.3 Cases from developing countries				
		2.2.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmansville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
		2.2.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmansville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
2.3	Decentralized Power by RE (from wind, solar, hydro, or biomass etc., sources)	2.3.1 Cases from Andhra Pradesh and Telangana	Greening of GIP Jadcherla, Telangana	IGEP, ASEM German Technical corporation.	June, 2015	

		2.3.2 Cases from India	Design guidelines and feasibility report on Development of Industrial Park in VADA, Bellary District, Karnataka, India	IDECK, Infrastructure corporation, Karnataka	Bangalore, India, 2009	http://www.iddkarnataka.gov.in/docs/3.Prefea_VADA.pdf
		2.3.3 Cases from developing countries	Algeria Tanzania			http://www.oecd.org/env/cc/34008620.pdf
		2.3.4 Cases from developed countries				
2.4	Recycling of Water, Grey water supply, Water Storage, Central Rain Water Harvesting Systems,	2.4.1 Cases from Andhra Pradesh and Telangana	Greening of GIP Jadcherla, Telangana	IGEP, ASEM German Technical corporation.	June, 2015	
		2.4.2 Cases from India				
		2.4.3 Cases from developing countries				

		2.4.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmansville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
2.5	Integrated Transportation of Goods and Services	2.5.1 Cases from Andhra Pradesh and Telangana				
		2.5.2 Cases from India	janmarg			http://www.ahmedabadbrts.org/web/commuters.html
		2.5.3 Cases from developing countries	Green Design and Planning Resolutions for an Eco-Industrial Town: A Case Study of Polluted Industrial Estate in Rayong Province, Thailand	Ariya Aruninta, Department of Landscape Architecture, Faculty of Architecture, Chulalongkorn University, Bangkok, Thailand	Thailand, 2012	http://www.scirp.org/journal/PaperInformation.aspx?PaperID=25056
		2.5.4 Cases from developed countries				
2.6	Preventive Maintenance of Drainage, Roads, etc.,	2.6.1 Cases from Andhra Pradesh and Telangana				
		2.6.2 Cases from India				

		2.6.3 Cases from developing countries		Gravity Line Preventative Maintenance Program		http://www.lexingtonky.gov/Modules/ShowDocument.aspx?documentid=22216
		2.6.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmanville, Ontario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
3	Buildings in Industrial Parks					
3.1	IGBC / GRIHA Certified Industrial Buildings	3.1.1 Cases from Andhra Pradesh and Telangana	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.1.2 Cases from India	Kamal Agencies	Kamal Agencies	2013	http://www.kamalcogentenergy.com/CaseStudies.aspx
3.2	Storm Retrofitting of Buildings	3.2.1 Cases from Andhra Pradesh and Telangana	Planning and Design of ALEAP Green Industrial Park (A-GRIP), Nandigama	IGEP, Association of Lady Entrepreneurs of Andhra Pradesh	March 2015, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf
.		3.2.2 Cases from India	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf

		3.2.3 Cases from developing countries				
		3.2.4 Cases from developed countries				
3.3	Green retrofitting of rooftops, facades	3.3.1 Cases from Andhra Pradesh and Telangana	Planning for Sustainable Industrial Parks	IGEP, Association of Lady Entrepreneurs of Andhra Pradesh	June, 2015	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62975/20150629_PlanningofSustainableIndustrialParksa.pdf
		3.3.2 Cases from India				
		3.3.3 Cases from developing countries				
		3.3.4 Cases from developed countries	Greening of GIP Jadcherla, Telangana	IGEP, Association of Lady Entrepreneurs of Andhra Pradesh		
3.4	Preventing flooding	3.4.1 Cases from Andhra Pradesh and Telangana	Planning and Design of ALEAP Green Industrial Park (A-GRIP), Nandigama	IGEP, Association of Lady Entrepreneurs of Andhra Pradesh	March 2015, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62974/20150630_ALEAPCaseExamplea.pdf
		3.4.2 Cases from India	Wipro Campus case study	FRDC Pvt.Ltd	May 2014, Bangalore, India	http://www.slideshare.net/somajotm/green-presentation-3926808

		3.4.3 Cases from developing countries				
		3.4.4 Cases from developed countries				
3.5	Landscaping with native plants and water conservation measures	3.5.1 Cases from Andhra Pradesh and Telangana	Greening of GIP Jadcherla, Telangana	IGEP, Association of Lady Entrepreneurs of Andhra Pradesh	March 2015,Hyderbad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62973/20150630_GIPJadcherlacaseexample.pdf
		3.5.2 Cases from India	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.5.2 Cases from India	ITC Green centre Case study	Green centre, IGBC	2014	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.5.3 Cases from developing countries	Green design and planning resolutions for an eco-town	Laura Saikku, Research Institute for Social Sciences, University of Tampere	Bangkok, 2012	http://www.scirp.org/journal/PaperInformation.aspx?PaperID=25056
		3.5.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmanville, Ontario, Canada, 2014	https://www.nrdc.org/buildinggreen/casestudies/ohsu.pdf

3.6	Improved indoor environmental quality	3.6.1 Cases from Andhra Pradesh and Telangana				
		3.6.2 Cases from India	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.6.2 Cases from India	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.6.2 Cases from India	Green Building Concepts & Retrofitting of Existing Buildings	IGBC, CII - Confederation of Indian Industry	July 2013, Hyderabad, Telangana	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.6.2 Cases from India	ITC Green centre Case study	Green centre, IGBC	2014	http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e48745/e49028/e56114/e56149/2.Mr.Anand.pdf
		3.6.3 Cases from developing countries				
		3.6.4 Cases from developed countries				https://www.nrdc.org/buildinggreen/casestudies/nrdcsm.pdf

		3.6.4 Cases from developed countries	Guide to eco- z one planning & development	Partners in project green	Bowmanville, O ntario, Canada, 2014	https://www.partnersinprojectgreen.com/wp-content/uploads/2015/03/Guide_Eco-Business_Zone_Planning_and_Development.pdf
4	Industrial Processes					
4.1	Reducing exposure to flooding and cyclones	4.1.1 Cases from Andhra Pradesh and Telangana				
		4.1.2 Cases from India				
		4.1.3 Cases from developing countries	A strategic Approach to the flood Risk management	ADB, GIWP, UNESCO	2013	http://www.adb.org/sites/default/files/publication/30246/flood-risk-management.pdf
		4.1.4 Cases from developed countries	Integrated Flood Management Case Study1 Japan: Tokai Heavy Rain	Ministry of Land, Infrastructure and Transport, Japan	2004	http://www.apfm.info/publications/casestudies/cs_japan_full.pdf
		4.1.4 Cases from developed countries	United Kingdom: Parrett Catchment Project	Humphrey Temperley		http://www.apfm.info/publications/casestudies/cs_uk_sum.pdf

4.2	Water management: Increase water efficiency, water recycling, Use of grey water	4.2.1 Cases from Andhra Pradesh and Telangana	CII, godrej building, Hyderabad	Sunanda Subramanian, BMSE	Aug, 2012	http://www.indiaenvironmentportal.org.in/files/file/CII_Sohrabji_Godrej_Green_Business_Centre-Case_Study.pdf
		4.2.2 Cases from India	Wipro Campus case study	FRDC Pvt.Ltd	May 2014, Bangalore, India	http://www.slideshare.net/somajotm/green-presentation-3926808
		4.2.2 Cases from India	Industrial water reuse Case studies	Josef Lahnsteiner and Ferdinand Klegraf	Nov, 2005	http://www.wabag.com/wp-content/uploads/2012/04/Industrial-Water-Reuse.pdf
		4.2.2 Cases from India	Green buildings – some kry facts	Soma Majumdar, FRDC pvt.Ltd	May, 2010	http://www.slideshare.net/somajotm/green-presentation-3926808
		4.2.2 Cases from India	ITC Green centre Case study	Soma Majumdar, FRDC pvt.ltd	May, 2010	http://www.slideshare.net/somajotm/green-presentation-3926808
		4.2.3 Cases from developing countries	Case study Upclose, Zero waste SA Industry Programme	Government of South Australia	Jun, 2007	http://www.zerowaste.sa.gov.au/upload/REAP/ZWSA%2091392%20UpClose%20Adelaide%20Convention%20Centre%20WEB.pdf
		4.2.4 Cases from developed countries	waste water study	Jane M Carlson	May-10	http://www.whitewater-wi.gov/images/stories/public_works/wastewater/Whitewater_WWTP_ADS_Final_Report-May_2010.pdf
		4.2.4 Cases from developed countries	Industrial Water Reuse Case Studies	Josef Lahnsteiner and Ferdinand Klegraf	Nov, 2005	http://www.wabag.com/wp-content/uploads/2012/04/Industrial-Water-Reuse.pdf

		4.2.4 Cases from developed countries	Case study on , Zero waste SA Industry Programme	Government of South Australia	Jun, 2007	http://www.zerowaste.sa.gov.au/upload/REAP/ZWSA%2091392%20UpClose%20Adelaide%20Convention%20Centre%20WEB.pdf
4.3	Use of RE and decentralised power supply	4.3.1 Cases from Andhra Pradesh and Telangana				
		4.3.2 Cases from India	Green building key facts	FRDC Pvt.ltd	May, 2010	http://www.slideshare.net/somajotm/green-presentation-3926808
		4.3.3 Cases from developing countries	Sustainable business development	Sustainable Connections pvt.ltd	Feb, 2014	http://sustainableconnections.org/bizdev/tzw/casestudies#bellingham-roller-betties-waste
		4.3.4 Cases from developed countries	TCPA community group International energy technology Collaboration and climate change Mitigation Best practises of the alliance for Rural Electrification	NCG, UK International Energy Agency	May, 2014 2004	https://www.nrdc.org/buildinggreen/casestudies/ohsu.pdf http://www.oecd.org/env/cc/34008620.pdf

				Alliance for Rural Electrification	2010	http://www.ruralelec.org/fileadmin/DATA/Documents/06_Publications/ARE_Best_Practises_2013_FINAL.pdf
		4.3.4 Cases from developed countries	ZERVAS group, Sustainable Zero waste management	NRDC	Mar, 2014	https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjltuj6pPLAhXCc44KHUF6DDMQFggcMAA&url=https%3A%2F%2Fwww.nrdc.org%2Fbuildinggreen%2Fcasestudies%2F&usg=AFQjCNHT_Gx9DVEXmXP_0F3zoeZSFfwoZw&sig2=GltvN2yf5zwT_GwLm2fpow&cad=rja
4.4	Implementation of Zero Waste Technologies	4.4.1 Cases from Andhra Pradesh and Telangana				
		4.4.2 Cases from India				
		4.4.3 Cases from developing countries	Toward Zero Waste: Case Studies Sustainable Development		2014	http://sustainableconnections.org/bizdev/tzw/casestudies#bellingham-roller-betties-waste

		4.4.4 Cases from developed countries	Zero Waste SA	Alec Gilbert, Chief Executive	2007	http://www.zerowaste.sa.gov.au/upload/REAP/ZWSA%2091392%20UpClose%20Adelaide%20Convention%20Centre%20WEB.pdf
		4.4.4 Cases from developing countries	Toward Zero Waste: Case Studies Sustainable Development		2014	http://sustainableconnections.org/bizdev/tzw/casestudies#bellingham-roller-betties-waste
5	Market, supply chain, finance and insurance					
0	Diversifying suppliers to reduce dependency					
5.2	Shading of storage facilities, reduce flooding exposure	5.2.1 Cases from Andhra Pradesh and Telangana				
		5.2.2 Cases from India				
		5.2.3 Cases from developing countries	Warehousing & Bulk Storage – Environmental Industry	Case studies – Environmental, building products	Sep, 2011	http://bigtopshelters.com/building-products/environmental/warehousing-bulk-storage/
		5.2.4 Cases from developed countries	A Resource Management Giant Protects Their Own Resources	Spotlight Case study	Oct, 2014	http://www.bigtopshelters.com/wp-content/uploads/2014/05/Big-Top-Environmental-Applications.pdf

5.3	Development of resilient products, options for Change of Routes, transportation, etc.,	5.3.1 Cases from Andhra Pradesh and Telangana				
		5.3.2 Cases from India				
		5.3.3 Cases from developing countries				
		5.3.4 Cases from developed countries	State agencies for environment and climate change resilient pilot projects, USA	Department of Federal Highway Administration .	March, 2012	http://www.fhwa.dot.gov/environment/climate_change/adaptation/resilience_pilots/2013-2015_pilots/index.cfm
5.4	Use of Insurances against disasters	5.4.1 Cases from Andhra Pradesh and Telangana				
		5.4.2 Cases from India				
		5.4.3 Cases from developing countries				

		5.4.4 Cases from developed countries	The Geneva Reports Risk and Insurance Research, Insurers' contributions to disaster reduction—a series of case studies.	Meghan Orie and Walter R. Stahel	May, 2013	http://www.lse.ac.uk/CATS/Publications/Publications%20PDFs/Surminski-geneva-report-7-CaseStudy)May-2013.pdf
8	Interaction with Communities around IP					
8.1	Joint initiatives, early warning systems,	8.1.1 Cases from Andhra Pradesh and Telangana				
		8.1.2 Cases from India				
		8.1.3 Cases from developing countries				
		8.1.4 Cases from developed countries	The Hidden Tragedy Pollution in the Developing World	Blacksmith institute – Organization, New York, USA	May, 2012	http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf
8.2	Joint water and waste management,	8.2.1 Cases from Andhra Pradesh and Telangana				
		8.2.2 Cases from India				
		8.2.3 Cases from developing countries				

		8.2.4 Cases from developed countries	The Hidden Tragedy Pollution in the Developing World	Blacksmith institute – Organization, New York, USA	May, 2012	http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf
8.3	Community dialogue	8.3.1 Cases from Andhra Pradesh and Telangana	ALEAP Gajulamandyam			
		8.3.2 Cases from India	Case study of surat India Naroda Industries Association	Blacksmith institute – Organization, New York, USA	May, 2012	http://www.blacksmithinstitute.org/files/FileUpload/files/Additional%20Reports/hidden.pdf http://www.narodaassociation.org/nepl
		8.3.3 Cases from developing countries	Public participation in solid waste management in small island developing states			http://www.caribank.org/uploads/publications-reports/staff-papers/SquiresSWMpaper.pdf
		8.3.4 Cases from developed countries				

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INTEGRATION Environment & Energy
Climate Change Adaptation Project (CCA), 1st Floor, ParisramaBhavan
FatehMaidan Rd, Basheerabagh, Hyderabad – 04, Telangana, India
www.integration.org
Tel. +91 (0)40 66184019,

Responsible
Dieter Brulez, Director, CCA

Authors
Dieter Brulez, Hrishikesh Mahadev and Rajani Ganta