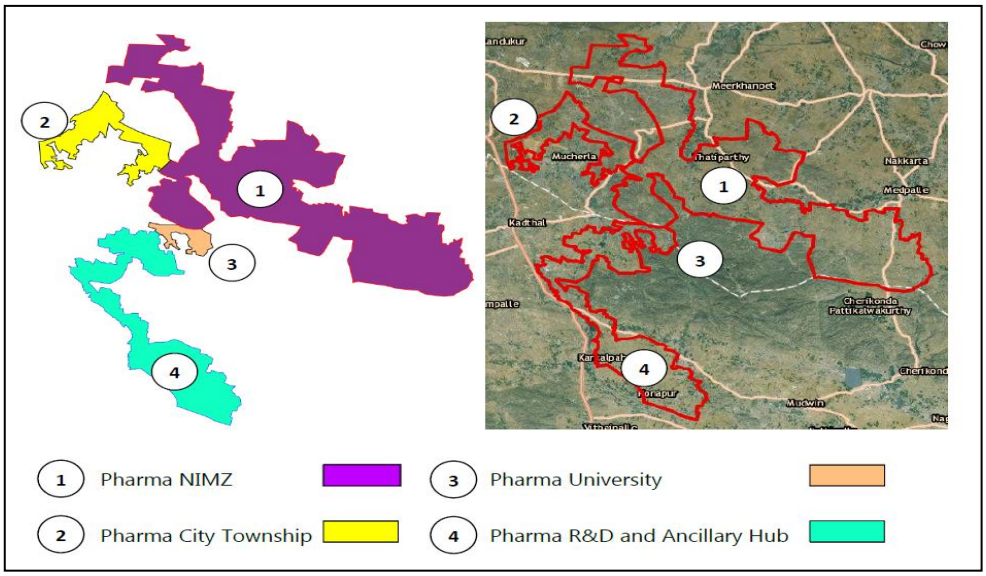
Existing IP : JEEDIMETLA



New / Upcoming IP: HYDERABAD PHARMA CITY

Baseline Documentation for Selected Industrial Parks in Telangana – A pilot Study

November, 2016

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List of Abbreviations

APIIC	Andhra Pradesh Industrial Infrastructure Corporation Limited
CCA	Climate Change Adaptation
DRM	Disaster Risk Management
IALA	Industrial Area Local Authority
IMD	Indian Meteorological Department
IPs	Industrial Parks
IT	Information Technology
ITeS	Information Technology enabled Services
PCB	Pollution Control Board
SEZs	Special Economic Zones
SC	Scheduled Castes
ST	Scheduled Tribes
TSIIC	Telangana State Industrial Infrastructure Corporation Limited

Summary:

Despite overwhelming evidence of climate change, the preparedness and action to address climate change risk has not provided the desired results. Some of the key factors of failure of a climate change adaptation project are action without holistic assessment of the risk, the nuances of the existing infrastructure, and piecemeal approach to adaptation. The industrial parks in Telangana face climate risk and need adaptation. To bring about a holistic adaptation to industrial parks in Telangana, the project ”Climate Change Adaptation (CCA project) in Industrial Areas in India” has assessed the climate risk to selected industrial parks and under this report attempts to study the baseline status of selected park in Telangana.

The findings of this report are summarised as:

- Describing a method for baseline documentation
- Applying baseline documentation to the project

The climate related profile of the IP would provide information about the past climatic trends, frequency of extreme events, and observed variability. Chapter 2 of this study guides through the method of baseline documentation.

Chapter 3 of this report provides findings and observations of the baseline study conducted at IP Jeedimetla. This includes observation during the site visit and inputs during the consultation at the zonal office.

This chapter also provides the findings about newly proposed / upcoming IP Hyderabad Pharma city which includes general observation of the current status of the IP and measures that need to be considered during future process.

1.Introduction and Background of the Study

1.1 Background of the report

Climatic conditions are never static. Historically, the climate has been changing at natural pace. However, human activities have resulted in increasing pace of these changes due to emission of greenhouse gases. The scientific community has predicted that if human intervention were to continue in the same shape and the impacts will become harsher and more unbearable with time; magnitude of loss of infrastructure, human life, business could be several times larger and more unpredictable. In the wake of these changes, communities need to assess the risk, and their current ability to cope with climatic changes, small and large, and not just address disasters post-fact-to. Such a pro-active and structured approach will lead to more resilience and sustained growth.

To provide any solution to climate change, it is important to understand precisely the current infrastructure status, management procedures, maintenance systems, and manpower capabilities to understand the climate change impacts and address them. The baseline information collection will also result in identification of infrastructure gaps, documentation gaps etc.

INTEGRATION has been entrusted by GIZ the task of developing demonstration projects or pilot cases on climate change adaptation in the industrial parks in the state of Telangana & Andhra Pradesh The first step in this process was to select IPs to be further analyzed, the second step was to establish the baseline documentation for subsequent elaboration of climate change adaptation plans and identification and implementation of climate change adaptation measures in the identified industrial parks.

INTEGRATION has commissioned Core CarbonX Solutions Pvt. Ltd to identify one existing and one upcoming industrial park in the State of Telangana and to undertake the baseline study for climate change adaptation planning.

The study involves below mentioned tasks:

- Main Task 1: Preliminary screening of climate risks in existing and upcoming industrial parks / SEZs in the States of Telangana
- Main Task 2: Rapid Climate Risk Analysis of selected existing and upcoming industrial area of TSIIC
- Main Task 3: Baseline study for the 2 selected (1-existing & 1-upcoming) pilot Industrial Parks in both states

CoreCarbonX has already submitted the report under the Task1, Task 2 The results of Task1 available in the report titled ‘Preliminary Risk Assessment of the Industrial Parks in Telangana’ has resulted in selection of six existing and four upcoming parks based on the preliminary findings on climate exposure and impact data on the adaptive capacity status of the industrial park. Results of Task 2 are available in the report titled ‘Rapid Climate Risk Analysis of Industrial Parks - Experiences Made in Telangana’. The completion of Task 2

has resulted in selection of Jeedimetla Industrial Park under TSIIC-Jeedimetla zone as existing IP and Pharma city Industrial Park located at Mucherla village under TSIIC-Shamshabad zone as new IP for the baseline study. The detail of the selection process is mentioned in Annex I. This report provides as-is-status of the above industrial parks with respect to the key vulnerabilities identified in Task 2.

This task 3 will provide detailed baseline status of the identified IP. The baseline report provides elaboration on the key baseline parameters needed for development of Climate Change Adaptation interventions. The objective of baseline documentation is to further understand and document the infrastructure and institutional framework in the IP that is already stressed and are likely to get further stressed on account of climatic changes. Adaptation measures, in the next step, will be identified for the infrastructure and institutional parameters identified as stressed.

The report is divided into three chapters:

- **Chapter 1: Introduction and background**
  This chapter provides a background of the climate change adaptation project, objectives and the key aspects of this report
  It provides in brief an overview of the earlier steps in the project i.e. Preliminary and RCRA screening reports, current industrial park set up in Telangana, climatic trends as found during the study are also briefed here.
- **Chapter 2: Baseline documentation methodology**
  This chapter explains in detail the procedure followed for collecting baseline information from the IP.
- **Chapter 3: Baseline observations and findings**
  This chapter describes baseline status of all the key parameters. The information presented in this section is based on survey and other secondary source of information and through any sample collection and primary data.

2.Baseline Documentation Methodology

2.1 Development of baseline

Creation of a baseline of existing assets and services becomes the starting point for climate risk analysis where multiple components are taken together and their interactions are studied. Therefore, to document the baseline, as the first step, an inventory of critical infrastructure in the industrial park was developed. Subsequently, identification of hot spots of these assets and services to climate change impacts for climate resilient interventions was conducted. The figure below shows the broad approach that was followed for this study.

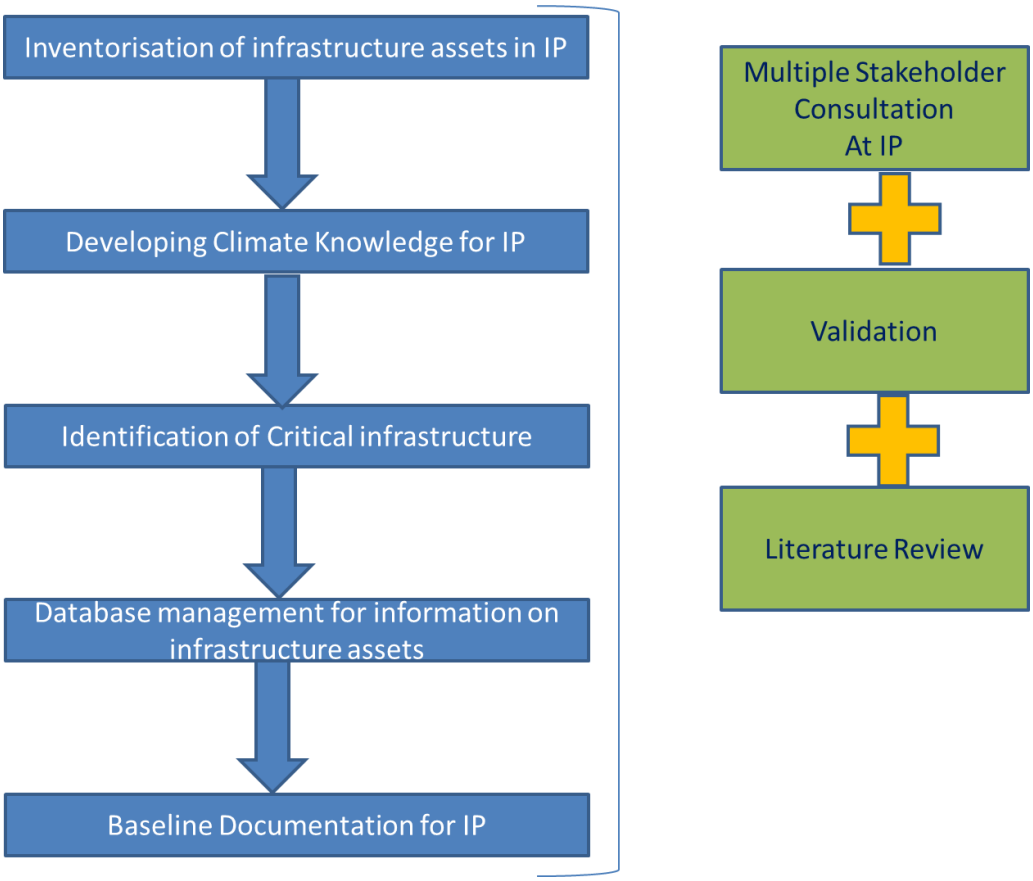

FIGURE 1: METHODOLOGY FOR BASELINE DOCUMENTATION

Inventorisation of infrastructure assets in IP

In Telangana, climate change does not yet figure as one of the primary considerations while planning of Industrial Park. Besides, even if the IP has an environmental goal outlined, it is often observed that it is not translated into the design elements of infrastructure and services for climate resilience. Thus, infrastructure inventories of IP are a starting point and the very basis for preparation of risk inventories for climate change. Infrastructure inventories provides the basis for understanding interdependencies of various sectors. The focus of the

infrastructure inventory was on collecting baseline information on infrastructure assets and services at the IP level. The approach that will be followed has been illustrated in the below paragraph:

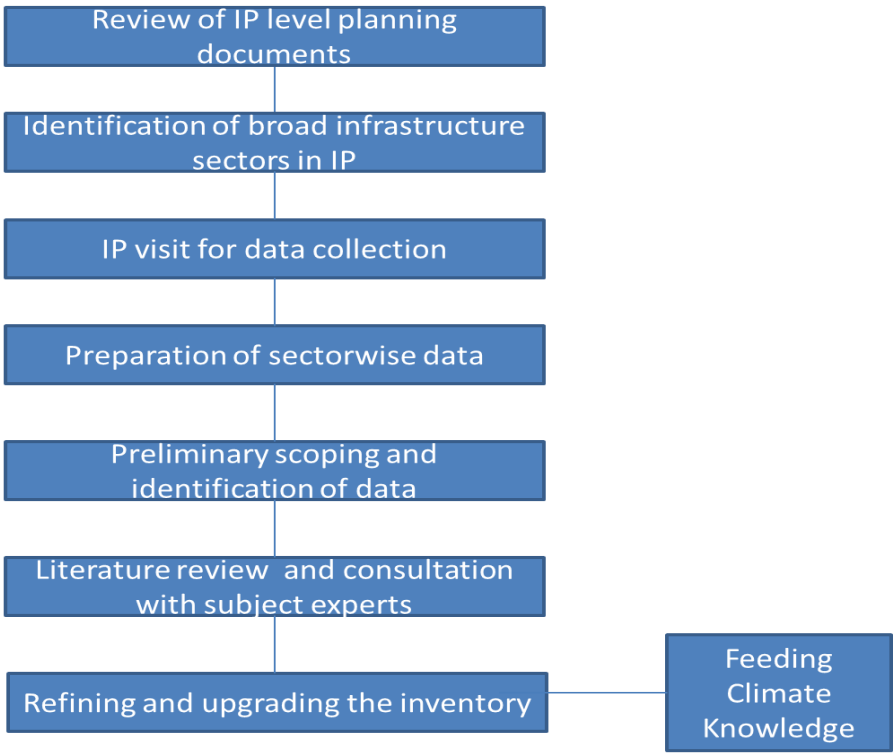

FIGURE 2: APPROACH FOR THE INVENTORISATION

Developing Climate Knowledge of IP

The knowledge of climate, particularly in the context of IP like rainfall, storm surges, availability of water, flood etc., is an essential component of this study. This has already been evaluated for the selected IP at the earlier stage. The same information has been consolidated to make an assessment of impact of these climate hazard on IP.

Identification of Critical infrastructure

In the next step, the climate hotspots was spatially plotted on the IP to identify areas and assets that are likely to be affected. The following criteria has been selected to identify critical infrastructure assets in IP:

- Infrastructure assets which are likely to be affected due to flooding, exposure to urban flood and heavy rainfall.
- Infrastructure assets which are critical for relief/ response in case of water scarcity/heat wave.

These include road networks, open areas/public spaces/parks, emergency response stations, etc.

2.2 Baseline Documentation of IP

This stage involves preparation of a detailed IP profile.

The IP profile may be categorized as non-climatic and climatic.

The non-climatic profiling involves collecting information and understanding the following:

1. Socio–economic profiling— Density of industries and economic parameters.
2. Environmental profiling— Natural assets of the IP like nearby rivers, water bodies, green cover, waste treatment and disposal, etc.
3. Institutional profiling— this would involve an institutional analysis of IALAs and their functions.
4. Major functions/sectors— an assessment of the major function of the IP in terms of type of industries and size of industries.
5. Growth trends (Physical and demographic)—Growth trends of the IPs in terms of increase in number of industries. A detailed study of the land-use/master plan would be necessary to understand the growth trends.
6. Future projections for growth—Account the future expansion, demands and industry growth of the IP.

The climate related profile of the IP would provide information about the past climatic trends, frequency of extreme events, and observed variability. Some of the indicators with respect to key sectors and their respective guiding questions for baseline documentation are given in the below table. The guiding question will also result in identification of areas under each indicator for documentation.

TABLE 1: GUIDING QUESTIONS FOR BASELINE DOCUMENTATION

Indicators	Guiding Question
Socio Economic Profile	In which part of the IP the density of SMEs is more? What has been the extent of casualties/ impacts on Industries and workforce because of past climate-related events or hazards? The key sector within the IPs?
Eco system	Are there fragile stretches of land sensitive to any of the identified climate hazards? What are the key issues which have made the land sensitive? Has the expansion of built-up areas affected the ecosystem in terms of increasing its sensitivity? Has there been impact on the ecosystem of the IP due to extreme events or hazards?
Infrastructure and Basic services	Which part of the IP is critically affected by water availability? Whether energy systems (power infrastructure) are prone to climate change? Whether precipitation projections likely to surpass drainage capacity? Is the drainage of the IP efficient to handle extreme climate events such as heavy rainfall? Would hazards like floods hamper the basic services like drinking water supply/supply lines?

Outcome

The outcome for the baseline documents is presented area wise. An example of the baseline document outcome has been presented in the below table:

Example

Area	Sensitive Sector	Factors Causing Sensitive
Phase I	Solid Waste management. Water Supply Grid Connectivity	Flood Prone
Phase III	Road Infrastructure	Water Scarcity No water conservation Low Elevation Heat Wave

3. Baseline observations and findings

3.1 Baseline Status of Existing Industrial Park at Jeedimetla

IP Jeedimetla spans in an area of about 894 acres. It is divided into five phases namely, **Phase I, Phase II, Phase III, Phase IV and Phase V.** Phase II and Phase IV and separated from other phases by the main road that passes between them. Phase II is a residential colonies and does not have any industries under its boundary.

The information collected during earlier phases of the study has also contributed towards development of baseline documentation.

TABLE 2: THE KEY FINDINGS OF THE BASELINE DOCUMENTATION ARE AS FOLLOWS:

Aspect	Observations
General profile	It is one of the oldest IPs located within GMHC limit and well connected to all the major transportation and other infrastructure. Bulk Drug, Pharmaceuticals, Chemical, Engineering, Paints, Pesticides, Textile, and steel rolling industries are the major occupants of the IP. The IP is nearly 100% occupied with no further space for new industrial development. It houses about 1100 industries with an employee population of about 30,000 employees.
Climatic profile	Impacted by drought, heatwave and flash flood
Open space	Overall open space in the IP is about 10%.
Water logging and storm water system	All phases of IPs experience water logging. The number of water logging spots in Phase III and Phase I are more as compared to other phases. Storm water drains are present cover large portion of the IPs. However, they are being discontinued at certain places. Due to open drainage system and disposal of garbage around the drains they are clogged with heavy silt, leaves, and other items. The cleaning of drainage channels are usually done before monsoon and whenever it gets clogged.
Energy system	Almost all the companies depend on state electricity grid for supply of power. However, some of the companies do have provision for diesel generator sets as source of backup power. Many pharma, chemical and bulk drug units require process steam which is generated in onsite boilers of 2 to 5 MT capacity. The boilers are either run on coal and /or biomass. No data was available to confirm the percentage of industries operating on coal and biomass respectively.

Governance and management system	TSIIC zonal office and IALA are responsible for management of the IPs like, roads, common lights and other infrastructure.
Water and waste water system	Ground water sources in and around IP Jeedimetla have been polluted due to leaching of chemicals. Thus, the industries are mostly dependent on water supplied by HMWSSB (mostly through water tankers) and on private water tankers. India's first Combined Waste Water Treatment Plant [CWWTP] at Jeedimetla Industrial Area Jeedimetla Effluent Treatment Limited (JETL) was established in 1989 which has a treatment capacity of 5000 m3/day. It treats both high and low TDS effluent and domestic wastewater as well.

The above methodology was applied to the baseline study of existing industrial park i.e. IP Jeedimetla located at Jeedimetla zone in Hyderabad to collect and document the baseline situation at the Industrial park.

A two day visit on 20th, 21st of May 2016 and subsequent visit on 2nd September 2016 was carried out by the team to IP Jeedimetla. A focused group consultation was conducted at the IALA office of the IP on 20th of May. The relevant stakeholders who consulted during the visit were:

- IALA commissioner, Jeedimetla IP
- Secretary, IALA, Jeedimetla IP
- Treasurer, IALA, Jeedimetla IP
- Members, IALA, Jeedimetla IP
- Zonal Manager, Jeedimetla, TSIIC
- Zonal Environmental Engineer, Jeedimetla, TSIIC
- Environmental Engineer, Head office, TSIIC

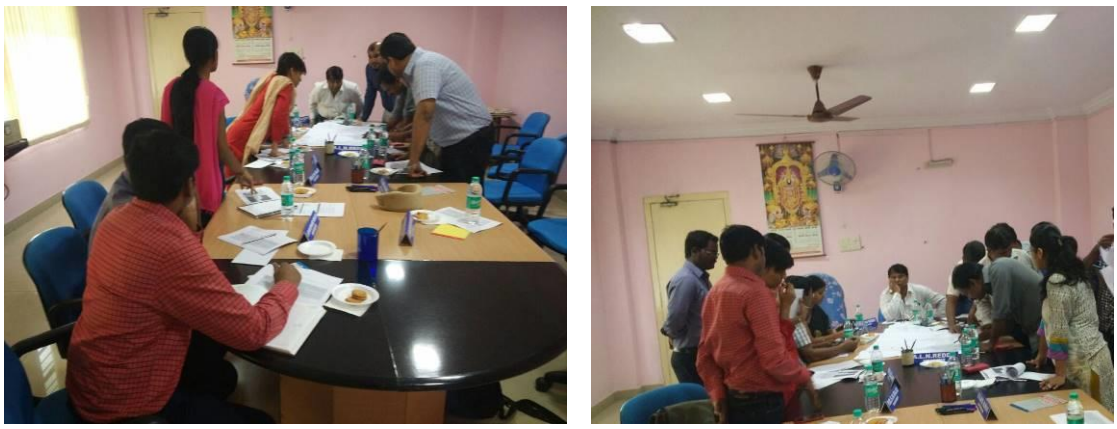

FIGURE 3: CONSULTATION PROCESS AT IP JEEDIMETLA ZONAL OFFICE

The consultation was followed by reconnaissance survey on 20th and 21st of May 2016. Reconnaissance survey was carried out by team of experts from CoreCarbonX and INTEGRATION along with the assistance of IALA/TSIIC field staff. During the survey, team

visited all the five phases of IP Jeedimetla i.e. Phase I to Phase V and interacted, interviewed with few industries including water supply station, Jeedimetla Effluent Treatment Plant (JETL) and Identified major water logging locations in the IP,
The INTEGRATION team also verified these locations after August 31, 2016 heavy rains, which flooded many places within industrial parks.

FIGURE 4: WATER LOGGING IN THE INDUSTRY AFTER 3 DAYS OF HEAVY RAINFALL

3.1.1 Non- Climatic Profile of Jeedimetla Industrial Park

IP Jeedimetla was established more than 40 years ago in the year 1973. It is located in Jeedimetla Industrial zone of TSIIC and administratively in the Rangareddy district of Telangana. It falls within Greater Hyderabad[1] Municipal Corporation (GHMC) limits and lies in the Northwest part of Hyderabad. It is well connected with the main road. It is about 15 km from the center of Hyderabad city and about 45 km from the Rajeev Gandhi International Airport at Hyderabad. It is about 20 km from the Hyderabad railway station.
In the last 4 decades, Hyderabad city has expanded in size and the industrial park is now within the city limits. Population density around the park has also grown and the surrounding area is densely populated. There are no major water bodies in the immediate vicinity of the IP. The immediate surroundings of the IP do not have any major green patches.

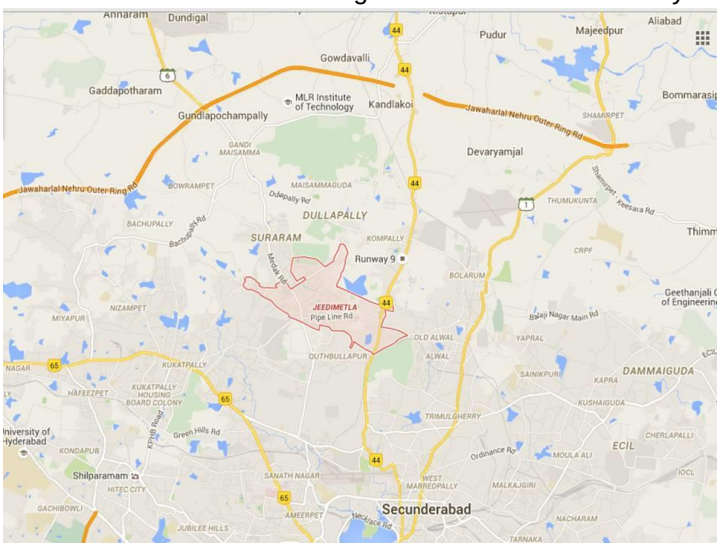

Figure 5: Location map of IP Jeedimetla

[1] Hyderabad is the capital of the state of Telangana.

IP Jeedimetla spans in an area of about 894 acres. It is divided into five phases namely, **Phase I, Phase II, Phase III, Phase IV and Phase V.**

Phase II and Phase IV are separated from other phases by the main road that passes between them (as shown in the map below). There are no physical boundaries demarcating or separating one phase from the other phase. There are no entry and exit gates.

Phase II is a housing/residential area and does not house any industries. Other phases of the IP are purely industrial having small, medium and large scale industries. Bulk Drug, Pharmaceuticals, Chemical, Engineering, Paints, Pesticides, Textile, and steel rolling industries are the major occupants of the IP. The IP is nearly 100% occupied with no further space for new industrial development. It houses about 1100 industries with around more than 30,000 workforces.

Amongst all the phases**, Phase I is the largest phase**. It covers a total of 358acres. The percentage of open space in Phase I is the lowest i.e. 6%. All other phases have more than 10% open area. Total open space at IP Jeedimetla is 84 acres which is about 10% of the total area. However, it has 21.6 acres of open space which is the largest in all phases. Phase II is a residential area and smallest in size. In addition to Phase II, 53 acres of land in Phase IV has been allocated to government scheme titled AP Rajiv Swagruha, a housing scheme for moderate income group people.

TABLE 3: PHASE WISE PROFILE OF IP JEEDIMETLA

Phase No.	Year Est	Plotted Area		Roads		Open spaces		Area for other purpose		Total
Phase I	1975	267.61	74.74%	60.61	16.93%	21.61	6.03%	8.25	2.30%	358
Phase II	1981	17.01	47.55%	10.21	28.54%	4.57	12.77%	3.99	11.14%	36
Phase III	1979	102.5	66.16%	28.01	18.08%	17.39	11.23%	7.02	4.53%	155
Phase IV	1981	98.91	73.29%	17.99	13.33%	18.06	13.38%			135
Phase IV (Rajiv Swagruha[2])								53.00		53
Phase IV (extension)		20.24	45.27%	13.06	29.21%	7.22	16.15%	4.19	9.37%	45
Phase V	1983	79.9	69.48%	19.7	17.73%	15.40	13.39%			115
Total		**586.167**		**149.58**		**84.25**		**76.45**		**896**

[2] Rajiv Swagruha: An area of 53 acre has been allotted to AP Rajiv Swagruha scheme which provides affordable housing to people.

No major water body is located inside the IP other than water storage tanks. Fire station is located at Phase III next to the bus depot. Common Effluent Treatment Plant /JETL is also located at Phase III. (Map of IP Jeedimetla showing all these items is attached as Annexure B).

3.1.2 Water logging

Storm water drains are existed in all phases of the IP and cover about 60% of the total area of IP Jeedimetla. During the survey it was found that most of the parts of IP Jeedimetla have storm water drains. These drains run along the length of the road and are mostly open. Drains are present on both sides of the road but in some cases they run only along one side of the road. Rain water from the industrial premise flows into storm water drains, which discharge it into the Municipal sewers, and open nallahs. Some of the storm water flows into natural drains or open spaces outside the IP. The storm water drains are discontinuous at certain places. The storm water drains are open and are usually cleaned before monsoon season or when the drains are blocked.

FIGURE 6: SEWER DRAINS AND GARBAGE IN IP JEEDIMETLA, WHICH POLLUTING THE AREAS

Rain water finds its way into the storm water drains. Whenever the design and maintenance of drainage system is inappropriate it leads to the possibility of flooding/water logging during events of heavy rainfall.

Each phase of IP Jeedimetla has few water logging and/or flooding prone zones. While conducting baseline survey all water logging or flooding areas were identified with the assistance of TSIIC and IALA field staff and visited. The hotspots have been identified by using below legends:

Legends	
	Sensitive Areas-Water Logging
	Water Logging/Flooding
	Industrial Hotspots

FIGURE 7: SEWER DRAINS IN IP JEEDIMETLA, WHICH OVERFLOWS DURING HEAVY RAINFALL FURTHER POLLUTING THE NEARBY AREAS

Some of the common observations are as below:

- Municipal waste is found lying along the drain- as a part of the cleaning process or as a practice to dispose waste
- Though site visit was conducted during a dry weather several drains had blackish water flowing through them indicating discharge of sewage water into it
- Road intersections in the low lying areas have been identified as hotspots for water logging
- Shoulders of the road at several places are neither paved, nor covered with a green patch providing opportunity to the loose top soil to enter the drains. This increase the possibility of silt accumulation in the drains.
- All the industries where boilers are in operation and there are located adjacent to each other has been identified as possible hot spots.

3.1.2.1 Water logging in phase I

Around six water logging sites were identified in Phase I. Amongst the identified water logging locations, site number V21 was found to be the most effected site. It is situated at Road no.5. This storm water drains over flows during the rainy season due to over loading at the site. A distillery is situated next to the drain. This distillery has in the past experienced water logging due to over flow of the drain. As a remedial measure the distillery has elevated its floor level.

TABLE 4: WATER LOGGING LOCATIONS IN PHASE I OF THE IP

Location No. (As in the map)	Geographical coordinates	Description
V20	17°51'63" E 78°48'01"	Water logging occurs on both side of the intersection.
V21	17°51'50" E 78°45'17"	The drain at this point gets over loaded due to which water from drain over flows on the road. As a result, rain water has no place to drain resulting in heavy water logging.
V22	17°51'63" E 78°44'89"	It is located on Road no 6 and experiences water logging from overhead tank till the intersection of roads. The water logging at this location is significant but has not resulted in loss to any industry.
V23	17°51'43" E 78°45'09"	This site is located on road no7. Water logging occurs during rainy season and usually covers from plot no 30 to 35 on that road. Industry has not

		experienced damage due to flooding.
V24	17°50'88" E 78°45'42"	The water logging at this location is usually not significant
V25	17°51'26" E 78°45'12"	The water logging at this location is usually not significant

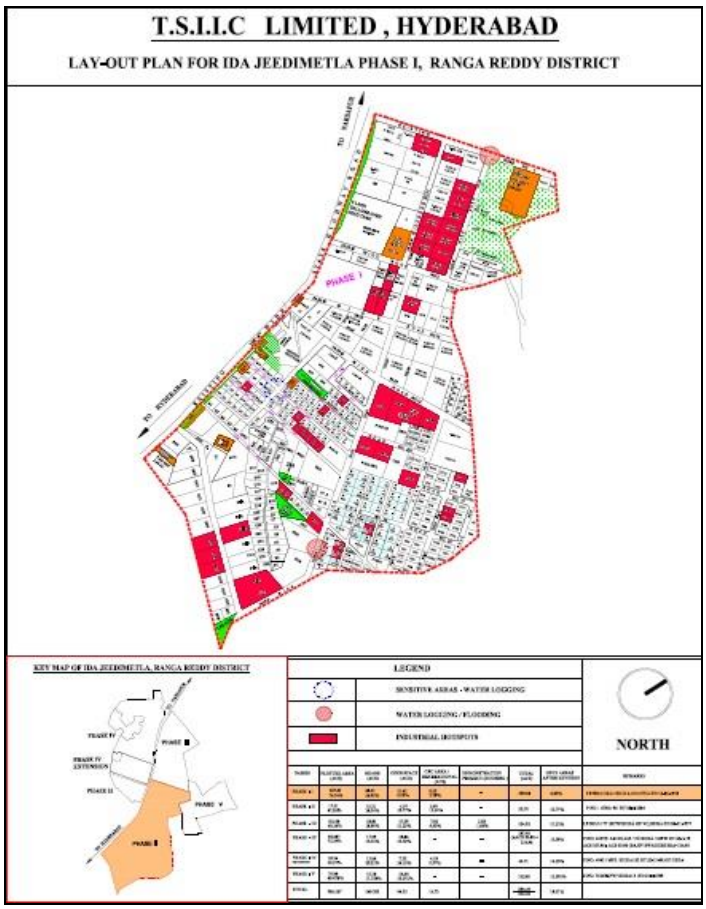

FIGURE 8: CLIMATE HOTSPOTS MAP FOR PHASE I

3.1.2.2 Water logging in Phase II

Phase II is a residential area and one identified water logging was observed. Hence, no sites are reported under Phase II.

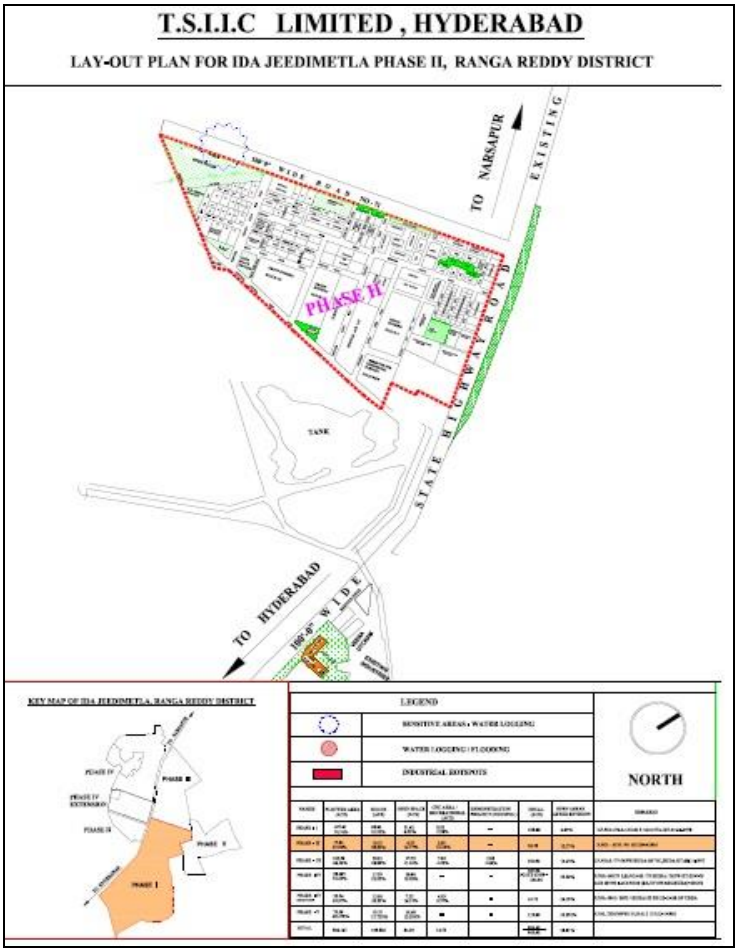

FIGURE 9: CLIMATE HOTSPOTS MAP FOR PHASE II

3.1.2.3 Water logging in Phase III

Phase III has 9 water logging sites which are either at the intersection of roads or near the intersection. These sites are mostly low lying areas and hence, experience water logging.

Road no. 35 has 3 water logging sites namely, V11, V12 and V13. Similarly there are two water logging site at road no. 36 and one near it. Generally, it is observed that water logging sites in Phase III are not immediately in from of a chemical, bulk drug or pharmaceutical unit.

TABLE 5: WATER LOGGING LOCATIONS IN PHASE III OF THE IP

Location No. (As in the map)	Geographical coordinates	Description
V11	17°52'59" E 78°44'45"	This site is located at the intersection of road no 35 and road no33 in front of the IALA office. There is a large vacant space in front of the IALA office on road no. 35. The site is low lying and receives water from all the sides.

V12	17°52'59" E 78°44'45"	It is located on Road no 35 at the intersection in front of plot no. 59. It receives water from upper side of both the roads at the T-junction.
V13	17°52'68 E 78°44'68"	It is located on road no. 35 in front of plot no. 56 and 68A and experiences logging due to water flowing from the upper side of road no. 35.
V14	17°52'82" E 78°44'28"	This site is located in between plot no. 144 and 145.
V15	17°52'82" E 78°44'28"	This site is located at the intersection of road no. 36 and road no. 33. It is a low lying area. It receives water from road no. 36 flowing from plot no 145 towards the intersection. It also received water from the north east direction of road no. 33
V16	17°52'73" E 78°44'13"	This site is located at the intersection of road no. 36 and road no. 32. Water flows from north west side of road no 36 and north east side no 32 towards the intersection.
V17	17°53'18" E 78°44'10"	This site is located on road no 33 in front of plot no. 183. This is the only site in Phase III where water logging occurs in front of a chemical /pharma unit.
V18	17°53'25" E 78°43'92"	This site is located on road no. 39. Water gets logged in front of plot no. 176 and 180.
V19	17°53'24" E 78°4'86"	This site is located at the intersection of road no 3 9and road no. 32. Water logging zone extends from the intersection till plot no. 11/B

FIGURE 10: IMAGES OF V11 & V12 LOCATION AREAS

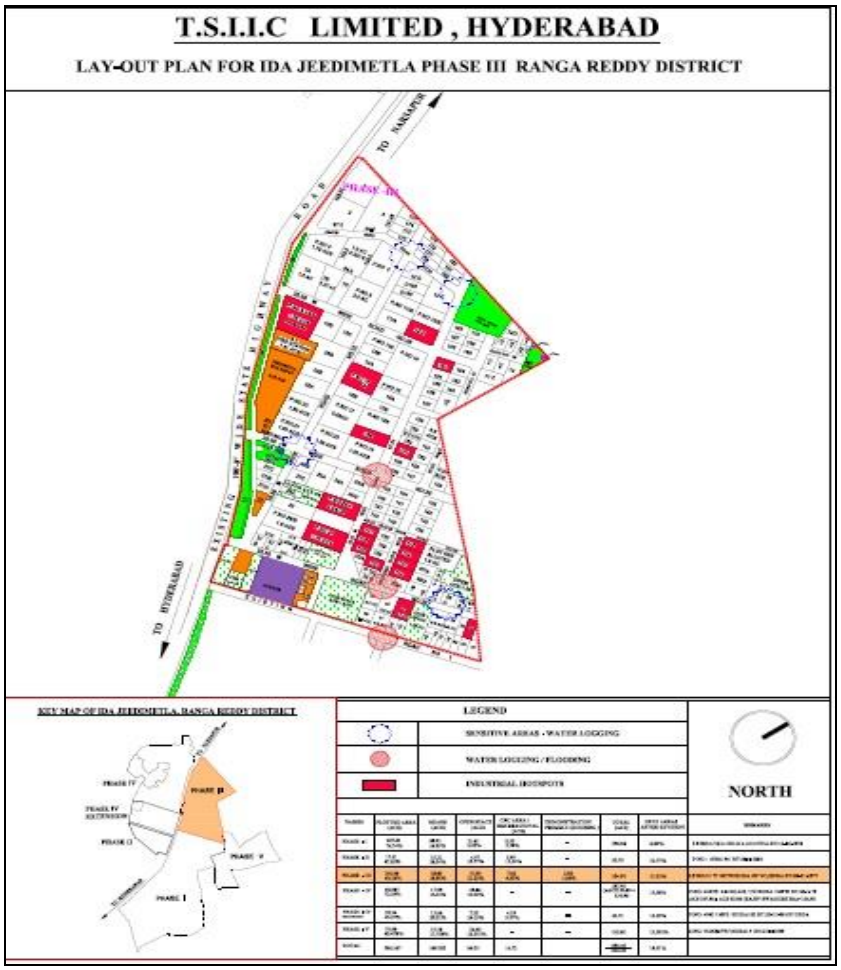

FIGURE 11: CLIMATE HOTSPOTS MAP FOR PHASE III

3.1.2.4 Water logging in Phase IV

Phase IV has seven water logging sites out of which 3 sites (i.e. V1, V2 and V3) are located in one patch of road no 52. There is a natural slope from plot no 38 till plot no 42/A, which is the lowest point and site number V1 is located here. Site V1 also receives water due to the terrain from road no 56 and other side of road no 52 i.e. from plot no. 44/A till V1. Thus, amongst the three sites on this road site V1expereiences maximum flooding.

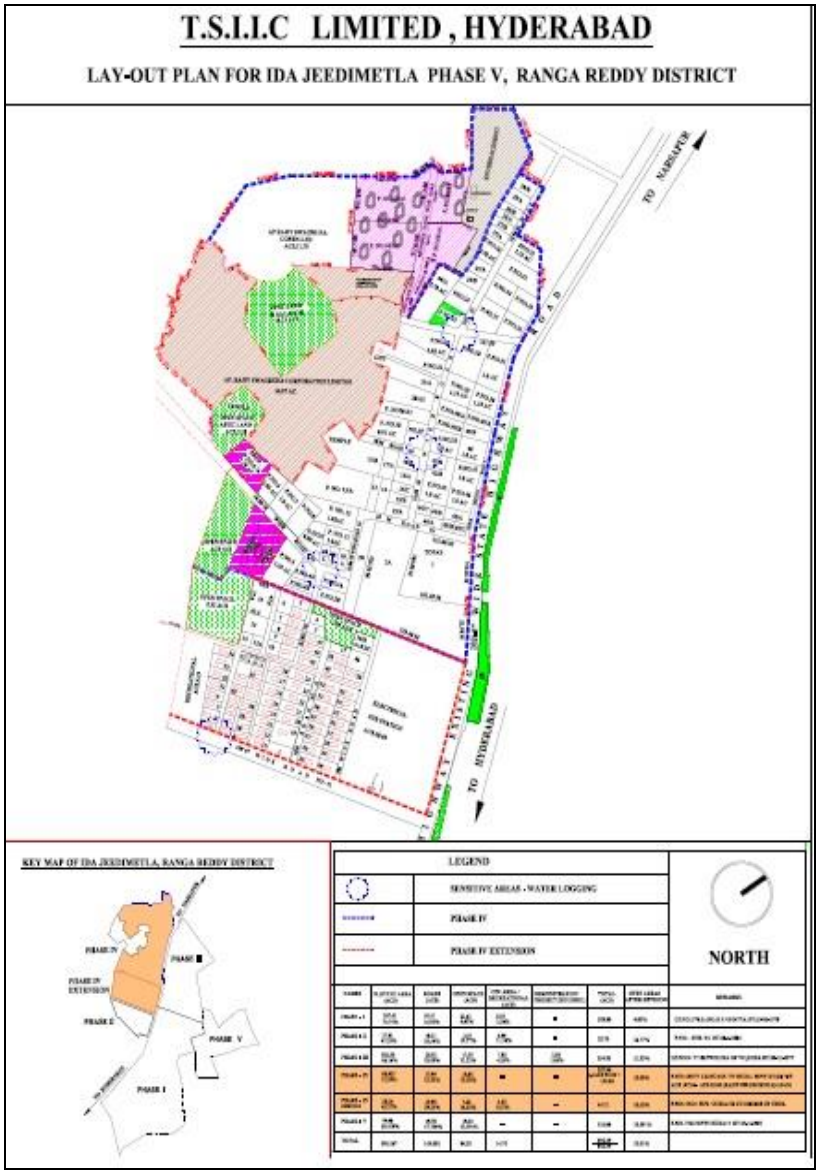

FIGURE 12: CLIMATE HOTSPOTS MAP FOR PHASE IV

TABLE 6: WATER LOGGING LOCATIONS IN PHASE IV OF THE IP

Location No. (As in the map)	Geographical coordinates	Description
V1	17°31'37.93"E 78°26'15.34"	It is the lowest point on road no 52 and experiences water logging due to water flowing from three directions as depicted in the map.
V2	17°31'43.16" E 78°26'14.61".	This site is also on road no 52 close to V1 and received water coming from plot no 38A.
V3	17°31'33.08" E 78°26'18.91"	This is the third site located on the same road. It gets water logged due to water coming from road no. 52 itself and the hillock.

V4	17°31'46.86" E 78°26'6.47"	This site is located in front of plot no 3A. It is a low lying area. It receives water from road number 54 and 55.
V5	17°31'32.36" E 78°26'11.51"	It is located in front of plot no. 6 and 7 on road no. 55. It is in front of a small hillock and elevated open land. It receives water from this land formation.
V6	17°31'23.30" E 78°26'12.01"	It is located in front of plot no. 17 and 47. It is the dead end of one of the internal roads. The dead end has a small open space next to it.
V7	17°31'10.22" E 78°26'17.86"	This site is located in front of plot no. 1 around the corner where the road forms a T-junction with road no. 71.Road no 71 separates phase IV from Phase II.

3.1.2.5 Water logging in Phase V

In Phase V only two water logging sites were identified namely, V9 and V10. The water logging at both theses sides has not resulted in any physical loss to industries in the area.

TABLE 7: WATER LOGGING LOCATIONS IN PHASE V OF THE IP

Location No. (As in the map)	Geographical coordinates	Description
V9	17°31'45.81" E 78°27'8.97"	The intersection of road no. 34 and road no 64 is a low lying area and hence experiences water logging
V10	17°31'41.76" E 78°27'8.11".	The intersection of road no. 80 and road no 62 is a low lying area and hence experiences water logging

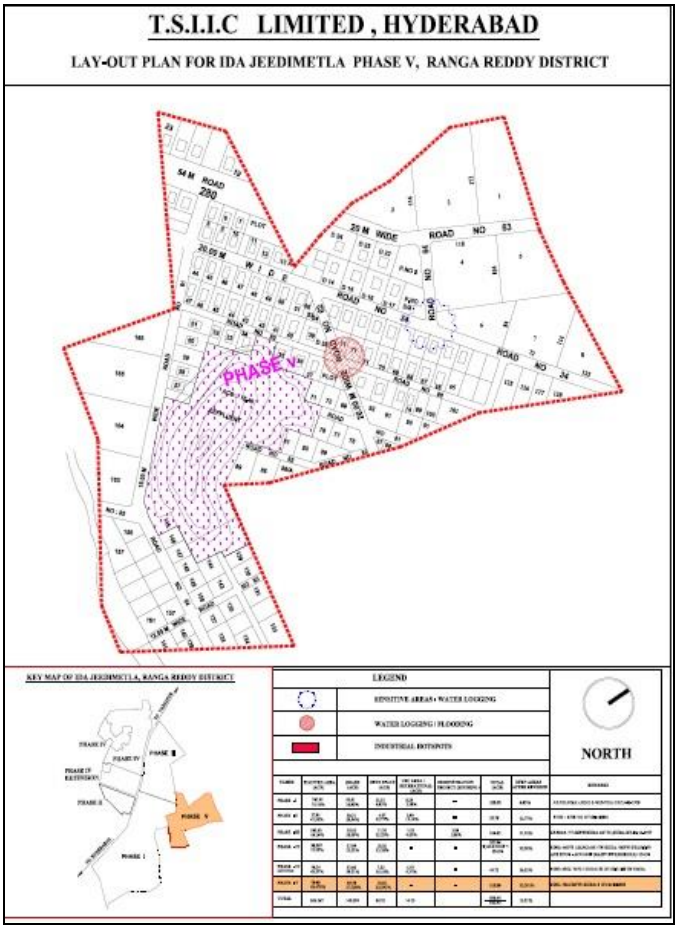

FIGURE 13: CLIMATE HOTSPOTS MAP FOR PHASE V

FIGURE 14: STRUCTURES CONSTRUCTED TO DIVERT WATER FROM ROAD TO THE DRAINS

3.1.3 Governance and Management System

IALA has the responsibility of managing the IP along with TSIIC. The IALA allocates about 20% of its funds for environment related activity which includes plantation, storm water drains management, etc**.** However, no separate funds are allocated towards climate change and disaster management activities. It does not have a workforce which understands the details of climate change aspects. In the absence of this project, the IALA does not intend to spend on enhancing the manpower capabilities.

In the event of any climate change related disaster IALA does not have an identification, reporting and action plan to manage the same. Although, IALA gets frequent complaints related to power outage, submergence, etc., during heavy rainfall and thunderstorms.

3.1.4 Energy System

It is a general practice in the IP to procure power through state electricity board instead of generating power onsite. TSIIC or IALA does not operate any common power or steam generating facility for common offices in IP, lighting or any other purpose. During power interruptions by the supplier, most of the medium and large scale industries operate on diesel generators located in their premise. Overall about 40% of the industries have a diesel generator in their premise.

Amongst all types of renewable sources of power, solar based power generating systems are most popular. Solar water heaters, solar lights and solar fencing systems have been installed by some of the medium and large size industries. There is no other form of power generation and renewable power source used in the IP.

All chemical, bulk drug and pharma units require process steam in the range of 2 to 5 tonnes per hour. To meet the power requirement each unit has installed its own boiler. Coal and biomass the two fuels used in the boiler. During the baseline study, few industries were contacted to understand the fuel type used by them. They confirmed the use of coal and biomass.

3.1.5 Water supply and wastewater management

3.1.5.1 Water Supply

The industrial growth of IP Jeedimetla has have severe negative impacts on the ground water quality of the IP and its surrounding areas. The pollution level of ground water is so high that it is not suitable for use by most of the industries. Many industries in the IP belong to bulk drug, pharma, chemicals and pesticide sector which require high quality process water. This has left the industries with only two options of obtaining water namely, from municipality (mainly through tankers) and other being private tankers.

Hyderabad Municipal Water Supply and Sewerage Board (HMWSSB), has a water supply station at Phase III. It is situated next to the main road i.e. the state highway. This station supplies water to industries in the IP, surrounding slums, and residential colonies namely, Sururam colony, Subhash Nagar and Rajiv Gandhinagar. The water supply station has an overhead tank with water holding capacity of 3 lakh gallons, 900KL water sump and pump house for pumping water through pipeline. The water station supplies about 4.7MGD of

water through pipeline. In addition to piped supply, water for commercial purposes is supplied through tankers at a price of INR 700 for 5KL of water.

FIGURE 15: WATER TANKS IN IP JEEDIMETLA

Each industry is responsible to organize water for process and non-process requirements. IALA office or TSIIC is not responsible for organizing water supply for the industries. Since, industrial user is responsible for managing the water supply the data on water use by individual industry is not available with TSIIC or IALA office. However, each industry records its own water consumption and water supply details and submits it to the state pollution control boards regional office. Such submission is mandated by the Consent for o operate (CFO) issued by the state pollution control board. Consent for operation is a certificate which allows the company to operate based on curtained environmental performance parameters for the industry. CFO needs to be renewed periodically. Though SPCB may have data on the water consumption pattern of industries it usually, does not collate the information to understand or report the water consumption pattern of an IP.

However, based on limited information available the phase wise water consumption is given below:

- Phase I – not known
- Phase II – 1000KL/Month is consumed by the training institute. Water consumption by the remaining housing units is unknown
- Phase III- Housing, automobile and fine chemical units in this phase consume 23056 KL/month of water. Water consumed by other types of units is unknown.
- Phase IV – Plastic, General engineering and rubber units consume 12000KL/month of water. Water consumed by other types of units is unknown.
- Phase V – Pharma, drugs and engineering units consume 16013KL/month of water. Water consumed by other types of units is unknown.

From the baseline survey it was found that:

- Water inventorization at IP level is not available

- Water pricing for different industries and industrial sectors is absent in public domain

3.1.5.2 Wastewater

Common Effluent Treatment Plants (CETP) / JETL at IP Jeedimetla, is the first such effluent treatment unit in India. It is operated by an independent entity called Jeedimetla Effluent Treatment Limited (JETL). CETP is located in Phase III of the IP. It is accessible from Road no 1 and Road no 13. It covers an area of 20 acres, out of which 4 acres is covered by Green patch.

The objective of setting up JETL is to receive the industrial effluent from the small and medium industries for treatment and disposal to the sewers of HMWSSB which meets at Amberpet Sewerage treatment plant (STP) before the treated water flows into the river. Prior to setting up of JETL, the effluent from the industries was discharged into open Nala which is flowing through JIE.

Treatment facility was commissioned in April, 1989 at the cost of Rs. 46 Lakhs to treat 350 m3/day of effluent using Activated Sludge Process. During 1998, the CETP was converted into a Combined Wastewater Treatment Plant (CWWTP) for treating industrial waste and the domestic sewage in a combined plant before discharging to the sewers of HMWSSB.

JETL is treats High TDS (HTDS) and Low TDS (LTDS) wastewater. Multi effective evaporator is used to treat HTDS. The total plant capacity is 5000 m3/day. It currently treats 3500 m3/day of sewerage, 1500 m3/day of LTDS and 400 m3/day of HTDS wastewater.

All industries do not send their effluent to JETL plant. They release the effluent into the drains either after or before treatment of the effluent in their premise. The type of wastewater treatment is also dependent on the type of industrial activity. Several Pharmaceutical and bulk drug industries have statutory obligation to maintain zero liquid discharge. Many of these industries have ETP's in their own premise to meet the zero liquid discharge condition. Those who choose to use the services of CETP send the effluent through tankers. Users pay for the treatment depending on the quantity and quality of effluent being sent to JETL.

3.2 Climatic Profile of Jeedimetla Industrial Park

IP Jeedimetla's is located in semi-arid region. It is experiencing changes in climatic pattern. The rainfall and temperature pattern have been altered during the past few years. The minimum and maximum temperatures during the seasons have changed. The temperature during summers has increased and the duration of summers has increased. The number of days with heat waves has risen during the last decade.

Drought is another climatic phenomenon which is an indicator of inadequate rainfall and water availability in the region. This term is usually applied to drinking water and for agricultural purposes. Here, it signifies the unavailability of water for industrial, drinking and other non-potable uses in the IP on account of low rainfall. Similar to Hyderabad, the IP has also experienced an increase in the frequency of such situations. Since, the ground water in the IP is polluted; it depends on water supplied by private tankers and by Municipal Corporation. HMWSSB draws water from Krishna and Godavari rivers. The water is received from a distance of more than 100kms and the distance of water withdrawal is only likely to increase with time. Thus, drought situation in the state which impacts the water flow in these

rivers can have a potential impact on the water availability for Hyderabad and for the industries. Thus, climatically IP Jeedimetla is exposed to water crises.

Heavy rainfall is a climatic event which has impacted and is likely to have even more severe impacts on the IP. The IP has experienced shorter but more intense rainfall in last decade. It is predicted that such variations will only increase. These incidents have increased incidents of water logging in the IP.

Thunderstorm and flash of lightening incidents appears to have increased in the region but there is no documentation on significant negative impact of these events either within the IP or otherwise in the urban areas of Hyderabad. Hence, thunderstorm and stroke of lightening are considered to be inconsequential. Around 20% of the buildings in the IP have installed lightening arresters.

Since, IP Jeedimetla is located in landlocked state of Telangana it does not face impact of cyclone, storm surge and salinization. The surrounding of IP Jeedimetla have been urbanized, hence it is not impacted by wild fires.

TABLE 8: A SNAPSHOT OF THE CLIMATIC PROFILE OF IP JEEDIMETLA IS PROVIDED BELOW:

Heat waves		Drought		Heavy rainfall including flood, landslide and other events	
Whether there are instances of heat waves in the region	Yes	Whether there are instances of drought in the region during the past years	Yes	Whether there are instances of flood, landslide and other events during the past years in and around the IP?	Yes
If yes how do you rate the instances of heat wave?	medium	If yes, how do you rate the intensity of drought?	high	If yes what type of event was observed?	small flood
Whether the duration of experienced heat waves has increased during the past years?	Yes	Whether the duration of drought has increased during the past years?	Yes	If yes, how do you rate the strength/intensity of these events?	low
If yes, how do you rate the increase in duration of heat wave?	high	If yes, how do you rate the increase in frequency of drought?	high	Have you experienced increase in duration of these events in the past years? If yes, how do you rate it?	low
Whether the frequency of heat waves has increased during the past years?	Yes	Whether the frequency of drought has increased during the past years?	Yes	Whether there are increase instances/frequency of flood and rainfall related events?	No

How do you rate the increase in frequency of heat wave?	high	If yes, how do you rate the increase in frequency of drought?	mediu m	If yes, how do you rate the increase in frequency?	No

3.3 Baseline Status of New Industrial Park – Pharma City

Government of Telangana state (GoTS) proposes to develop a PHARMA CITY near Hyderabad city with integrated physical, environmental, social and technical infrastructure in an area of 19,333.20 acres (7824 ha./78.24 Sq.km) in Mucherla village, Kandukur Mandal of Ranga Reddy district of Telangana state.

Project Location

Geographically the proposed site is located at 17° 3'10.84"N, 78°32'15.45"E & 17° 0'9.88"N, 78°32'40.06"E.

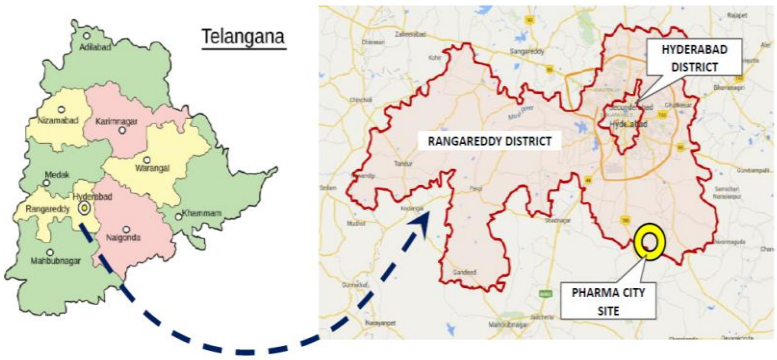

FIGURE 16: IP LOCATION OF PROPOSED HYDERABAD PHARMA CITY

The Pharma city's key project component are:

1. Pharma NIMZ (National Investment Manufacturing Zone)
2. Pharma city township
3. Pharma University
4. Pharma R&D and Ancillary Hub

A Stakeholder consultation for upcoming industrial parks with the TSIIC officials at TSIIC Zonal office and a site visit to the Pharma city was conducted on 5th August 2016. The meeting was attended by Zonal manager of TSIIC and other officials.

FIGURE 17: LOCATION PHOTOS OF IP PHARMA CITY

This Pharma City shall provide plug and play land with necessary infrastructure to the potential investors willing to set up units in the Pharma City. The project envisages development of the following broad components:

a. Industrial plots, Industrial sheds for Pharma units with separate zones for bulk drug units, formulation units etc.
b. Trunk and internal roads
c. Solid waste and liquid effluent management facilities (CETP / ZLD facilities)
d. Water treatment & distribution facilities
e. Drainage and sewerage facilities
f. Power substation and distribution
g. Data and telecom facilities
h. Support facilities for manufacturing such as Material Testing Lab, Skill Development Centre's, Quality Certification Lab /R&D Centre etc.
i. Specialized facilities such as dedicated steam lines, effluent lines etc.
j. Residential facilities for industrial workers
k. Any other essential components.

During the site visit along with CCX team, CoreCarbonX team was shown with (i) Site boundary, (ii) Existing settlements in the vicinity and within the Site (if any), (iii) Existing road network within and in the vicinity of the Site, (iv) Existing physical features such as water bodies, streams, hills/hillocks, rocky areas, Forests etc., (v) Administrative boundaries of

villages / Mandals / districts that fall within the Site, etc. However, due to absence of sufficient information on topographic survey and cadastral maps and target area of 14000 acreage for industrial park, no specific conclusion was made on CCA measures. This is the preliminary stage of the project activity and request for Proposal Selection of consultant for Preparation of Integrated Master Plan & Designs for Hyderabad Pharma City is under process, it is advisable to include the CCA measures under the Master Plan and Design. It has been observed that many components of climate change adaptation measures have been considered for inclusion under the request for proposal. Below issues need to be assessed and integrated during the integrated master plan and design stage:

- Analyse the existing infrastructure status – covering water supply, power supply, storm water drainage, connectivity links, solid waste management, wastewater management etc.
- Understand the terrain of the Site and the current storm water drainage pattern of the Site
- Assess highest flood level (HFL), low water levels (LWL), discharge velocity etc. from available past records, local enquiries and visible signs, if any, on the structural components and embankments. The Consultant shall obtain the rain fall data as well as make local enquiry to arrive at the design intensity of rainfall.
- Assess the environmental and social aspects of the Site that would have a bearing on the project planning, implementation and operation.

Annexure A

3.4 Results and overview of Preliminary Screening of IPs

The State of Telangana is the youngest state in India, formed in the year 2014. It is the twelfth largest state by size and population. The service sector, industries and agriculture are the three main economic drivers of the state. The state has 10 districts which are located in semi-arid and arid climatic zones. In Telangana, water availability and quality of water are two of the primary areas of concern.

The state of Telangana has over 131 Industrial Parks (IPs) established throughout the State. Several new industrial parks are also under different stages of planning. 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 the development of Industrial Parks and Special Economic Zones. To develop and manage the industrial parks TSIIC has divided these IPs into six industrial zones namely Jeedimetla, Karimnagar, Patancheru, Shamshabad, Warangal and Cyberabad. Most of these industrial zones are in the periphery of Hyderabad.

Hyderabad is a well-established hub for pharmaceutical and associated industries. In last two decades Hyderabad has gained international recognition as an information technology hub as well. Details of industrial sectors present and proposed in each of the industrial zone are presented in the table below:

TABLE 9: ZONE-WISE DISTRIBUTION OF INDUSTRIAL SECTORS

Industrial Zones	Existing industrial sectors	Proposed industrial sectors[3]
Jeedimetla	Automotive based Industries, General Engineering, Steel Re rolling, R & D of Biotech, Pharmaceuticals, Vaccines, Chemicals, Paints, Pesticides, Bulk Drugs	Pharma, Food processing, Chemicals, Engineering
Karimnagar	General engineering, Rice mills, Oil mills, and other agro based industries, Pipes, Paints, Granite etc.,	Fertilizer, Power, Cement, Textiles, Paper, Minerals and Food processing
Patancheru	Pharmaceutical, Chemical, Textile, Logistics and warehousing, Edible Oils, General Engineering, Steel rolling, Paints, Rubber and Tyres	Chemicals, Engineering, Automobiles and Pharmaceuticals
Shamshabad	Pharmaceutical, Auto ancillary, chemicals, Warehousing, Food processing and Beverage	IT, Pharma, Food processing, Defense and Aerospace, Textiles,

[3] Conceptual plan for district development, Pg 117, Socio Economic Outlook 2015

	industry, Aerospace, Solar Equipment, Electronic Hardware, Bulk Drugs	Consumer products
Warangal	General Engineering, Agro based industries, Plastic, granite based, Warehousing	Mineral, Food processing, Textile and Leather, Cement, Pharma, Granite, Power, Metallurgy and Paper
Cyberabad	IT & ITeS (Information Technology & Information technology enabled services)	IT & ITeS (Information Technology & Information technology enabled services)

The Task 1 and Task 2, has resulted in a two-step preliminary screening methodological tool for screening of IPs based on their climatic exposure, climatic impact and capability to adapt. The field-based preliminary screening methodology was tested and applied to 53 IPs in the state, spread across all zones. To reduce the effort for the field-based preliminary screening, before preliminary screening a desk based first screening (first step) was performed to arrive at IPs which are significant for the CCA project in size and the allotment of industrial plots to industries. The field step of the preliminary screening methodology was conducted through one to one interview process with the stakeholders by means of a structured preliminary questionnaire. Zonal manager and officers at zonal office were the key stakeholders identified for this survey. Information of Climatic changes and weather pattern data were also recorded from the revenue department and IMD. The field level information was corroborated with secondary data available with these departments. For the upcoming IPs/new IPs, no climatic impact history and capability information were available through the one to one interview. Hence, the new IPs were assessed based on data from secondary sources on climatic exposure, accompanied with the inputs from corporate office of TSIIC on planning process of IPs. Existing IPs were scored under each section i.e. climatic exposure, climatic impact and capability. Finally, geometric mean of each IP was arrived at and used for ranking the IPs. The IPs finally chosen for climate rapid risk analysis are represented in the table below.

TABLE 10: LIST OF IPS SELECTED FOR RAPID CLIMATE RISK ANALYSIS STUDY

Sr. No.	Name of IP	Industrial Zone	Preliminary Screening Score	Name of IP	Industrial Zone
	Existing IP			**New IP**	
1	IP Pashamylaram	Patancheru	0.89	IP Sulthanpur	Patancheru
2	IP Jeedimetla	Jeedimetla	0.76	IP Buchinelly	Patancheru
3	Hitech City Madhapur & Software Units layout	Cyberabad	0.61	Mega Food Park	Warangal
4	IP Rampur and IP Madikonda	Warangal	0.46	Hyderabad Pharma City	Shamshabad
5	IP Cherlapally	Shamshabad	0.32		

3.5 Results and overview of Rapid Risk Analysis of IPs

The step of rapid risk analysis in this projects aims at:

- Describing a replicable approach for a rapid climate risk assessment methodology for industrial parks in India;
- Applying the approach to the state of Telangana

Rapid climate risk assessment approach

The climate risk assessment approach depicted in this study is based on a 7- Step process as shown in the figure on the right:

Step 1: Identify relevant *climatic hazards* in the area
Step 2: Determine temporal and spatial *exposure* of the IP to these hazards
Step 3: Determine *susceptibility and fragility* of the IPs
Step 4: Combine exposure and susceptibility to expected *impact*
Step 5: Determine *resilience* of the IP
Step 6: Combine impact and resilience to derive *vulnerability* of the IP
Step 7: *Risk* analysis

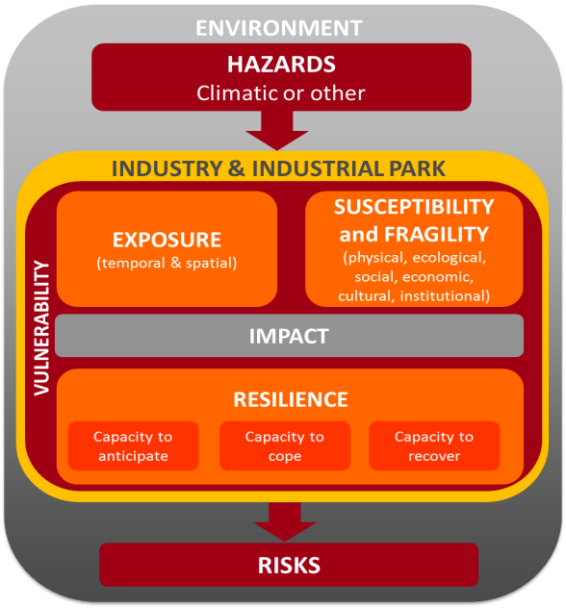

FIGURE 18: PROCESS OF CLIMATE RISK ANALYSIS

Telangana case study

Five IPs were selected through a preliminary screening process and was analyzed in more detail through the Rapid Climate Risk Analysis Methodology.

Table 3: Rapid Risk Analysis of IPs

Rapid Climate Risk Analysis was carried out for the shortlisted 5-IPs in Telangana as mentioned at above table 2:
Focus Group stakeholder consultations with industrialists, IALAs, TSIIC zonal officers were conducted between 21st of December 2015 and 30th of January, 2016. The stakeholder consultations were guided by a climate risk adaptation questionnaire designed for the study.

Key findings related to each element of the risk assessment approach for existing IPs in Telangana are summarized in below table.

TABLE 11: FINDINGS OF THE RAPID CLIMATE RISK ANALYSIS

Element	Key findings
Exposure	• Droughts: the frequency of drought incidents has increased; drought causes reduction in ground water level and several other water quality and availability issues • Heat waves: heat wave situations have become worse in last decade; during consultations IP Jeedimetla, IP Madhapur and IP

	Pashamylaram experienced high exposure levels to heat wave. • Precipitation: Overall, the rainfall pattern of Hyderabad and other regions in Telangana has changed with delayed monsoon, more wide spread rainfall and decreased overall rainfall. Thus, the instance of water logging and flash flooding that IPs get exposed got usually low scoring. • Salinization, lighting and thunderstorms not perceived as relevant or no changes experienced by the IPs. • IP Madhapur and IP Jeedimetla have highest exposure to climatic hazards.
Susceptibility	• IPs internal road systems, storm water management system, waste water management system and energy were found to be climatically most susceptible areas among the **main nine (9)**climatic susceptibility measures studied i.e., • 1. Building infrastructure • 2. Internal Roads • 3. Storm water management • 4. Water management • 5. Waste water Management • 6. Energy • 7. Workforce and industrial • 8. Production • 9. Open spaces and greenery • Water management was found to be the next most susceptible parameter consistently across all IPs. • IP Jeedimetla has highest susceptibility. IP Cherlapally is ranked 2nd in susceptibility. Similarly, IP Rampur and IP Madikonda have high susceptibility. Age, design and type of industries are influencing this ranking.
Resilience	• IP Jeedimetla and IP Rampur and IP Madikonda are least resilient to climatic changes across all **main six (6) parameters i.e.,** • 1. Financial • 2. Rules and Regulations • 3. Supply structure • 4. Governance and Management • 5.Human resource, awareness and knowledge • 6. Production • Governance and management, human resource, awareness and knowledge levels at this IP are poor. • IP Madhapur is financially robust, it has a well-designed system for supply of essential services, and thus the resilience of this park is highest and ranked as number 5.

The scoring and subsequent ranking of IPs has resulted in prioritizing "**Jeedimetla" as the most vulnerable existing IP**. It is proposed that the baseline documentation will be conducted for IP Jeedimetla.

TABLE 12: CLIMATIC VULNERABILITY RANKING OF IPS BASED ON THE RISK ASSESSMENT TOOL

Order Based on exposure	Susceptibility Score			Impact ranking	Resilience Score			Vulnerability Ranking
Madhapur	6	3	0	5	3	2	1	5
Jeedimetla	3	4	2	1	0	5	1	1
Pashamylaram	4	3	2	3	2	2	2	4
Rampur & Madikonda	6	1	2	4	0	4	2	3
Cherlapally	4	2	3	2	1	2	3	2

In case of upcoming IPs, the methodology focuses on three reinforcing pillars that collectively contribute to the understanding of IPs risk: a hazard impact assessment, an institutional assessment, and a socioeconomic assessment. All the new industrial parks identified for the study are exposed to similar climatic hazards.

Hyderabad Pharma city is expected to be a world class, pharma IP. It is currently in the master planning stage which is the ideal time for development of baseline documentation on CCA, identification of adaptation measures and also implementation of the same. It represents one of the most important industrial sectors of Telangana. Thus, **Hyderabad Pharma city** has been chosen as the upcoming industrial park for the next step of baseline assessment.

Annexure B

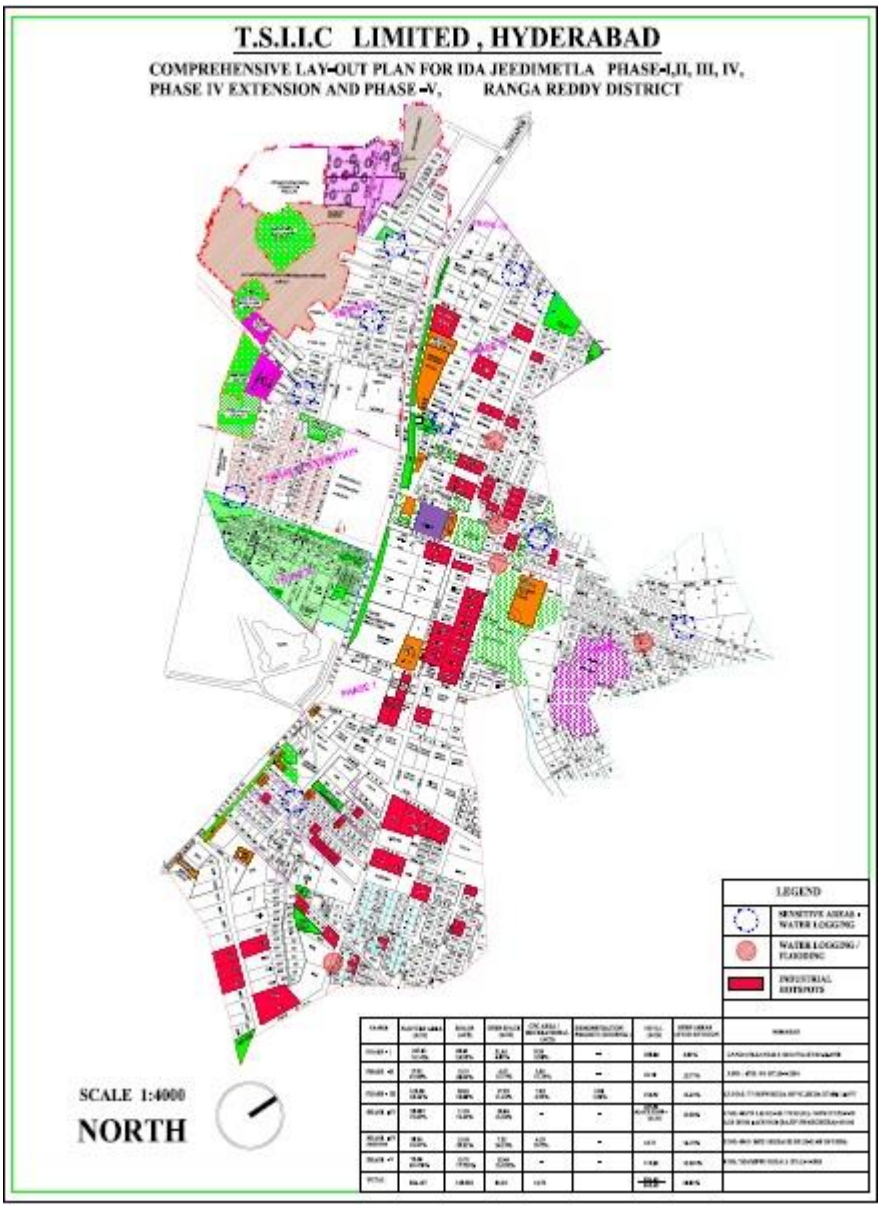

FIGURE 19: CLIMATE RISKS MAPS FOR IP JEEDIMETLA

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INTEGRATION Environment & Energy
Climate Change Adaptation Project (CCA),
1st Floor, Parisrama Bhavan
Fateh Maidan Rd, Basheerabagh, Hyderabad – 04, Telangana, India
www.integration.org
Tel. +91 (0)40 66184019, Fax. +91 (0)40 23233677

Responsible
Dieter Brulez, Director, CCA

Prepared by

Core CarbonX Sols Pvt Ltd
Hyderabad-500082, Telangana, India
Tel:+91-4023410367
www.corecarbonx.com

Authors:
Shaily Maloo
Niroj Mohanty

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