Waste Management

Waste can be defined as a material for which the generator has no further use in terms of production, transformation or consumption and wish to dispose as per national laws. Anything that is thrown away such as paper, plastic, unwanted food, broken glass, discarded clothes etc can said to be waste for the generator; however they can serve as the precious raw material for many others including recycle units (plastic, polythene, glass and metals), manure productions farms (organic waste), road construction units (construction & demolition debris) and industries (heating purpose).


Compressed Gas


Toxic


Flammable


Corrosive


Compostable


Recyclable


Biohazard


Miscellaneous


Explosive

Radioactive


Waste Generation


Waste segregation

Over 10 lac population of the city beautiful, Chandigarh, is generating a huge some of municipal waste i.e about 340 tons/day[1]. However, the well planned waste management structure of the city collects about 97% of the total waste every day, out of which nearly 219 tons/day is processed by the Jaypee waste processing plant and converted in to RDF (refuse derived fuel), while nearly 40 tons/day is been sent to the dumping site (Daddu Majra, Sector 38, Chandigarh)[1]. Remaining waste materials like plastic, polythene wrappers, metallic containers, cans, and glass bottles etc. were collected separately by the local scrap dealers and were sold to specific bodies for further recycle and reuse.

Biomedical waste generated from the city was partially handled by the incineration plant setup at PGIMER after disinfection, and remaining waste sent to the hazardous waste dumping site (Secure Landfill, Nimbua, SAS Nagar, Mohali) for final disposal as per Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 published by the Government of India in the Ministry of Environment and Forest vide number S.O.1676(E), dated 28th September, 2007 in the Gazette of India.

[1]Municipal officer of health, Municipal Corporation, Chandigarh.


Collection


Trasporation


Processing & Recycling


Disposal

CLASSIFICATION OF SOLID WASTE

Bio-degradable/Non hazardous:

The waste materials that could be broken down into small molecular fragments by the metabolic or enzymatic action of living micro-organisms such as bacteria, fungi etc. within a reasonable span of time.

For Example: Fruits & vegetable waste, Lawn-garden waste, agricultural residues etc.

Biodegradable waste

Non-biodegradable:

The waste substances that do not break down naturally by the living organisms in to environmentally safe materials over reasonable time period.
For Example: Discarded materials made up of plastic, polythene, glass, and metals etc.

How long will it take for these wastes to biodegrade?

Source: http://www.greengood.com/terms_to_know/biodegradable_and_compostable_definitions.htm
Http://www.hoaxorfact.com/Science/how-long-does-it-take-to-decompose.html

Hazardous:

Any waste material that is dangerous or potentially harmful to human health or the environment. Hazardous wastes can be liquids, solids, gases, or sludges. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes.

For Example:
Acid containers, bottles of toxic chemicals, infected needles, radioactive waste, flammable etc.

As per the Resource Conservation and Recovery Act (RCRA), hazardous wastes fall into two categories:

Catagory 1: Listed Waste	Cat. 2: Characteristic Waste
The F-list: Waste generated from non specific source	Ignitability: Waste having a flash point less than 60 °C (140 °F)
The K-List: Waste generated from the particular generation source	Corrosively: Waste having pH less than or equal to 2, or greater than or equal to 12.5
The P-List: Discarded commercial chemical products	Reactivity: Waste which can cause explosions, toxic fumes, gases, or vapours when heated, compressed, or mixed with water.
	Toxicity: Waste that are fatal when ingested or absorbed

Source: http://www.epa.gov/osw/laws-regs/regs-haz.htm

Bio-medical waste

Bio-medical waste means “any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals. Biomedical waste poses hazard due to two principal reasons – the first is infectivity and other toxicity.

For Example:
Human anatomical waste,Microbiology and biotechnology wastes,hypodermic needles, syringes, scalpels,Discarded medicines and cytotoxic drugs,dressing, bandages, plaster casts, material contaminated with blood, tubes and catheters,Liquid waste from any of the infected areas Incineration ash and other chemical wastes

Colour coding and type of container for disposal of bio-medical wastes

YELLOW BAGS	RED BAGS	BLUE BAGS	BLACK CARBOY
Infectious waste, bandages, gauze, cotton or any other objects in contact with body fluids, human body parts, placenta etc.	Plastic waste such as catheters,injection syringes, tubings, iv bottles	All types of glass bottles and broken glass articles, outdated & discarded medicines	Needles without syringes, blades, sharps and all metal articles.

Notes:

1. Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers/bags.
4. Category 3 if disinfected locally need not be put in containers/bags.

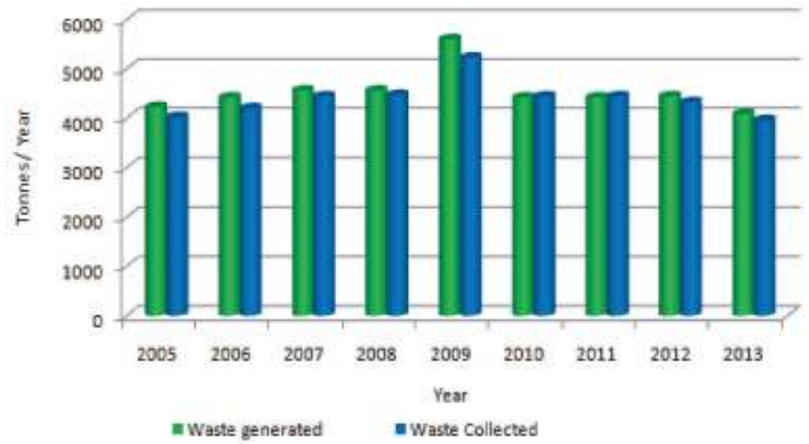
http://envfor.nic.in/legis/hsm/biomed.html

WASTE GENERATION IN CHANDIGARH:

MUNICIPAL SOLID WASTE

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Population (Lacs) Approx.	9	9	9	9	9	9	10.55	10.55	10.55
Municipal Population (Lacs) Approx.	8.01	8.01	8.01	8.01	8.01	8.01	9.7	9.7	9.7
MSW Generation (Tonnes/Day)	352	368	380	380	467	368	368	370	340
MSW Collected (Tonnes/Day)	335	350	370	370-375	436	370	370	360	330
MSW (g/capita/Day)	370	370	370	250-270	345	345	345	350	350
No of Landfill Area	1	1	1	1	1	-	-	1	1
Collection Efficiency (%)	95	95	97	95	N.A	N.A	N.A	97	97
No of Sehaj Safai Kendras	-	-	28	30	32	-	-	35	36
No of Safai Karamcharies	2542	2705	2962	3589	3209	-	-	2850	3420

Source: -> Municipal Waste Generated (MWG), Information Derived From The Survey Conducted By Service Level Bench-marking in Pilot Cities, Ministry of Urban Development , The Survey was conducted in the year of 2009.
Department of Census (UT) Chandigarh and Municipal Officer of Health, Municipal Corporations, Chandigarh



The graph above shows the trend in the total waste generation and collection over the last nine years in Chandigarh. It indicates that the waste generation is now following a decreasing trend due to the growing awareness among the people & imposed regulation by the Chandigarh administration over the excessive use of polythene & poly packaging.

Sehaj Safai Kendras: Total waste generated in the city is collected door to door on daily basis and segregated by 3,420 workers of 36 special units of waste managers called "Sehaj Safai Kendras". Segregated waste is transferred to the respective units for recycling and reuse.

Municipal Corporation, Chandigarh has provided garbage collection containers at planned points to dispose off the house hold and horticulture waste. M.C. has 45 garbage bins of 6.5 Cu Ms and 580 and 75 garbage bins of 4.5 Cu Ms and 1.0 Cu Ms respectively.

For better segregation of waste and to ensure better management of municipal solid waste, M.C. in association with Chandigarh Animal Welfare, Eco-Development Society, and Environment Department has built Sehaj Safai Kendras and Khad Banao Kendras at various places of the city. Approximately 340 tonnes of municipal solid waste per day which includes horticulture waste is generated in U.T. of Chandigarh out of this 330 tonnes waste is collected. Out of this 330 tonnes except 70 tonnes all the waste is sent to garbage processing plant. The garbage processing plant started receiving entire quantity of city MSW from April 2009 onward. Approximately 70-90 MT garbage containing Mandi Waste, Hotel Waste, Drainage silt etc. is dumped directly into dumping ground daily. One heavy chain Bulldozer is used for compacting, pushing and leveling the garbage in low lying areas at landfill site. One JCB has been provided for digging of fresh soil and two tippers for transportation of the soil for spreading its layer on garbage on day to day basis.

Jaypee's Municipal Solid Waste Processing Plant:

The plant converts all of Chandigarh's municipal solid waste into consistently high quality Refuse Derived Fuel (RDF) with low moisture content for energy recovery in power plants and cement kilns. It was set up in 2008 as a first-of-its-kind plant in India based on German technology and since then, has received recognition for indigenous and innovative technological improvements. The combustible waste (219 tons/day) of the city is converted into high calorific valued Refuse Derived Fuel (RDF) blocks and available for sale to the various industries to meet their heating requirements

The plant was chosen (2013) for the third year in a row as the 1'st Runner Up for excellence in Solid Waste Management at the JCB CII - APTDC Solid Waste Management Awards ceremony in Hyderabad.

HAZARDOUS WASTE

Year	Type of Hazardous Waste	Quantity of Hazardous Waste Generated (MT/yr)	Method of disposal
2010-11	Used Oil (MT/yr)	86.01	Sale for re-processing
	Acid Residue	49.14	Used as Raw Material
	Incinerable	15	Incinerated
	Inorganic Natured Waste	78.263	Landfill
	Zinc Ash	NIL	-
	Spent Acid	1615.14	Handed over to M/s Aurodying Baddi for use in their Process
	Total	1843.553	
2011-12	Used Oil (MT/yr)	211.09	Sale for re-processing
	Acid Residue	166	Sale for re-processing
	Incinerable	NIL	-
	Inorganic Natured Waste	16753.389	Landfill
	Zinc Ash	1562.93	Sold to Zinc Sulphate Manufacturers
	Spent Acid	1175.26	Handed over to M/s Aurodying Baddi for use in their Process
	Total	19868.669	
2012-13	Used Oil (MT/yr)	159.308	Sale for re-processing
	Acid Residue	1719.2	Sale for re-processing
	Incinerable	Nil	-
	Landfillable	94.847	Landfill
	Zinc Ash	2228.453	Sold to Zinc Sulphate Manufacturers
	Spent Acid	NIL	-
	Total	4201.808	
2013-14	Used Oil (MT/yr)	199.56	Sale for re-processing
	Acid Residue	2814.49	Sale for re-processing
	Incinerable	15.1	Disposed 2.7 MT Ash to BOWML, Kanpur in PP Bags
	Inorganic Natured Waste	56.355	Landfill
	Zinc Ash	584.9	Sold to Zinc Sulphate Manufacturers
	Spent Acid	NIL	-
	Total	3670.405	

Source: Member Secretary, CPCC, Chandigarh (UT)

State of ENVIRONMENT Chandigarh - 2014

Hazardous wastes generated by the industries are required to be managed as per the Hazardous Waste (Management & Handling) Rules, 1989, as amended. About 4.4% of hazardous waste generated in the country required immediate incineration. Besides, segregated organic residues, highly concentrated effluents such as mother liquors and toxic effluents which are not feasible for physico-chemical and biological treatment, require proper disposal through incineration. Common incineration facilities are now in operation in the country.

The data indicates that hazardous waste produced 2013-14 in city had been decreased from 4201.808 MT/yr (2012-13) to 3670.405 MT/yr.

Source: Member Secretary, CPCC, Chandigarh (UT)

BIOMEDICAL WASTE

Year	Field	HCFs	No. Of HCF Utilizing CBWTF & Private Agencies	No. of HCF Having BMW Treatment Disposal Facilities	BMW Generated (Kg/Day)	BMW Treated (Kg/Day)	No. of Healthcare Facilities Violated BMW Rules
2009	All other Institutions Generating BMW	529	485	-	57	57	8
	Hospitals & Nursing Homes With 50-200 Beds	6	5	1	38	38	2
	500 Beds & Above	3	None	3	1071	1071	3
	Less Than 50 Beds	40	40	-	35	35	19
	Total	578	530	4	1201	1201	32
2010	All other Institutions Generating BMW	640	596	-	56	56	12
	Hospitals & Nursing Homes With 50-200 Beds	7	6	1	35	35	-
	500 Beds & Above	3	None	3	1554	1554	1
	Less Than 50 Beds	41	41	-	45	45	2
	Total	691	643	4	1690	1690	15
2011	All other Institutions Generating BMW	634	633	-	93	93	6

	Hospitals & Nursing Homes With 50-200 Beds	7	6	1	35	34	1
	500 Beds & Above	3	None	3	1750	1750	-
	Less Than 50 Beds	41	41	-	53	53	6
	Total	**685**	**680**	**4**	**1931**	**1931**	**13**
2012	All other Institutions Generating BMW	629	628	-	161	161	8
	Hospitals & Nursing Homes With 50-200 Beds	7	6	-	67	67	3
	500 Beds & Above	3	Nil	3	1702	1702	3
	Less Than 50 Beds	40	42	-	109	109	8
	Total	**681**	**676**	**3**	**2039**	**2039**	**22**
2013	All other Institutions Generating BMW	672	715	3	2091	2091	72
	Hospitals & Nursing Homes With 50-200 Beds	6	5	-	47.8	47.8	3
	500 Beds & Above	3	-	3	1721.54	1721.54	1
	Less Than 50 Beds	39	39	-	129.27	129.27	22
	Total	**720**	**715**	**3**	**2091**	**2091**	**72**

Source: Member Secretary, CPCC, Chandigarh (UT)

Beds facilities in hospitals

Beds in Government Hospitals -

Chandigarh has total 9 government Hospitals with total 3120 beds (2013) out of which Post Graduate Institute of Medical Education and Research has 1740 , Government Medical College and Hospital - 32 has 697, Government Multi Specialty Hospital -16 has 500, Primary Health Centre - Manimajra has 50, ESI Hospital has 70,Composite Hospital - ITBP has 50, Police Hospital has 11, and Model Jail Burail - Sec 51 has 2 beds, respectively.

Beds in Private Hospitals

Name of Hospital/ Nursing Home	Number of Beds
Dhanwantry Ayurvedic Hospital & College	120
Mukat Hospital	70
Landmark Hospital	50
Chetanya Hospital	35
INSCOL	34
Kidney and Uro Stone Centre	25
P.N. Urology Centre Pvt. Ltd	20
Dharam Hospital	20
Chuttani Medical Centre	18
Omni Hospital	16
Grover Eye & ENT Hospital	16
Pandhi Hospital	15
Dogra Nursing Home	15
Grewal Eye Institute	15
Hope Clinic & Maternity Centre	15
Delwyn Hospital	20
Santokh Nursing Home	15
Gynae & Fertility Research & IUF Centre	15
Kidney Centre	15
NINS Hospital	11
Indu Nursing Home	10
S. Inderjit Charitable Hospital	10
Arya Hospital	10
Sangam Hospital	10
Abilasha Hospital & Infertility Centre	7
Abhinav Medicare, Kidney & Dialysis Centre	7
Chander Hospital	6
G. M. Nursing Home	5
A. G. Nursing Home	5
Bedi Nursing Home	5
Family Hospital	5
Sangeeta Nursing Home	5
Bhatia Hospital	4
Dhillon Nursing Home	4
Dhavan Clinic & Nursing Home	4
Infosys Technologies Ltd	4
Sekhon Nursing Home	4
Mangal Nursing Home	2
City Gynae Centre (Gynae & Endoscopy Centre)	2
Vishwas Hospital	2
Total Beds	671

Source: Member Secretary, CPCC, Chandigarh (UT)

Common Bio-medical Waste Treatment Facilities

Monitoring of common Biomedical Waste Treatment facilities at Chandigarh were carried out by Chandigarh Pollution Control Committee. Presently Biomedical waste treatment facilty in Chandigarh has installed double chambered incinerator with Air pollution control system, autoclave, shredders, ETP and adopted conveyer waste feeding system.

Incinerator Plant, Pgi Chandigarh

Name & address of CBWTF	Equipment installed & their capacity	No of HCF's Covered	No. Of beds covered	Cost of treatment charged by CBEWTF operator (Rs./Month)	APCS in incinerator
Sh. S.S. Malhotra, Alliance Enviro Care Company, IMA Complex, Sec 35-B, Chandigarh.	Autoclave: 40 kg/h Shreeder: 15 kg/h ETP: N.A	715*	804	RS. 630/month for small units up to 8 kg/month after that Rs. 66/kg Rs.990/month for big units up to 15 kg/month after that Rs. 66/kg	CBWTF is using the incinerator of PGI, Chandigarh for the treatment of biomedical waste

Source: Member Secretary, CPCC, Chandigarh (UT)

* *Other than these 715 HCF's, 3 major hospitals have their own treatment facilities, Civil Hospital, Manimajra is traporating their BMW to GMSH 16, Chd. for further treatment. Whereas Panjab University transports the BMW to PGIMER for treatment using their own vehicle. (Total 720 Health care units)*

CPCC,Chandigarh

ELECTRONIC WASTE (E-waste):

It may be defined as the waste electronic/electrical devices which are destined for reuse, resale, salvage,recycling or disposal; such as monitors, CD, hard disks, mobile phones, batteries, chargers, CPU and adaptors etc.

The city beautiful, Chandigarh, has a rapidly growing educational and IT (Information Technology) sector. Therefore in the era of changing technology, the e-waste generation in the city has also realized to pose the possible threats to the environment in the coming years. First e-waste project in Chandigarh was launched by the Young Indians (YI) body of Confederation of Indian Industry (CII) Chandigarh and Noida based Attero Recycling, in the presence of Chandigarh administration on 6th June 2011. The project is aimed to collect/purchase the e-waste generated anywhere in Chandigarh and transport it to the waste recycling plant setup by Attero at Roorkee, Uttrakhand. Any e- waste generating unit can contact with the authorized body (Attero) through proper channel (Chandigarh Pollution Control Committee) CPCC and dispose the generated material as per law.

The annual report submitted by Attero to CPCC shows that with the increase in awareness among the waste generators, the total collection of e-waste has shown almost 9 fold increase (7, 062 to 62, 772 kg) in just two consecutive years (2012-2013)

E-Bin Locations in Chandigarh	Date of Installation
e-Sampark, Industrial Area Phase-1 (Electricity Bill Collection Centre)	06-06-2012
e-Sampark, Sector-15 (Electricity Bill Collection Centre)	06-06-2012
e-Sampark, Sector-17 (Central Treasury Office)	06-06-2012
e-Sampark, Sector-18 (Electricity Bill Collection Centre)	06-06-2012
e-Sampark, Sector-23	06-06-2012
e-Sampark, Sector-40	06-06-2012
e-Sampark, Sector-43 (Electricity Bill Collection Centre)	06-06-2012
e-Sampark, Sector-10 (Electricity Bill Collection Centre)	06-06-2012
e-Sampark, Mani Majra (Electricity Bill Collection Centre)	06-06-2012
Department of Environment, 3rd Floor, Paryavaran Bhawan, Sector-19-B	20-09-2012
e-Sampark, PGI Sector-12	06-06-2012
Punjab & Haryana High Court, Sector-1	07-08-2012
Shop No. 16 & 17, Mehak Medicos. Sector-48-A	07-08-2012
e-Sampark, Sector-21	20-12-2012
Chandigarh Pollution Control Committee (CPCC), Ground Floor, Paryavaran Bhawan, Sector-19-B	20-09-2012
Department of Forest , U.T., 2nd Floor, Paryavaran Bhawan, Sector-19-B	20-09-2012
e-Sampark, Sector-47, (Electricity Bill Collection Centre)	06-06-2012

Source: Department of Environment, Chandigarh Administration, Chandigarh.

Administrative Responses

E-Waste (Management & Handling) Rules, 2011:

The e-waste (Management & Handling) Rules, 2011 have been notified in May 2011 and will be effective from 01-05-2012. These rules were notified in advance to give the various stakeholders adequate time to prepare themselves and also to place the required infrastructure for the effective implementation of these rules.

Applicability

1. These rules shall apply to every producer, consumer or bulk consumer. Collection centre, dismantler and recycler of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in schedule I, the regulatory agencies involved are SPCBs/PCCs and CPCB.
2. The rule will not apply to lead acid batteries as covered under the batteries (Management and Handling) Rules, 2001, Micro and small enterprises as defined in the Micro, Small and Medium Enterprises Development Act,2006 (27 of 2006) and radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under.

Fig.1: Growth of E-waste in India

Dr. S. Chatterjee,
Department of Information Technology

3. The e-waste Rules apply to all electrical and electronic equipment (EEE) listed in Schedule 1 (annexure-I) including their components and consumables put on the market in India. The rules are also applied to all components and consumables, which are part of the product at the time of discarding.
4. The rules also call for the reduction in the use of hazardous substances in electrical and electronic equipment. Every manufacturer of equipment listed in Schedule 1 of the Rule (namely, information and telecommunications equipment and consumer electrical and electronics falling within the specified categories) to ensure that the products do not contain lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls or poly-brominated di-phenyl ethers above a specified threshold. The threshold for cadmium is 0.01% by weight in homogeneous material; for all other substances, the threshold is 0.1% by weight in homogeneous material. The reductions have to be achieved by 1 May 2014, two years from the dates when the rules become effective. Certain applications listed in Schedule 2 (Annexure-II) are exempted from the above requirement and there is also an exemption for components of electrical and electronic equipment manufactured or placed in the market six years before the date of commencement of these rules.
5. There may be significant doubt and uncertainty on number of products particularly in specialized or industrial components, in case of dispute, the decision on whether they are included within the scope of the Rules shall be assessed by MoEF/CPCB by comparing with scheduled-I components and decisions shall be taken reasonably and with clarity.
6. Equipment or system that is not listed in Schedule-I but has a part or component that is listed in Schedule-I as an integrated part of that equipment or system is considered to be outside the scope of the rules. However, waste generated from such equipment shall be accepted for channelization to recycling facility as long as it is recyclable.

Ban on burning of leaves

City Chandigarh has rich green cover with trees which are deciduous with leaf fall during autumn or early spring. This led to a serious problem of burning of leaves by safai karmchaari or private parties. The burning was not only destroying peace of environment but face of city as well. That is why Municipal Corporation, Chandigarh has banned burning of dry leaves in open and even at landfill sites. Composting is promoted instead. 125 eco-club members, Environment related societies in colleges, and departments in Panjab University etc have shown great interest in promoting and implementing composting over burning.

The Environment (Protection) Act, 1986

This is a comprehensive legislation which aims for the protection and improvement of environment and matters connected therewith. The Act also includes the provisions of the prevention of hazards to human beings, other living creatures, plants and property.

Under the provisions of the Act, various Laboratories called environmental laboratory have been recognized all over India. The Ministry has also notified standards for liquid, gaseous, and solid wastes under the Act.

Hazardous Waste (Management & Handling) Rules, 1989

These rules provide for the control of import, export, storage, and disposal of hazardous waste. These rules have been amended in 2000 and in 2003 and classification of wastes has now been changed. About 36 processes have been included which have 125 waste streams from where the hazardous wastes are generated. In addition 78 substances have been listed with concentration limits. The State Pollution Control Boards have been authorized to monitor the compliance of the various provisions of the rules. The import/export of wastes is being implemented by the Ministry of Environment & Forests/CPCB directly and Committee is the prescribed authority for grant of authorization for storage and transportation of hazardous wastes. A survey was carried out with the help of Central Pollution Control Board in the year 1996. But due to amendments in the rules in the year 2000, this survey has no relevance and Central Board has been requested to conduct fresh survey to identify the new wastes if any. A fresh survey was also carried out in year 2004 and report has been sent to CPCB/MoEF. The waste generated is stored in the premises of the unit and would be disposed off in the hazardous waste treatment and disposal facility in Punjab near Derabassi.

Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989

These rules have been framed in relation to chemical hazards and provide for controlled import, storage, and manufacturing of chemicals. The chemicals have been further classified as toxic, flammable, and explosives. 684 such chemicals have been listed in the schedule attached to these rules. The Committee is responsible for limited functions under the rules. Rest functions are performed by other authorities.

Rules for Manufacture, Use, Import, Export, and Storage of Hazardous Micro-Organism, 1989

These rules are applicable in case of sale, storage for the purpose of sale, any kind of handling over, export and import of genetically engineered cells, production, manufacturing, process, storage, import, draining off, and packaging and repacking of genetically engineered products. Various types of hazardous microorganisms have been listed in these rules.

Bio-Medical Wastes (Management & Handling) Rules, 1998

These rules are applicable to all the persons who generate, collect, receive, store, transport, treat, dispose of, and handle bio-medical waste in any form. Every occupier of an institution generating Bio-Medical Waste which includes a hospital, nursing home, clinic, dispensary , veterinary institution, pathological laboratory, and blood bank by whatever name called to take steps to ensure that such wastes is handled without any adverse effect to human health. The Pollution Control Committee is prescribed authority for the grant of authorization for handling, collection, treatment, and transportation of Bio-medical wastes in U.T., Chandigarh.

Recycled Plastic Manufacturer and Usage Rules, 1999

These rules were notified by Govt. of India in the year 1999 and further amended in 2003 to have control on the manufacture, sale, and use of virgin and recycled plastic carry bags and recycled plastic containers. All vendors are prohibited from using carry bags or containers made of recycled plastic for storing, carrying, dispensing, or packaging of food stuffs. The use of recycled carry bags for other purposes have also been regulated and minimum thickness of carry bags made and virgin plastic have also been provided. The District Magistrate has been made responsible for the enforcement of rules and Committee is responsible for control at manufacturing level. There were 22 numbers of units manufacturing polythene bags and plastic container in U.T., Chandigarh.

Complete ban on plastic/polythene carry bags in Chandigarh

Chandigarh administration has put a complete ban on plastic/polythene carry bags in Chandigarh. No person including a shopkeeper, vendor, wholeseller or retailer, trader, hawker or rehriwala etc shall use polythene/plastic carry bags for supply of goods in polythene/plastic carry bags. No person shall manufacture, store, import, sell or transport polythene/plastic carry bags in Union Territory of Chandigarh. This ban is applicable with effect from 2nd October 2008.

Use of Fly Ash Notification 1999

This notification has been issued to protect environment, conserve top soil, and prevent dumping and disposal of fly ash discharged from coal or lignite based thermal power plants. All the brick kilns in a radius of 100 km from thermal power plants are required to utilize at least 25% of the ash with the soil for making bricks. Every construction agency engaged in the construction of buildings within a radius of fifty to one hundred kilometers from a coal or lignite based thermal power plant shall use fly ash bricks or blocks or tiles or clay fly ash bricks or cement fly ash bricks or blocks or similar products or a combination or aggregate of them in such construction as per the following minimum percentage (by volume) of the total bricks, blocks and tiles, as the case may be, used in each construction project, namely:

- 25 per cent by 31st August 2004
- 50 per cent by 31st August, 2005
- 75 per cent by 31st August 2006
- 100 per cent by 31st August 2007.

In respect of construction of building within a radius of 50 kilometers from a coal or lignite based thermal power plant the following minimum percentage by volume of use of bricks, blocks, and tiles shall apply:-

- 50 per cent by 31st August 2004
- 100 per cent by 31st August 2005

Municipal Solid Waste Rules 2000

It is a comprehensive legislation that is applicable to every municipal authority responsible for collection, regeneration, storage, transportation, processing, and disposal of municipal solid wastes. Every municipal authority has been made responsible for the implementation of the provisions of these rules and for any infrastructure development. Comprehensive guidelines have also been provided for collection of municipal waste, regeneration of municipal solid wastes, storage of municipal solid wastes, transportation of municipal solid wastes, and processing. The main responsibility of implementing the rules is with the Municipal Corporation. The Corporation is required to send the report to Chandigarh Pollution Control Committee every year. A MoU has been signed between CPCB,

CPCC, and M.C., Chandigarh to set up a Model Facility for Demonstration of the treatment of Municipal Solid Waste for Implementation of the Municipal Solid Waste Rules.

7R's of Waste Management

Refuse : Say no to un-necessary materials such as polythene and plastic used for carrying items or packaging etc.
Reduce : Use carry bags made up of paper or cloth as they are biodegradable.
Reuse : Try to reuse everything before filling the dustbins.
Repair : Increase the life of materials by timely repair and servicing.
Recycle : Segregate the waste that can be recycle such as paper, plastic, metals and glass etc.
Recover: Extract the useful material form the discarded objects before dump.
Rot : Adopt composting for the waste materials that are biodegradable such as food waste, fruit waste, yard waste and cattle waste etc.

The Rock garden of Chandigarh is perfect example of solid waste management. All the Sculptures are made from solid waste. It is situated near Sukhna Lake. It consists of man-made interlinked waterfalls and many other sculptures that have been made of scrap & other kinds of wastes (bottles, glasses, bangles, tiles, ceramic pots, sinks, electrical waste, etc.) which are placed in walled paths.

Energy

Union territory of Chandigarh is a small city with 114 Sq. Km. Land area; came into existence with effect from 01 Nov 1966 after the re-organization of Punjab. Chandigarh does not have any provision of power generation of its own and is totally dependent on the neighboring states for its power supply. Chandigarh Administration has taken over the local distribution of electricity from PSEB on 2nd May, 1967. Almost 1480 employees are working daily under the guidance of four Executive Engineers and a Superintending Engineer.

As per the latest authenticated stats, the electricity department of Chandigarh has about 282 MW electricity requirement; which is being met from different Central/State Generating stations. Chandigarh is receiving 67% of its power through Mohali (PSEB), about 10% through Dhulkote (BBMB) and remaining 23% through Nalagarh. The city has a transmission network which comprises of one 220 KV Sub Station (Kishangarh Manimajra), thirteen (13) 66 KV Sub Stations, five (5) 33 KV and 1746 11 KV Sub Stations. At present (31/03/2014), the city has total 2,00,000

Consumers including 1,72,653 domestic consumers, 21,428 commercial consumers and about 2300 industrial consumers. The average per capita consumption of electricity in Chandigarh is 1168 units per annum; leading to an average power requirement of 32.49 lac units per day. The city beautiful has an allocation of 166-236 MW of power from different Central/State Generating Stations during different hours of the day. Besides this, Chandigarh Administration is maintaining 19437 numbers overhead tube type of street light points within sectors (i.e. V-6) roads.

Source: http://chandigarh.gov.in/engg_web/pages/about_us.html

Supdt. Er. Electy.OP Circle,U.T.Chandigarh

The increase in population along with the ever-increasing per capita consumption of electricity is making it difficult for the city to meet the demand. This in turn leads to power cuts and discontinuous supply of power to both residential and non-residential areas including the industrial area; as a consequence of the productivity is being affected. Chandigarh draws power from the central grid and has no power generation of its own. But yet electricity consumption of Chandigarh is increasing by 52 million units every year. Therefore it is imperative that the union territory adapts itself to reduce dependence on the grid electricity and build its own captive generation or switch to renewable power that helps to generate its own power. Aiming to the energy efficient city, Chandigarh is moving strongly to adopt Solar City plan to reduce dependence on Conventional Energy resources.

Ministry of Natural & Renewable Energy (MNRE) Government of India (GOI), New Delhi has selected Chandigarh to develop as Model Solar City through Chandigarh Renewal Energy, Science and Technology Promotion Society (CREST). Master Plan for Model solar City was prepared by, "The Energy and Resource Institute" (TERI) and approved by MNRE, GOI in Jan 2012. The Solar City plan is aimed to reduce the dependence on conventional electricity consumption by 10 % in next five years (2017).

This Master Plan for Solar City is a dynamic document meant to change with time, experience, and need. The development of master plan has benefitted from the collaborative participation of CREST, Public Works Department, Municipal Corporation UT, Chandigarh Administration, Municipal Water Supply Department, Forest Department, power utilities, electricity department of Chandigarh Administration; and other agencies with energy-related responsibilities. Development of a solar city requires an integrated urban planning approach, which simultaneously involves reducing reliance on fossil fuels by the application of energy conservation & efficiency measures and by replacing the conventional energy generation with the renewable energy. The key steps of the Model Solar City concept comprised:

- Base line determination,
- Energy planning Energy use projections
- Energy efficiency measures and audit
- Utilization of available renewable energy sources
- Developing an Master Plan

Electricity Consumption in Chandigarh

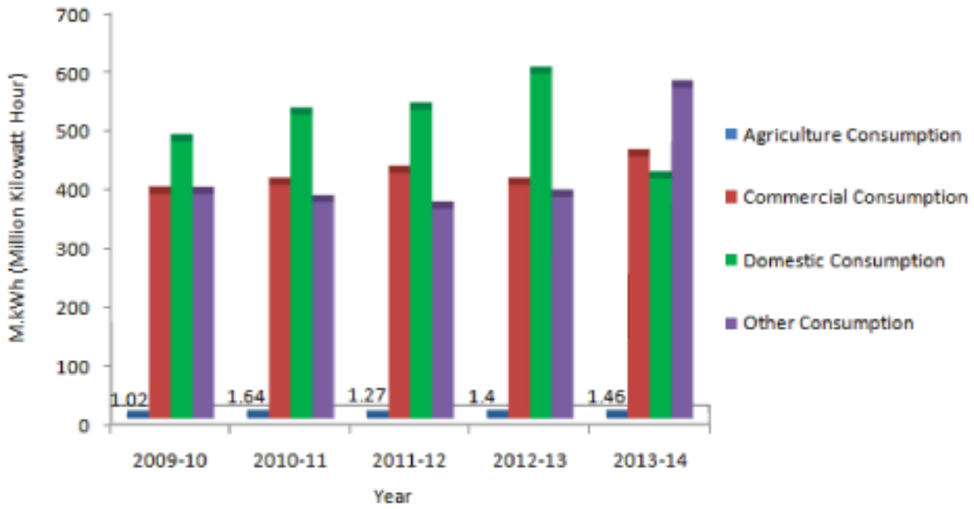
With the gradual increase in the population of the city the demand for electricity has also been increased at a faster rate. Compared to the total electricity demand in 2009-10, nearly 182 Million Kilowatt Hour (M.kWh) electricity consumption has been increased till 2013-14 in just four years as shown in the table.

Year	Total Consumption (M.KWH)
2009-10	1237.58
2010-11	1284.45
2011-12	1301.47
2012-13	1362.73
2013-14	1419.27

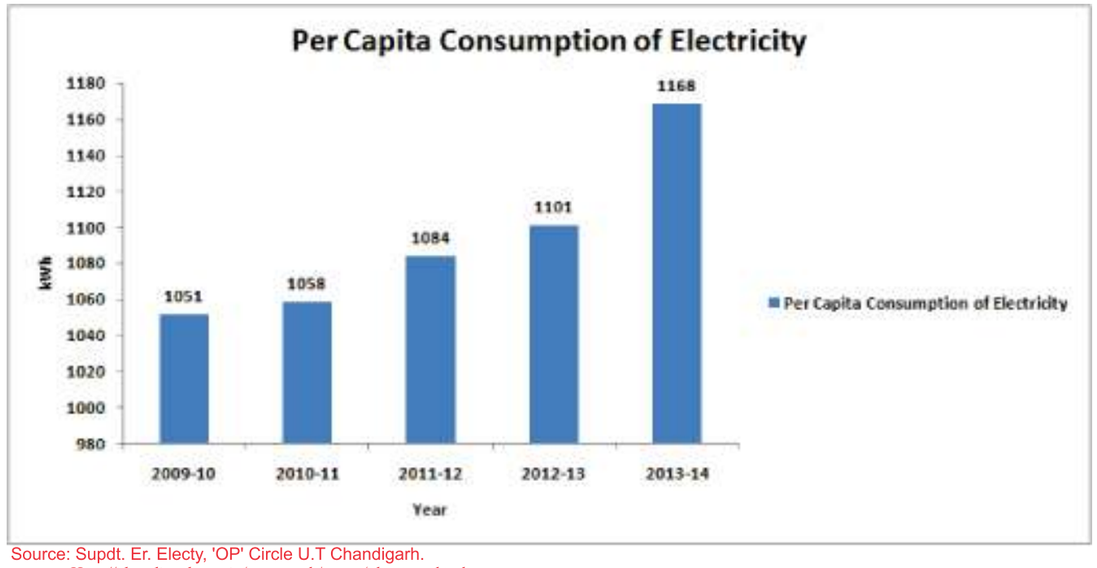
Source: *Supdt. Er. Electy, 'OP' Circle U.T Chandigarh.*

Sector Wise Electricity Consumption

As per census 2011 report, Chandigarh lies amongst the highly populous cities of India with the remarkable per capita income. Due to high living standard the domestic consumption of electricity was observed to be the highest compared to the other sectors. Agricultural sector of Chandigarh is shrinking day by day due to rapid growth and expansion of the city. With ,merely 600 Hectare crop area, the agriculture sector of the city has the lowest electricity consumption of just 14.6 lac units per annum. The major portion of the supplied electricity has been occupied by the commercial, domestic and other sectors such as Industries, Public Lighting , Educational & medical Institutions, Govt. Buildings & offices etc. Sector wise annual consumption of electricity is given by the graph below.



Source: Supdt. Er. Electy, 'OP' Circle U.T Chandigarh.



Source: Supdt. Er. Electy, 'OP' Circle U.T Chandigarh.
Http://chandigarh.gov.in/engg_web/pages/about_us.html

Energy Consumption Petroleum Products

Products	2009-10	2010-11	2011-12	2012-13	Unit
Petrol Incl. ULP	118855	128519	124671	116921	kl
High Speed Diesel	90564	92757	88175	91267	kl
Kerosene	9033	9155	7491	3941	kl
Light Diesel Oil	451	682	444	573	kl
Furnace Oil	8541	34117	31118	19827	MT
Low Sulphur heavy Stock	6800	9024	4065	643	MT
L.P.G Connections	340,961	315,011	324,400	323,685	Nos.(Cum.)

Source:Statistical Abstract Chandigarh-2003,2006,2007,2008,2009,2010,2011,2012,2013

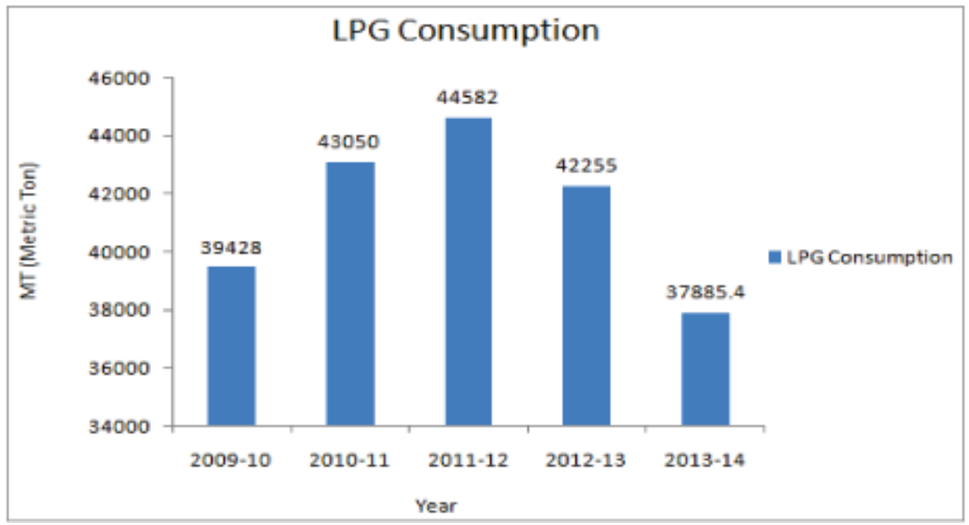
Among the petroleum products, Petrol as a fuel has the highest consumption in the city due to petrol based automobiles. Though the consumption of petrol has been reduced to 1,16,921 kl in 2012-13 compared to 1,24,671 kl of 2011-12 possibly due to advanced diesel vehicles and high prices of petrol. At the same time the consumption of diesel has shown an increase of 3092 kl in 2012-13 due to the above mentioned reasons. The product wise consumption of petroleum products during last 5 yr is given by the table above.

Number of Connection Released:

Liquified Petroleum Gas (LPG) is the major source to fulfill energy requirements related to cooking food and food products in households and commercial eateries of Chandigarh. LPG supply to almost all houses of Chandigarh has been done by three major LPG suppliers named Indian Oil Corporation (IOC), Hindustan Petroleum Corporation (HPC) and Bharat Petroleum Corporation (BPC). Chandigarh administration has promoted the use of LPG in the territorial villages, instead of traditional fuel sources to control the air pollution caused by their combustion, greenhouse gas emission and to preserve the natural resources like Forests of the area. With the increase in population, nuclear family trend and development of commercial sector, the LPG connections are also increasing day by day. During 2013-14 the total number of LPG connections released were 23,510; whereas the number was 20,036 for the session 2012-13. Year- wise details of the LPG connections released by different companies and the trend of LPG consumption in Chandigarh is given below by the table and graph respectively.

Year	No of Connections Released(IOC)	No of Connections Released(HPC)	No of Connections Released(BPC)
2009-10	8771	2349	847
2010-11	9646	2379	1363
2011-12	8928	3717	2049
2012-13	15603	2779	1654
2013-14	17735	1764	4011

Source: Manager-SLC,UTC,HPCL,Chandigarh



Source: Manager-SLC,UTC,HPCL,Chandigarh.

Customer Population

Year	Customer Population(Lacs)(IOC)	Customer Population(Lacs)(HPC)	Customer Population(Lacs)(BPC)
2009-10	227447	73085	47082
2010-11	241794	77469	47202
2011-12	250407	81186	48835
2012-13	390897	55498	51374
2013-14	206877	82162	54499

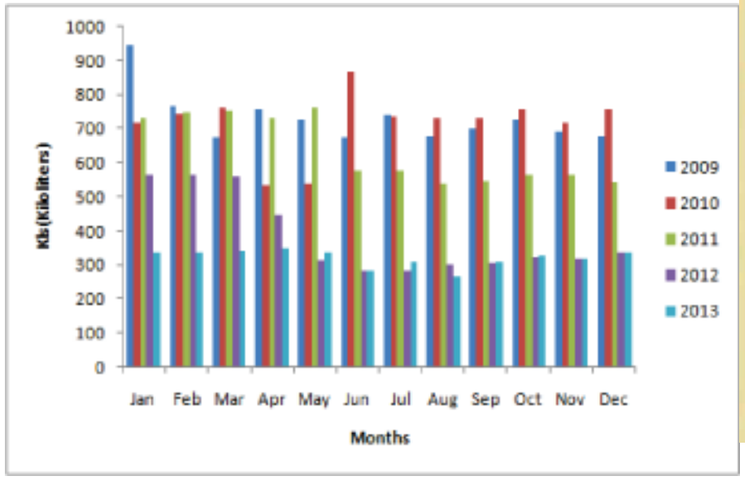
Source: Manager-SLC,UTC,HPCL,Chandigarh

Kerosene Oil Consumption

Kerosene oil is comparatively low grade liquid petroleum fuel which was used for the domestic purpose only; for heating, cooking & combustion. Presently, with the increase in the availability and affordability of LPG, the use of kerosine oil is decreasing at a faster rate. As depicted from the stats of last few years, the use of kerosine oil has decreased to 56.25% till 2013 from the consumption of 8764 kl (2009) to 3834 kl (2013)

Year	Total	Unit
2009	8764	kl
2010	8592	kl
2011	7636	kl
2012	4550	kl
2013	3834	kl

Souce : Asstt. Food & Supply Officer Sector-17 Chandigarh.



Souce : Asstt. Food & Supply Officer Sector-17 Chandigarh.

Non Conventional Sources

Energy generated by using the natural resources such as wind, tides, solar, geothermal heat, and biomass including farm and animal waste as well as human excreta is known as non-conventional energy. All these sources are renewable or inexhaustible in the long run of time and do not cause environmental pollution. Moreover they also do not require heavy expenditure. After initial investment these resources start delivering energy at negligible maintenance cost.

City beautiful Chandigarh has well defined boundary of 114 sq. km and almost all the area is covered under different land use patterns. Due to shortage of vacant spaces, Chandigarh do not have any option for the installation of wind mills or wind turbines. Also, due to the absence of yearly river/stream; the hydro power generation can't be done in the city. Chandigarh also do not have any geothermal energy source or radioactive material site, therefore the only way out left for the city to get non-conventional energy is Solar light. The climate of Chandigarh is subtropical humid, thus high intensity solar light is available during most of the period throughout the year. Therefore, taking account of the benefits of a cleaner energy, Chandigarh has adopted a well structured plan to move forward in the field of generating solar energy using solar water heaters, solar lights, blinkers, solar cookers and electricity generation by solar panels etc. Chandigarh is leading towards a complete solar city and the administration has installed solar

panels over the roofs of houses, commercial buildings schools, colleges, universities, hospitals and government offices etc. Solar lights has been installed at various places including parks, street lights at road sides and blinkers on the roads interconnecting different sectors of the city connect.

Year	Solar Water Heating	Solar Cookers	Solar Street Light	Blinkers	Battery Operated Vehicles	Solar Green House
2011-12	136500	105	887	-	560	20
2012-13	168600	105	894	14	560	26
2013-14	2,30,000	105	894	14	560	28
Units	LPD	No.	No.	No.	No.	No.

Chandigarh a Model Solar City

The MNRE (G.O.I) has set a target of 100 GW solar energy by 2022 out of which 40 GW is through Rooftop Solar Power Plants.

200 Kw Rooftop SPV Power Plant at Post Graduation College for Girls, Sec 42

World Solar Scenario Till 2013

Country	2009	2010	2011	2012	2013	Units
Germany	6.57	11.68	19.34	28	31.3	GW
Italy	0.67	1.9	10.8	18.86	20.46	GW
Spain	5.96	6.42	7.83	10.13	9.31	GW
Japan	2.62	3.62	4.91	6.92	13.91	GW
USA	1.7	3.05	5.26	12.8	17.55	GW
China	0.3	0.8	3.49	7	18.3	GW
India		0.16	0.46	1.2	2.32	GW
Global(Total)	22.99	40.01	69	99	135	GW

- Global Installed capacity of solar electricity has increased by six times between 2010 and 2013. Total global installed capacity by the end of 2013 was 135 GW with leaders like Germany(31.3 GW), Italy (20.46 GW) USA(17.55 GW), China(18.3 GW)
- More than 36 GW of new solar capacity was added in 2013 which implies capacity addition of 100 MW per day !!

MNRE has identified 60 cities in the country to be developed as solar city by 2012 as part of the National Mission of Solar Energy with Chandigarh being one of them in the northern region. Chandigarh is one of the 4 Solar Cities chosen by MNRE, GoI. This concept will prove extremely beneficial for Chandigarh, which is located in the sunny belt of the country and receives a good amount of solar radiation over the year. The Chandigarh Administration has got a DPR (Master plan for implementation of solar city program) prepared from TERI. The underlying philosophy of the concept of the Solar City is to ensure that ther energy demand in will be met in affordable, technologically advanced, and environmentally friendly manner. It means that after cost effective efficiency and demand response, the city relies on renewable sources of power and distributed generation, to the extent possible. It is proposed that Chandigarh will generate its own power by harnessing solar energy for which the following targets has been anticipated:

- 10 MW solar PV based roof top power plant
- 5 MW solar PV based power plants in landfill site of the city (this has of late has been ruled out due to capping of site

The MNRE (G.O.I). New Delhi selected Chandigarh to be developed as model solar City.

State of ENVIRONMENT Chandigarh - 2014

Solar City: The Concept

A “Solar City” is an urban area that aims to:

- Reduce dependence on fossil fuels for its energy needs.
- Limit emission levels to sustainable levels even while maintaining the desired socio-economic development growth.

Chandigarh Renewable Energy Science & Technology Promotional Society (CREST) under the aegis of Department of Science & Technology, Chandigarh Administration, is the Nodal Agency For executing solar and other RE Projects

Energy Consumption Scenario in Chandigarh:-

The peak electricity demand of the Chandigarh is around 350 MW which is being met from the central/state level power utilities / generating stations. The UT Chandigarh no generation capacity of its own.
Out of 350 MW, 43.04 % is being used by the domestic sector, 29.17 % by the commercial sector, 19.19% by the industrial sector,1.61% in public lighting,5.99% by bulk supply, 0.1% by the agriculture and .89% by the others. As per guidelines issued by MNRE, Govt. Of India, 3 % of the total energy consumption is to be obtained from the RE sources under RPO (Renewable Purchase Obligation) for UT. Chandigarh. Out of this 0.85% is to be met from solar energy. Thus, about 12.3 million units are to be produced/ obtained from the solar energy. In order to meet its RPO, UT Chandigarh has conceived Rooftop based SPV Power Projects as use of other renewable sources like wind power, Hydel Power etc. Is minimal in the UT.

Solar Energy Initiatives/ Strategies proposed for the Solar

- Solar Photo Voltaic Power Generation (Grid Interactive)
  - i. Roof Top Based Solar power Generation
  - Ii. Land Bases Solar PV Generation
- Solar Water Heating System
- SPV Street Light System in Parks, Gardens Etc.

Rooftop Based Solar PV system:

As per Master plan, the short term target (3 years, 2014) for Rooftop Solar PV System is 2.5 MW and long term target is 10 MW (10 years, 2022)
As per Master Plan of Model Solar City, following targets are proposed. These targets are based on the detailed energy audits in the Chandigarh and renewable resource potential assessment.

Targets in order to develop Chandigarh as a Model Solar City

Sr. No.	Description	Targets		
		Short Term (till 2014)	Medium Term (till 2017)	Long Term (till 2022)
1	Energy Conservation*	Reduction in present energy consumption		
1.1	Residential sector	10%	15%	20%
1.2	Commercial sector	10%	15%	20%
1.3a	Municipal sector (Water pumping)	5%	8%	12%
1.3a	Municipal sector (Street lighting)	10%	20%	25%
2	Coverage of solar water heating systems (as a proportion of total heating demand in residential and commercial sectors)	10%	25%	45%
3	Roof Top solar energy based electricity generation	2.5 MW	5.0 MW	**10.0MW***
4	Large solar energy based electricity generation at Landfill site	3.0 MW	5.0 MW	5.0 MW
5	Large solar energy based electricity generation at Patiyala ki Rao site	5.0 MW	15.0MW	25.0MW
	GHG emission reduction (tCO_2 /annum)	90973	214051	404969

* The above Rooftop SPV Plant target has been recently revised and increased to 30 MW by 2022.

Progress so far:

The Department of Science & Technology, UT Chandigarh has established a " Solar City Cell: in CREST and has developed capacity building through interactions/ Seminars Field Visits of other Solar Plants in Country. CREST is preparing Detail Project Report (DPR) for Grid Interactive Power Plant in house and sending it to MNRE, GOI for sanction.

Chandigarh as Model Solar City was formally launched by Dr. Farooq Abdullah, Hon'ble Minister, MNRE, GOI on 3rd July, 2013 with the inauguration of two Roof top Grid Interactive SPV Plants at Paryawaran Bhawan sector 19-B Chandigarh (50 kWp) and at Model Jail, Burrail (100 kWp).

State of ENVIRONMENT Chandigarh - 2014

As on today, around 5.2 Mwp Roof top SPV Plant has been commissioned on more than 99 Govt. Buildings of UT Chandigarh. This has put Chandigarh on 3rd position overall in entire Country among all States & UT in Rooftop Solar Plant installation, In terms of Government intervention, UT Chandigarh is at number one position. Another one plant of overall capacity 1000 kWp at Punjab Engineering College, Sec-12, Chandigarh, has been commissioned recently. CREST has been able to install rooftop SPV Plant on 35 Govt. Schools of UT Chandigarh in 2014-2015.

Besides this, CREST has installed Rooftop SPV Plants on 19 Government residential houses for demonstration purpose.

Dr. Farooq Abdullah, Hon'ble Minister, MNRE, GOI on 3rd July, 2013 with the inauguration of Roof top Grid Interactive SPV Plant at Model Jail, Burrail (100 kWp).

Shri Shivraj V. Patil, the Governor of Punjab and Administrator, UT, Chandigarh inaugurating 200 kWp Grid tied Rooftop Solar Photovotalic Power Plant on 22 Huts (Porta cabins) at IRB Complex, Sarangpur, in the presence of Shri Vijey Dev, IAS, Advisor to Administrator, UT, Chandigarh

Smt. Kirron Kher, Hon'ble Member of Parliament,Chandigarh inaugurating 210 kWp Grid tied Rooftop Solar Photovoltaic Power Plant on 28th January,2015 at Postgraduation Government College, Sector 46, Chandigarh

Sh. Vijay Dev, IAS, Advisor to Administrator, Chandigarh Administration, UT Chandigarh inaugurating 60 kWp Grid tied Roof Solar Photovoltaic Power on 15th January, 2015 at Govt. Model Senior Secondary School, Sec 16-D, Chandigarh