Open Access

SCHOLARENA

Journal of Waste Management and Disposal

CASE REPORT

ISSN: 2641-8827

Implementation of Integrated Solid Waste Management through Public Private Partnership in Dehradun Town

Mansoor HK *

Lal Bahadur Shastri National Academy of Administration, Mussoorie, India

***Corresponding author:** Mansoor HK, Deputy Director (Senior), Lal Bahadur Shastri National Academy of Administration, Mussoorie, India, Tel: 8475841566, E-mail: mhkhan.idas@gmail.com

Citation: Mansoor HK (2018) Implementation of Integrated Solid Waste Management through Public Private Partnership in Dehradun Town. J Waste Manag Disposal 2: 102

Article history: Received: 03 December 2018, **Accepted:** 25 March 2019, **Published:** 27 March 2019

Abstract

Dehradun is the capital of Uttarakhand province of India which was created in 2000 after carving it out of Uttar Pradesh province. Since 2000, Dehradun has been the hub of all the major developmental activities and due to population influx from its neighbouring hilly districts and huge growth of the industries during this period resulted in high pressure on civic authorities and the municipal bodies to dispose the waste generated by the household and the commercial units. Waste is for the most part discarded by the residents on the roads, drains, open ground, fallow land, and so on, sometimes burnt in open, which creates unhygienic environment for the residents and is debilitating human wellbeing. There is no existing methodology available or practiced by the municipality for scientific and integrated solid waste management and therefore, there is a strong and urgent need to introduce required changes in solid waste management by Dehradun municipality in order to make the town hygienic, beautiful and happy. This strategy paper aims at suggesting an integrated solid waste management approach for the city of Dehradun by using public private partnership.

Keywords: Solid Waste Management; Municipal Corporation; Public Private Partnership; Recycling; Sahastradhara

Introduction

Dehradun has seen huge rise of urban population in the recent years and consequently rise in the urban waste also. The population of Dehradun was 1.69 million in 2011 whereas it was 1.28 million in 2001 therefore there has been around 32% increase in population of Dehradun since it became capital of Uttarakhand province [1]. The growth of industries in Dehradun has also been phenomenal during this period from 247 units in 2001 to 3044 till 2011-12 [2]. This has resulted in municipal waste generated by urban area of Dehradun is 291.8 MT/day [3]. The amount of waste generated is increasing day by day and is being disposed either by citizens on the roads or fallow lands and by municipality (eveloUrban Dpment Report, 2015) by doing collections to some extent and then throwing at a dumping ground at Sahastradhara, which activates methane emission due to anaerobic decomposition of waste (UNFCCC, 2012) and also contains perilous, chemical and factory wastes (Figure 1) [3,4].

Source: Hindustan Times, 11 Nov and 26 Dec 2017[5]

Figure 1: Dumping Ground at Sahastradhara, Dehradun

This procedure of unscientific waste disposal lets introduction of health issues not on to the residents of neighbouring areas but also of other areas as the emission of methane gas [6]. Also, the recent burning of the waste created breathing problem for the

students of the school nearby [7]. Another severe repercussion of this is that the water of Bindal river (a small rivulet flowing through the town) has become black in colour having all sorts of toxic elements in it [6]. The Society of Pollution and Environment Conservation Scientists (SPECS) has done a study in May 2018 under which they collected a sample of water from the tributaries of Ganga- Bindal, Rispana and Suswa. The analysis of the sample shows that the water is highly contaminated with toxins like chromium, zinc, iron, lead, manganese, oil and grease which are very harmful for the soil, aquifers, human life, aquatic life, agriculture and domestic animals. The Total Dissolved Solids (TDS) standard of river water is 500 mg/litre but it was found to be 756-1667 mg/litre in the Bindal, 732-1250 mg/litre in Rispana and 722-1243 mg/litre in the Suswa River.

The oil and grease standard of a river is 0 mg/litre but in the Bindal it is 36 mg/litre while it is 13-27 mg/litre in the Rispana and 15-29 mg/litre in the Suswa. The dissolved oxygen standard of the river water is 3-4 mg/litre (minimum) but in Bindal it is 0.7-1.7 mg/litre and 0.4-1 mg/litre in Suswa. The chlorides standard of the river water is 250 mg/litre but in Bindal it is 716 mg/litre while it is 467-814 mg/litre in Rispana and 667-814 mg/litre in Suswa. The phosphate standard of the river water is 0 mg/litre but it is 2.7 mg/litre in Bindal, 2.2-3.8 mg/litre in Rispana and 3.2-4.1 mg/litre in Suswa. The flourides standard of the river water is 1.5 mg/litre but it is 2.4 mg/litre in the Bindal, 1.6-2.9 mg/litre in Rispana and 1.4-2.9 mg/litre in Suswa. The coliform standard of the river water is 0-50 MPN/100 Ml but in it is 3900 MPN/100 ml in Bindal, 1480-4800 mpn/100 ml in the Rispana and 1960-4200 mpn/100 ml in the Suswa River. Similarly, the faecal coliform standard of the river water is 0 MPN/100 ml but in Bindal it is 500 whereas it is 616-1860 mpn/100 ml in the Rispana and 416-1960 mpn/100 ml in the Suswa River.

There is also an absence of segregation of waste at source by the residents. The trash being dumped into these rivers consists of all kinds of domestic and industrial waste which is a major cause of incidences of various health hazards in the region.

Municipal bodies are the primary agencies responsible for arranging the solid waste management and hygienic conditions in the urban areas. However due to various administrative and logistics related constraints they have not been able to deliver. The financial health of the Municipal Corporation is also not very sound and workers are not being paid their entitlements in time leading to strikes which are resolved by intervention by the Ministry of Urban development.

In order to have a solution to these problems, this strategy paper outlines suggestion to develop a new policy on Integrated Solid Waste Management (hereafter referred as SWM) of Dehradun urban area through Public Private Partnership.

Possible Opportunities for change

Various rules and provisions in place such as Municipal Solid Waste, Jawahar Lal Nehru National Urban Renewal Mission (JnNURM) 2005, a flagship scheme of Government of India and Swachh Bharat Mission (Clean India Mission) (SBM, 2014) which aims at clean India by sesquicentennial year of birth of the Father of Nation Mahatma Gandhi i.e 2019, are converging towards effective SWM [8-10]. Availability of efficient private sector in the market to handle such types of work and various successful examples in the country (Nagpur, Chennai, Pune) shows that Public Private Partnership (PPP) could be an effective method to dispose solid waste [11]. Many municipalities are facing financial problems and are not in a position to setup and integrated SWM on its own and therefore introduction of PPP can be an effective way of solving this problem.

National Green Tribunal (NGT, 2015), Central Pollution Control Board and Hon'ble Supreme Court of India has also passed directions to the Government of Uttarakhand to come out with the solution to this problem in a time bound manner [12]. Also, the perception of treating waste as a resource if understood by the authorities, may lead to desired results.

Impact of current condition

Under the Government of India flagship scheme of JnNURM 2005, the municipal corporation of Dehradun started the waste management by involving the private enterprise for door to door unsegregated waste collection and dumping it at the earmarked landfill site at Sahastrdhara without any processing [3,9]. The waste is simply dumped at one place, leaving it to rot and emit greenhouse gases much to the discomfort of the public. The private operator roped in through outsourcing by the Municipality also faced operational problems due to pressure groups interference with regards to dumping problems. Public have started protesting against this dumping of waste and overflowing of Dustbins (Figure 2). Common dustbins are not cleaned regularly and are left flooded with waste, waiting to trigger health hazards.

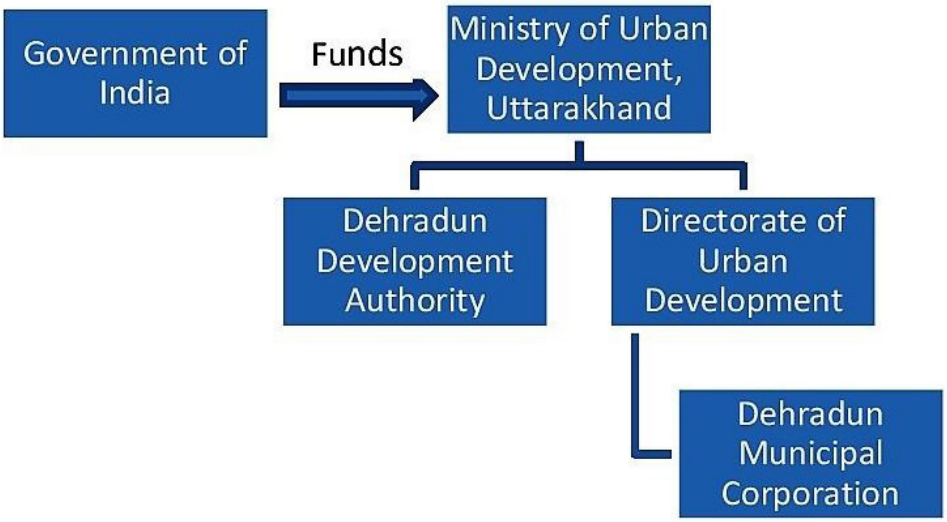
Source: Times of India, 12 Nov 2016 [13]

Figure 2: Overburdened Dustbins in Dehradun Town

The problem of dumping the waste at Sahastradhara site has become highly volatile matter with the public up in arms against the municipal authorities due to problem getting aggravated day by day [14]. Therefore the current situation confirms the inadequate mechanism in place for solid waste management and the city requires an integrated approach in order to have the deep rooted solution instead of a cosmetic one.

Current Role of the Government

Ministry of Urban development, Government of Uttarakhand and the Municipal Corporation Dehradun are the responsible agencies to undertake the effective solid waste management. Government of India has provided funds to municipal bodies to improve quality of life and infrastructure of cities, with solid waste management being an integral part of it. The urban development ministry has a defined organisational structure in order to perform waste management task (Figure 3).



Source: Ministry of Urban development, Government of Uttarakhand 2017
Figure 3: Waste Management Administrative setup (Urban Development)

The mandate of these departments are to have a balanced town planning along with provisioning of basic urban infrastructure to the residents (CDP, 2007) [15]. The Ministry is required to enact the policy and do necessary resource allocation for the effective implementation by the Municipal Corporations. Another ambition project of Government of India i.e Swachh Bharat Mission also mandates every municipality to work towards effective and scientific solid waste management (SBM Guidelines, 2017) [16].

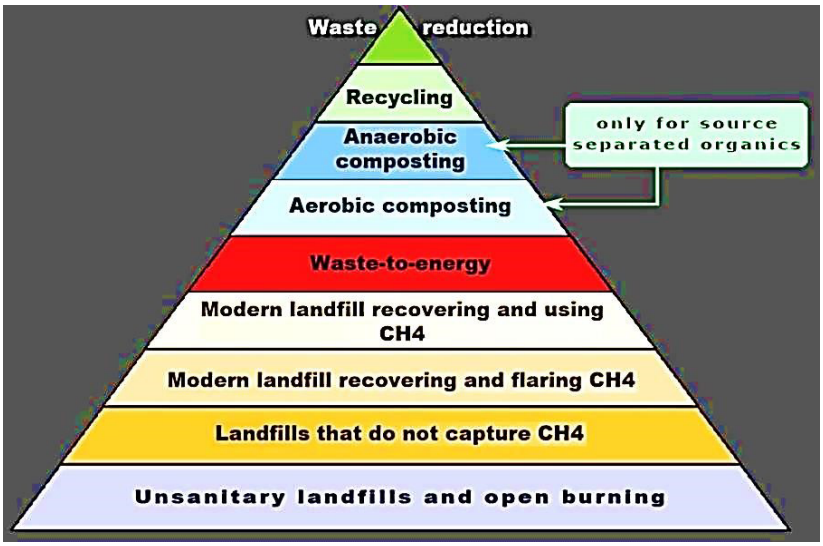
Existing Data

A draft action plan (MoUD, 2015) on Solid waste management was prepared by department of urban development to suggest improvement in solid waste management. One study came out with strong recommendation on utilisation of option of waste to energy conversion [17]. Confederation of Indian Inductry conducted an study on four Indian cities and came out with recommendations on using incinerators (CII, 2017) [18]. Another study worked on problems of Dehradun waste management and emphasised on increasing awareness of waste management amongst the public [6].

One more study worked on Futuristic Projection of Solid Waste Generation in Dehradun City of Uttarakhand using Supervised Artificial Neural Network-Non-Linear Autoregressive Neural Network [19]. A DPR was prepared for Urban Development Directorate by a consultant suggesting financial plan, implementation methods and sustainability of waste management of dehradun [20]. Another study came out with a suggestion on a user friendly expert system on solid waste management of Dehradun [21]. Most of the studies emphasised on scientific disposal of the municipal waste by recycling and conversion of waste into energy. These have been practiced at many places especially in South Korea [22]. However this requires huge initial capital cost (CAPEX) and maintenance cost (OPEX) and the financial conditions of municipal corporation does not allow to take this step [23]. In Feb 2018 Agra town could install a waste to energy plant for Rs 350 crores to treat a waste of around 500 MT/day. Indore Municipal Corporation has planned a waste to energy setup at an estimated a cost of Rs 100 crores for a waste of around 450 tonnes per day. Tambaram & Pallavaram municipalities came out with the plant for more than Rs 100 crores to treat 300 tonnes per day and produce power in Jan 2016. However, Dehradun Municipal Corporation with an income of just Rs 75 Crores per year and grants of around 40 crores would not be in a position to afford installation and running such type of plant on its own, despite of subsidy provision from Ministry of New and Renewable Energy Government of India. Apart from financial constraints various administrative problems like the human resource management issues restricts the Municipal bodies to go ahead with such initiatives and therefore an integrated approach either by financing from the government or by using PPP mode is needed.

Strategy for designing and implementation of Integrated approach towards Solid Waste Management

The causal theories are very important with respect to formulation of a public policy and the difficulties remain buried until or unless we get agitated about it [24]. We also understand how evidence and knowledge are fused to have a policy translation by effective utilisation of evidence translators [25]. Studies have suggested various sustainable options for solid waste management which can be best described by the desirability pyramid showing various methodologies of waste disposal (Figure 4).



Source: Annepu R K, 2012, WTERT, Columbia University [26]
Figure 4: Hierarchy of sustainable waste management

Keeping in mind sustainable, scientific and effective waste management, a strategy is proposed on the lines of Build, Operate and Transfer (BOT) for Integrated solid waste management of Dehradun under Public private Partnership mode with following components.

a) Door to Door collection of municipal waste from the residential and non residential areas of the town, its transportation to the dumping/processing site.
b) Directions to all the construction agencies to dump their construction and demolition waste at the processsing site earmarked above.
c) Installation of Binless collection of waste at common locations. This is a unique technique to be used to get rid of overflowing dustbins. This is more hygeinic, good aaessthetics and easy to handle also.
d) Installation of waste processing plant with following facilities;

i) Recycling
ii) Aerobic Composting
iii) Anaerobic Digestion
iv) Refuse Derived Fuel
v) Waste to Energy Combustion

e) A recycling Plant is to be installed for recycling plastic, paper, glasses etc.
f) A plant for the aerobic composting of the organic waste to compost is to be installed. This kind of composting avoids emission of green house gases.
g) Treatment of organic waste by anaerobic digestion to convert it into energy in the form of bio gas (Biomethanation). This can be used as a fuel or if used in generator can produce electricity.
h) A plant to convert the municipal waste into Refuse Derived fuel (RDF). RDF can be used as a substitute to coal for industrial combustion requirements.
i) A plant for converting waste to energy by the process of controlled combustion by thermally breaking down combustible solid waste to an ash residue and in the process producing electricity. South Korea is using this technology very effectively by generating electricity equivalent to 1.66 million tonne of oil equivalent (TOE) [27].
j) Conversion of construction and demolition waste into building material of low standard to be used for road construction, can be done by using inert waste management technology.
k) Department of Urban Development, Government of Uttrakhand has to ensure the fulfilment of all the prerequisites for the smooth implementation of the project, whether it is land availability, environmental clearance or any other legal matter in this regard.The whole process has been depicted in the form of flow chart (Figure 5).

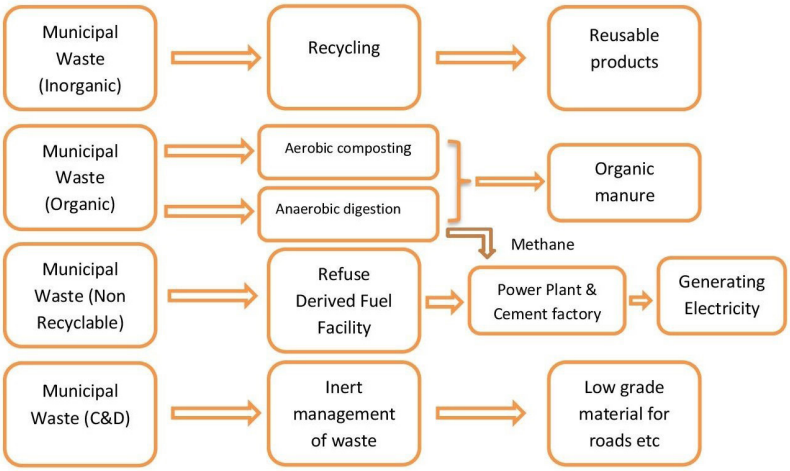


Figure 5: Proposed waste management plan

Dehradun Municipal Corporation is required to prepare a Request for Proposal (RFP) to invite bids from interested parties to perform the above scope of work under Public private Partnership. Since this integrated system would require an initial capital infrastructure, Government of Uttarakhand, Department of Urban Development can have this PPP by providing financial support to the concessionaire in the form of viability gap funding (PPP Cell, 2005). During operation the concessionaire would recover its cost by levying user charges on the residents and other agencies from where the waste is collected. Also, the concessionaire would be selling the compost, recycled materials, RDF and the electricity generated and earns revenues (carrots for it) out of it. The PPP would be having a span of at least 15 years in order to have the effectiveness and financial viability for the concessionaire.

Evaluation of the proposed strategy

Monitoring and evaluation of a public policy is highly important to judge effectiveness, efficiency, service orientation, accountability, democratic process and the trust of the people [28]. Whatever strength a policy or strategy has, the assessment of the magnitude of the policy instruments has major challenges in the form of various interferences it faces [29].

Waste to energy technology is measured in terms of the amount of power to be generated by the plant. The PPP agreement would be incorporating the clause for the generation of the power of required amount depending upon the quantity of waste processed. Using the similar cases of Tambaram and Pallavaram municipalities using a waste of 300 tonnes of solid waste per day the plant should generate 6 MW of electricity by using the standards fixed by the Central Electricity Regulatory Commission of Rs 15 crores per MW of power generated. The Capex estimated in this case is around Rs 100 crores and Dehradun Municipal Corporation with an annual income of Rs 75 crores and grants worth Rs 40 crores would not be able to afford it and therefore the PPP approach would be a better option by making the viability gap funding through the grant from Jawaharlal Nehru National Urban Renewal Mission - a huge city-modernisation scheme launched by the Government of India's under Ministry of Urban Development.

The project would be evaluated on the following phased pattern in order to judge its impact and need for any intervention. It is proposed that both qualitative and quantitative method of data collection (Silverman, 2004) would be employed.

1) During first year, the performance of the concessionaire would be monitored on regular door to door collection of waste. For this a survey would be conducted from a sample of residents. Data comparison would done about the solid waste been generated by the households and other entities with the previous year. The amount of power generated would be the indicator of the performance of the concessionaire and the revenue would be regulated on this outcome.
2) During the second year an audit of the performance of this action plan would be conducted to assess its progress and financial position. The water of the streams inside the city e.g Bindal and Rispana would be tested to judge the effect of the project as dumping on waste in the rivers should have minimised. The condition of the underground dustbins would be monitored.
3) During the third year, need for revision in tipping fee may be explored as per concession agreement It is to be judged by the Municipal Corporation Dehradun whether this policy of having integrated system has been an effective way of SWM or a fragmented one would have been better. The quantity of the by products produced and its sale by the concessionaire would be an indicator of its profitability.
4) All these assessment would be repeated in phased manner to judge the sustainability of the project and to preserve the nature [30-32].

Conclusion

The Government authorities and the public should work sincerely to advance source level separation of waste, accomplish higher rates of recycling and deliver usable manure from organics. While this is being accomplished and reusing is expanded, arrangements ought to be made to deal with the non-recyclable waste that are being produced and will keep on being created. State Governments should play a proactive role in streamlining the implementation of these endeavours. Enhancing SWM in India is very important.

Despicable SWM presents unavoidable risk to general wellbeing, environment and the personal satisfaction of citizens. Recycled materials and electricity recuperation from waste is a critical part of enhancing SWM in India. Having not just an approach to effective SWM but an integrated approach would serve a long lasting purpose and would leave our coming generations thankful to us for making the air worthy of breathing.

References

1. Census (2011) Political Census of India 2011, Central Census Organisation of India.

2. DIC Dehradun (2012) Industrial Scenario of Dehradun, Development Commissioner MSME Government of India. 17.

3. Urban Development Report (2015) Ministry of Urban development Government of Uttarakhand. 13.

4. UNFCCC (2012), CDM- Executive Board report, EB 66 Report Annex 32. 1.

5. Times of India (2017) Dehradun: Garbage piles up as municipal employees continue strike.

6. Pandey Vidush (2017) Report on Solid Waste Management in Dehradun, Hari Kamal Foundation for Policy Research.

7. Pune Mirror (2017) Dehradun: Pollution woes for residents as waste burns at Sahastradhara trenching ground.

8. MSW Rules (2000) Municipal Solid Waste (Management and Handling) Rules 2000, Ministry of Environment and Pollution, Government of India.

9. JnNURM (2005) Jawahar Lal Nehru National Urban Renewal Mission (JnNURM) 2005, Ministry of urban Development, Government of India.

10. SBM (2014) Swachh Bharat Mission, Ministry of Urban Development, Government of India.

11. GoI-ADB-PPP initiative (2010) Toolkit for Public Private Partnership frameworks in Municipal Solid Waste Management, ICRA Management Consulting Services Limited India.

12. NGT (2015) National Green Tribunal, Principal Bench, New Delhi, Appeal No 08 of 2015.

13. Times of India (2017), Citizens join hands to solve garbage disposal woes.

14. Pioneer (2016) Stir Over Waste Dump Off On Accord.

15. CDP (2007) City Development Plan: Dehradun, Urban development Department Uttarakhand.

16. SBM Guidelines (2017) Swachh Bharat Mission guidelines, Ministry of housing and urban affairs, Government of India.

17. Kalyani KA, Pandey KK (2014) Waste to energy status in India: A short review, College of Management & Economic Studies (CMES), UPES, Dehradun 248007, India.

18. CII (2017) Study on realigning Indo-German cooperation with the initiatives of the Indian Government: A case of waste management, Confederation of Indian Industry.

19. Saini, Ahuja, Bahukhandi (2017) Futuristic Projection of Solid Waste Generation in Dehradun City of Uttarakhand using Supervised Artificial Neural Network-Non-Linear Autoregressive Neural Network (NARnet). Inter J Chem Tech Res 10: 283-99.

20. IPE Global (2008) Detailed Project Report (DPR) for Solid Waste Management in Dehradun, IPE Global Private Limited (formerly Infrastructure Professionals Enterprise Private Limited).

21. Ahuja JN (2013) an expert system for integrated solid waste management system for Dehradun city, UCOST sponsored research and development projects.

22. Ryu C (2010) Potential of Municipal Solid Waste for Renewable Energy Production and Reduction of Greenhouse Gas Emissions in South Korea.

23. DMC (2016) Financial Statement of Dehradun Municipal Corporation.

24. Stone DA (1989) Causal Stories and the Formation of Policy Agendas, Political Science Quarterly. 104: 281-300

25. Ingold, Monaghan (2016) Evidence translation: an exploration of policy makers' use of evidence, Print.

26. Annepu R K (2012) Sustainable Solid Waste Management in India WTERT, Columbia University.

27. Jeong, Jihyun (2017) Economic and Environmental Cost Analysis of Incineration and Recovery Alternatives for Flammable Industrial Waste: The Case of South Korea, Business School, Kwangwoon University, Seoul 01897, Korea.

28. Phillip D (2008) Using Monitoring and Evaluation to Improve Public Policy, SRA Workshop 10 March 2008, British Library Conference Centre, London.

29. Naoko Tojo (2008) Evaluation of Waste Management Policy and Policy Instruments: Three case studies, IIIEE Reports.

30. Silverman D (2004) Qualitative Research theory: Method and practice, London, SAGE Sofía García-Cortés, Ellen Gunsilius, Barbara Ölz (2014), Sustainable Waste Management, Improving ecological, social and economic aspects of waste management, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

31. Amar U (2017) Hike in budget allocation to Dehradun Municipal Corporation.

32. PIU JnNURM (2007) Project Implementation Unit, Directorate of Urban development.