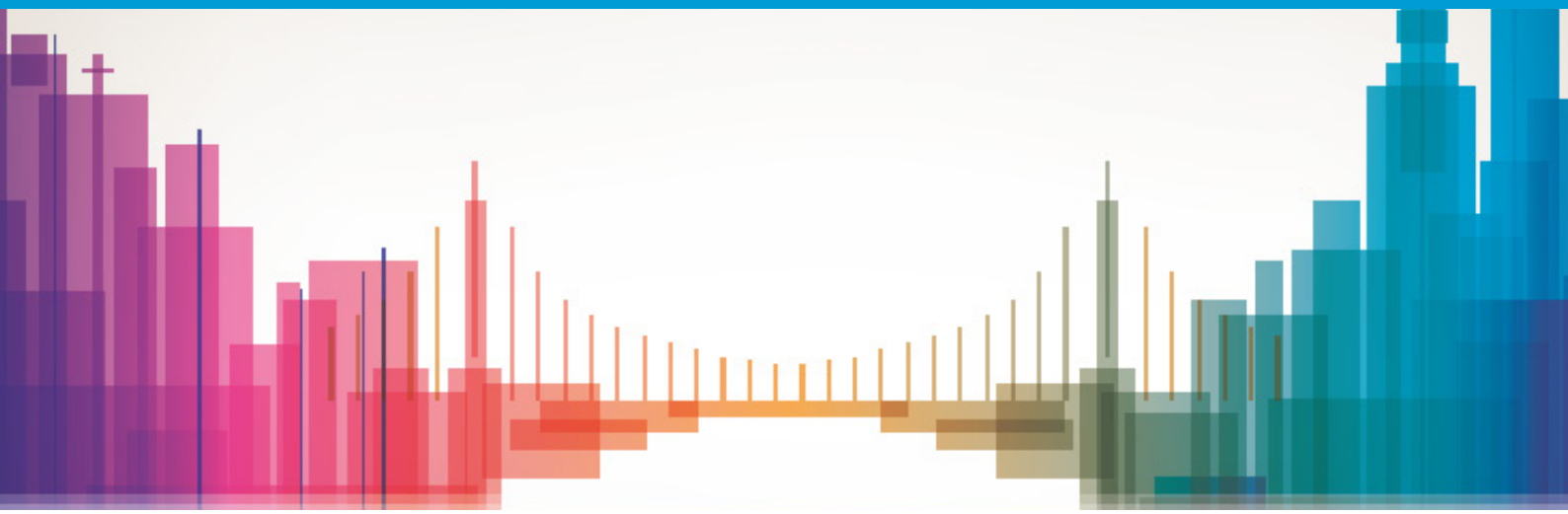
United 4 Smart Sustainable Cities

Reducing food waste

Case study of the U4SSC A guide to circular cities

June 2020



Convention on Biological Diversity

United Nations ECLAC

Food and Agriculture Organization of the United Nations

ITU

UNDP Empowered lives. Resilient nations.

United Nations Economic Commission for Africa

UNECE

UNESCO United Nations Educational, Scientific and Cultural Organization

UN environment United Nations Environment Programme

UNEP FINANCE INITIATIVE

United Nations Framework Convention on Climate Change

UN HABITAT FOR A BETTER URBAN FUTURE

UNIDO

UN OFFICE 4 PARTNERSHIPS

UNITED NATIONS UNIVERSITY UNU-EGOV Operating Unit on Policy-Driven Electronic Governance

UN WOMEN

WORLD METEOROLOGICAL ORGANIZATION


ZERO
WASTE
start now

United 4 Smart Sustainable Cities

Case study: Reducing food waste

June 2020

Foreword

This publication was developed within the framework of the United for Smart Sustainable Cities (U4SSC) initiative.

Acknowledgments

The case study Mumbai: collects surplus food at hotels and distribute to the poor was developed by Vimal Wakhlu.

The case study Oslo: Circular bioresources – treatment of food waste, garden waste and sludge from wastewater was developed by Nikolaos Kontinakis.

Both cases were reviewed by Okan Geray.

Okan Geray wishes to thank the U4SSC management team: Mr Nasser Al Marzouqi (U4SSC Chairman), Mr Abdurahman M. Al Hassan, and Mr Paolo Gemma (U4SSC Vice-Chairmen) for their assistance and contributions.

The author also extends his gratitude to the contributing organizations, along with their representatives: Mr Oliver Hillel from the Convention on Biological Diversity (CBD), Ms Lucy Winchester and Ms Vera Kiss from the Economic Commission for Latin America and the Caribbean (ECLAC), Ms Simone Borelli from the Food and Agriculture Organization (FAO), Ms Cristina Bueti and Mr Chris Ip from the International Telecommunication Union (ITU), Ms Iryna Usava from the United Nations Development Programme (UNDP), Mr James Murombedzi from the United Nations Economic Commission for Africa (UNECA), Mr Guilherme Canela from the Regional Bureau for Sciences in Latin America and the Caribbean of the United Nations Educational, Scientific and Cultural Organization (UNESCO), Ms Martina Otto and Mr Garrigan Curt from United Nations Environment (UN Environment), Mr Matthew Ulterino from the United Nations Environment Programme Finance Initiative (UNEP-FI), Mr Motsomi Maletjane from the United Nations Framework Convention for Climate Change (UNFCCC), Mr Andre Dzikus, Ms Tania Lim, Mr Jean Yves and Robert Lewis-Lettington from the United Nations Human Settlements Programme (UN-Habitat), Mr Mark Draeck, Ms Katarina Barunica Spoljaric and Mr Nicholas Dehod from the United Nations Industrial Development Organization (UNIDO), Mr William Kennedy from the United Nations Office for Partnerships (UNOP), Ms Soumaya Ben Dhaou and Ms Judy Backhouse from the United Nations University – Operating Unit on Policy-Driven Electronic Governance (UNU-EGOV), and Mr Alexander Baklanov from the World Meteorological Organization (WMO).

The opinions expressed in this publication are those of the authors and do not necessarily represent the views of their respective organizations or members.

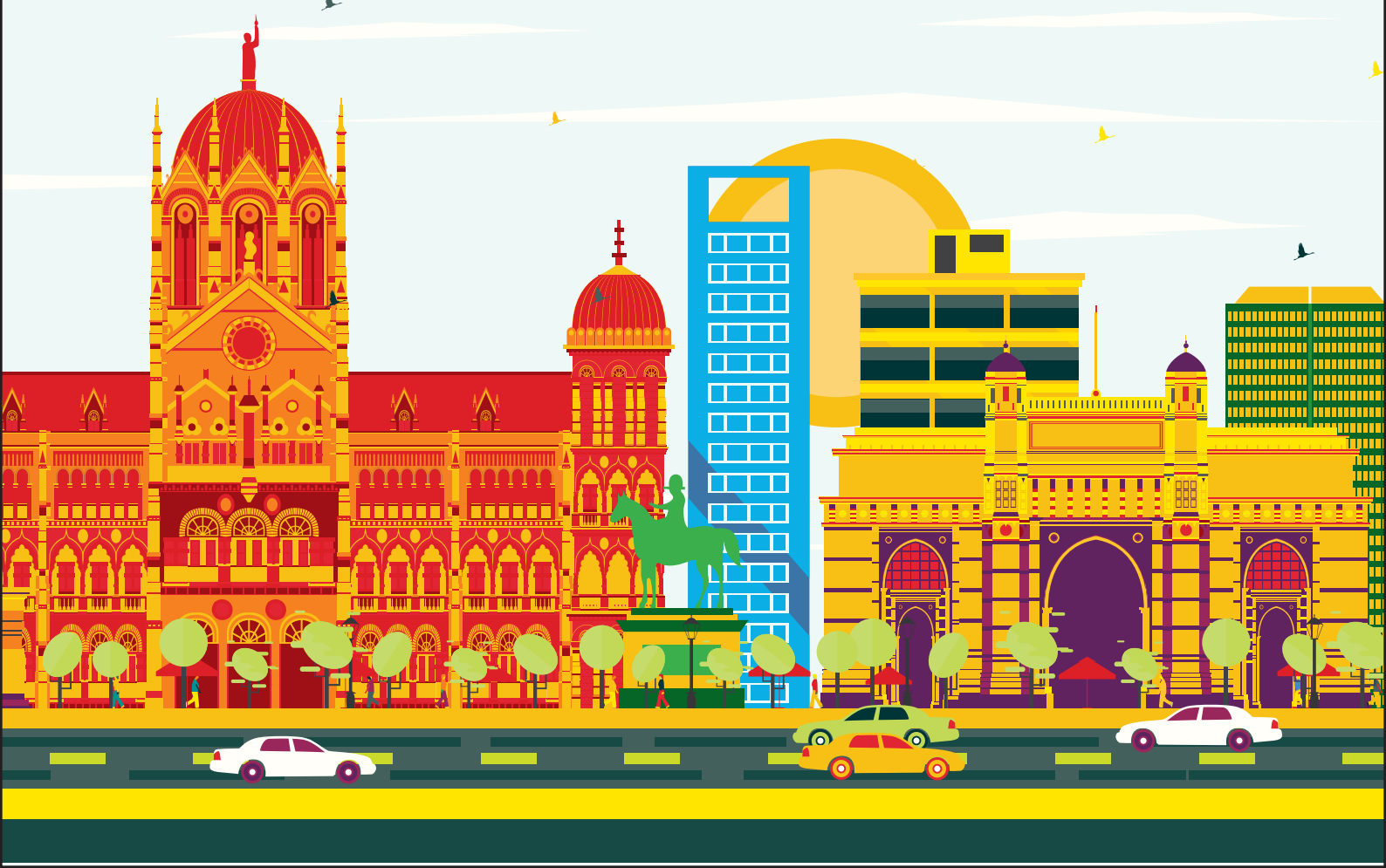
ISBN: 978-92-61-31231-2

CONTENTS

List of Figures

Figures

MUMBAI



Case Study 1 – Mumbai, India: Roti Bank (Food Bank)

Author:

Vimal Wakhlu

Introduction

Background

Globally, one in nine people in the world today (815 million) are undernourished. A vast majority of the world's hungry people live in developing countries, where 12.9 per cent of the population is undernourished. Southern Asia faces the greatest hunger burden, with about 281 million undernourished people. In sub-Saharan Africa, projections for the 2014-2016 period indicate an undernourishment rate of almost 23 per cent. Poor nutrition causes nearly half (45 per cent) of deaths in children under five – 3.1 million children each year. One in four of the world's children suffer stunted growth. In developing countries, the proportion can rise to one in three. Sixty-six million primary school-age children attend classes hungry across the developing world, with 23 million in Africa alone.

The Effects of Chronic Hunger: Chronic hunger – or food insecurity – is as devastating to families, communities and countries as famine. Chronic hunger claims more victims than famine each year – by far. Effects of chronic hunger include:

- high infant mortality rates;
- vulnerability to common illnesses;
- increased risk of infection;
- acute vulnerability in times of disaster;
- impediments to development; and
- impediments to economic growth.

The former United Nations Secretary-General, Ban Ki-moon, launched the Zero Hunger Challenge[1] in 2012 during the Rio+20 World Conference on Sustainable Development.[2] The Zero Hunger Challenge was launched to inspire a global movement towards a world free from hunger within a generation. It calls for:

- zero stunted children under the age of two;
- 100% access to adequate food all year round;

[1] https://www.un.org/zerohunger/
[2] https://sustainabledevelopment.un.org/rio20

- all food systems being sustainable;
- 100% increase in smallholder productivity and income; and
- zero loss or waste of food.

The year 2015 marked the end of the monitoring period for the two internationally agreed targets for hunger reduction. The first was the World Food Summit (WFS)[3] goal. At the WFS, held in Rome in 1996, representatives of 182 governments pledged '... to eradicate hunger in all countries, with an immediate view to reducing the number of undernourished people to half their present level no later than 2015'. The second was the formulation of the First Millennium Development Goal (MDG 1), which includes among its targets 'cutting by half the proportion of people who suffer from hunger by 2015'.

This has been followed up by UN Sustainable Development Goal 2 (SDG2), which includes among its targets 'ending hunger in all its forms by 2030'. Food is an important resource for sustenance of any society or city. It is against this backdrop that the initiative of Roti Bank or Food Bank undertaken by **Dabbawalla Association of Mumbai**, in India assumes importance. The purpose of this case study is to highlight how this initiative helps to meet the objective of overcoming hunger, and also how a resource like food, which would otherwise become waste and a challenge to address, can be used in a circular economy perspective in a city to meet a major SDG.

Challenge and response

Mumbai is the second largest city in India after Delhi with a population of 22 million. The space in the city is limited and the population has been growing steadily. A lot of economic activity happens here and consequently many people from the hinterland get sucked into this city. With limited scope for housing and other such amenities, 41 per cent of people are forced to live in slums. A lot of people find it difficult even to have a square meal.

The influx of people who get sucked into Mumbai City because of the lure of employment and a good future is quite large, and this makes the limited resources within the city insufficient to cater for the requirements of these new additions to the population every day. Intense economic activity also results in many people eating out and a lot of food becoming surplus to requirements at the end of the day in restaurants and eateries; this has to be sent to piggeries or get wasted. In fact, disposing of this surplus food also becomes a challenge at times.

The solution to the problem has been found by **Dabbawala Association of Mumbai**. They have a Six Sigma quality certificate and a global business fan club that includes Prince Charles and the owner of Virgin Group, Richard Branson. About 5 000 Dabbawalas have been in action for over 125 years and deliver nearly 200 000 lunches every day. Their unique operational method is a subject of management study in global business schools. **Roti Bank** is an NGO supporting them in their latest not-for-profit initiative.

[3] http://www.fao.org/wfs/index_en.htm

This organization collects surplus food at the end of the day from hotels and individual households and delivers it to the needy people in different parts of Mumbai, including some hospitals where the relatives of poor patients have come from remote corners of the country and cannot afford to eat in regular restaurants. As mentioned, apart from meeting the needs of the citizens, it also ensures that the waste created due to surplus food which would otherwise have to be disposed of, is dealt with.

Figure 1: Staff of the Roti Bank

This meets the U4SSC deliverable on circular economy-effective use of resources. Here, food is being as a resource for this purpose, and also partly meets SDG 2 and SDG 11.

Promoting circularity

Vision and content

On the one hand, a lot of people are going to bed hungry. On the other hand, disposing of surplus food has become an urban challenge. This is where organizations have joined together and come up with this initiative called **Roti Bank**, which literally means **Bread Bank** or **Food Bank**.

The **Roti Bank** project is a replicable model directed at mitigating the challenge of hunger.

Any city would be sustainable only if the people living in there are satisfied with their lives and are living in harmony with all the groups. The crime rate in a city is another determinant. With hungry people around, it would not be possible to have a low crime rate. Hence this basic human need for food should be met for every citizen. Also, a city having healthy people can contribute to the progress of the city in a big way.

Implementation

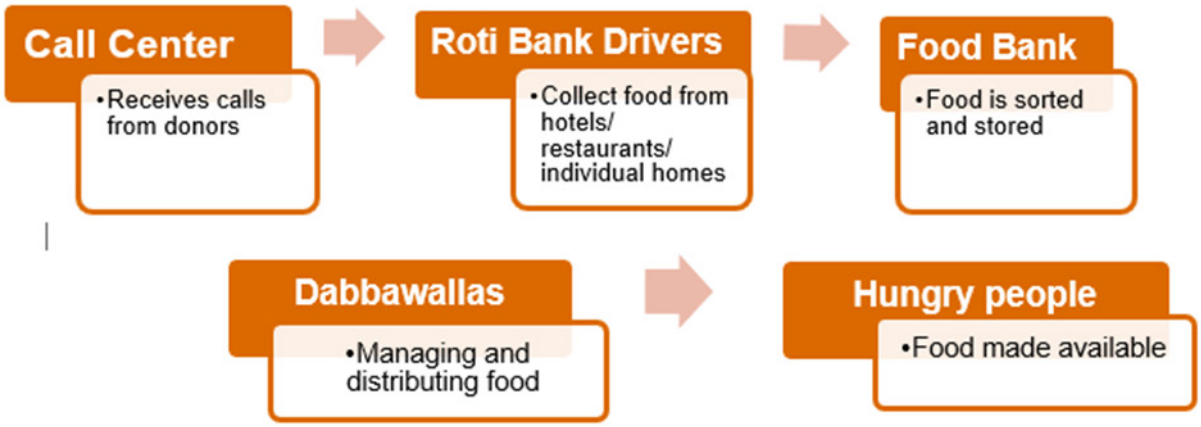
Key features and Design: The project is being implemented through a close working relationship between the well-established network of the **Dabbawalla Association of Mumbai** and an NGO called **Roti Bank**.

The additional resources they are using are:

- vehicles for transportation;
- volunteers for supporting the food distribution activity; and
- food preservation mechanisms.

The process of the implementation is described below in Figure 2.

Figure 2: The process of the Roti Bank



Enablers in the process have been the vision of the NGO Roti Bank, particularly under the leadership of Mr D. Shivanandhan, Former Commissioner of Police of Mumbai, the volunteering spirit of the people, and a proven and effective delivery network of the famous Dabbawallas.

The innovation and smartness of this project lies in its uniqueness, in the fact that what would otherwise be waste in a city is converted into one of the most important resources for sustaining human existence. The role of ICT in the project is to connect the demand with the supply nodes, effectively starting with the call centre, where any entity with surplus food on a particular day can call the implementing organization. Besides this, a database of routine donors and recipients is maintained for an effective utilization of surplus food in the city.

Results

The project is expected to mitigate the challenges of hunger in a city where 41 per cent of people are forced to live in slums. The results are sustainable because this model has gained acceptability and other cities in the country are being motivated to replicate it.

The project has the following impacts:

Social Impact: The challenge of hunger in society has been addressed. This would lead to more responsible citizens, a reduced crime rate and less spending on mitigating health-related challenges. It also enhances community cohesion and, to a certain extent, equality among its members.

Economic Impact: It is a given that healthy citizens can contribute better to the economic development of a city and a country. With issues like malnutrition taken care of, and also with reduced expenditures in health-related issues, the city is bound to see economic improvement in the years to come. It reduces the aggregate food expenditure in the city and also cuts food waste disposal costs that would otherwise be incurred.

Environmental Impact: The food that would have been disposed of as waste poses different environmental challenges. By converting it as an important resource for the city, the impact on the environment would be reduced in terms of Greenhouse Gases (GHG) emissions and this also contributes to the city's goal of achieving a clean environment.

References

- www.un.org/en/sections/issues-depth/food/
- Figure 8 at https://solvingworldwidehunger.weebly.com/
- World Population Review at worldpopulationreview.com/world-cities/mumbai-population/
- Zero Hunger Challenge at http://www.un.org/en/zerohunger/
- World Food Summit at http://www.fao.org/wfs/index_en.htm
- The Rio+20 information at https://sustainabledevelopment.un.org/rio20
- First Millennium Development Goal (MDG 1) at http://www.un.org/millenniumgoals/poverty.shtml
- The main website concerning the initiative is www.rotibankindia.org

List of discussion partners/interviews

- Mr Shivananda, Former Commissioner of Police, Mumbai
- Mr Subhash Talekar, Spokesperson of the Dabbawalla Association Mumbai
- Founding Trustees of Roti Bank
- Mr Sushil Jiwarajika, CMD, Artheon Group, Mumbai

Case Study 2 – Oslo, Norway: Circular Bioresources – Treatment of Food Waste, Garden Waste and Sludge from Wastewater

Author:

Nikolaos Kontinakis

Introduction

Background

Oslo is the capital of Norway and the country's largest city, with approximately 670 000 inhabitants. It is a compact capital city surrounded by a nationally protected forest and the Oslo Fjord. The population is young, highly educated and diverse – one third of the population are first or second-generation immigrants. The standard of living, and thus consumption levels, is high. This also generates a lot of waste from households, and roughly half of the waste is organic.

Oslo is one of the fastest growing cities in Europe, thus constituting a great opportunity, as well as a great challenge. The city has to plan and build for growth in terms of infrastructure, schools, care facilities and service production, while implementing an ambitious environmental and climate policy.

Challenge and response

The cycling of nutrients is critical for the growth of all plant and animal life on the planet. Humans set the natural balance of nutrients and the soil carbon cycle under stress by intensive use of land, harvesting plant material for food, feed and other applications. Mostly, the residues of these activities end up as 'bio-waste'.

Cities are major concentrators of bio-waste flows from food waste, garden and park waste, and the urban wastewater sludge. The bio-waste represents a significant opportunity to recover nutrients and return them to the soil. It is also possible to produce biogas and other bio-based products from the bio-waste.

Moreover, the production of bio-waste-based products provides a positive climate impact in comparison with landfilling and incineration, and by replacing fossil-based products such as mineral fertilizers, peat and fossil fuels. No biodegradable waste is sent to landfills (this has been prohibited in Norway since 2009).

The city of Oslo wanted to establish a cycle-based waste management where the resources in the bio-waste could be used for the benefits of the citizens and the society. Since the inner city is compact and the spaces for waste bins are limited, Oslo decided to retain the system involving the collection of waste from two bins at home. Therefore, it was decided to build optical sorting plants to be able to put three waste fractions into one bin.

Oslo has a circular waste management system where the waste is used as raw materials in industry. Buses and waste trucks run on environmentally friendly biogas produced from food waste and sewerage. Bio-fertilizers and soil products from food waste, sewerage and garden waste are used, for example, by local farmers, residents and in the urban areas.

The smart project

Vision and content

Oslo is aiming to have a circle-based waste management system. By recycling and recovery, the resources in the waste should be introduced back to citizens in the form of raw materials for production, compost and soil qualities for gardens and farmers, and energy in form of biogas for trucks and buses, district heating and electricity.

City-wide vision and strategy

The city government aims to make Oslo a greener, fairer and more creative city for everyone. The government also aims to improve local food production and develop a cycle-based resource management. The political programme includes a vision for reducing waste through circular and sustainable consumption, including re-use, sharing and recycling. In a circular economy, the resources should be kept in cycles with 100 per cent re-use and recycling of suitable waste. In June 2016, the City Council passed the Climate and Energy Strategy for Oslo. This lays out targets to cut emissions by 36 per cent by 2020 and by 95 per cent by 2030.

The circular bio-resources are part of circular resource management. The use of renewable biogas on buses and waste collection trucks in the city, contributes to the reduction of emissions.

Waste management system in Oslo

Oslo has a cycle-based waste management system. Household waste is separated at source and collected according to waste type, with the aim of acquiring clean waste streams for recycling. Food waste and plastic packaging is source-separated by the citizens in green and blue plastic bags. The coloured bags are put in the same waste bin as residual waste. The sorting facilities optically recognize the colours and the green and blue bags are separated from residual waste. The collection system covers all citizens.

Oslo's biogas plant is transforming food waste into biogas, which is used as fuel by buses and waste collection trucks in the city. The biogas plant also produces bio-fertilizer which is used by local farmers to produce food. The plant has the capacity to process 50 000 tonnes of food waste per year. This provides sufficient biogas for 135 buses, and enough bio-fertilizer for 100 medium-sized farms. The biogas is carbon-neutral and is considered one of the most eco-friendly fuel alternatives available today. Bio-fertilizer contains many important nutrients and can replace current fossil-based chemical fertilizers.

Garden waste is collected at the recycling stations and is composted. The city produces several soil and compost qualities, and products are used in citizen's gardens, as well as by professional gardeners and agencies in the city.

The city also produces biogas and fertilizer from sewerage sludge. The biogas is used as fuel for buses and the fertilizer is used on grain areas. When the bio-fertilizer and compost are used in gardens, parks and by local farmers, the cycle of the bio-resources is closed.

The holistic approach to the use of bio-waste is innovative and smart. Oslo is looking into the whole value chain of food waste, from food waste prevention through using food waste as a resource to new products. It has been important to communicate to the citizens that by source- sorting their food waste, they contribute to cleaner air in the city and reduction of CO_2 emissions from the buses and waste-collection trucks. They also contribute to the production of new food grown on bio-fertilizer. The city focuses on the quality of the products by further developing the processes.

At the same time, the city recognizes the importance of reducing food waste and is involved in activities to reduce the generation of food waste in public canteens, restaurants, grocery stores and among our citizens. Oslo is also actively working to reduce the inflow of wastewater containing micro-pollutants into the municipal sewage network, through its two treatment plants, which also produce biogas. Biogas from food waste and sewerage sludge is marketed together.

The city is at the forefront of the circular use of available resources, such as using bio waste and city sewage for biogas production, fuelling city buses and waste collection trucks. Waste no longer reaches an end point but is a resource to exploit. The city owned biogas plant also produces bio-fertilizer from the food waste, and the fertilizer is used by local farmers to produce food.

Communication is really important to be able to change the sorting habits of the households. Surveys have been done to reveal the citizens attitude to source separation. The city has communicated its message on source separation and waste through – to name a few examples – campaigns, stands at malls and by knocking on doors. The city also educates 4th graders about the waste management system.

Results

Since the city of Oslo started source separating food waste and plastic packaging in 2012, rates of material recovery of the household waste have increased significantly. In 2017, 38 per cent of the household went to material recycling, only 3 per cent ended in landfills, and up to 2 per cent was re-used.

Waste analysis carried out in 2018 shows that the collection rate for food waste was 45 per cent, or 41 kg food waste per person. Around 20 000 tons of garden and park waste was collected through the recycling stations in 2017. The city produced around 27 000 tons of compost and soil products.

Nearly all waste collection trucks, and more than 150 buses in Oslo, now run on biogas produced from food waste and wastewater, which help to reduce the city's overall CO_2 emissions. The liquid fertilizers used by local farmers also reduce the demand for phosphorus-based fertilizers. This is beneficial because producing synthetic fertilizers involves mining limited resources such as phosphate rock.

Compost and soil qualities from composting garden waste are highly demanded from citizens and from professional gardeners, thus reducing the use of other resources of soil and compost based on peat.

References

- Eurocities at http://eurocities2017.eu/files/uploads/files/Oslo_Circular%20economy%20case%20study.pdf
- Climate and energy strategy for Oslo at https://www.oslo.kommune.no/getfile.php/13166797/Content/English/Politics%20and%20administration/Green%20Oslo/Plans%20and%20programmes/Climate%20and%20Energy%20Strategy%20Oslo.pdf

REDUCE FOOD WASTE

For more information,
please contact: u4ssc@itu.int
Website: itu.int/go/u4SSC

ISBN: 978-92-61-31231-2

Published in Switzerland
Geneva, 2020