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SERIES L: ENVIRONMENT AND ICTS, CLIMATE
CHANGE, E-WASTE, ENERGY EFFICIENCY;
CONSTRUCTION, INSTALLATION AND PROTECTION
OF CABLES AND OTHER ELEMENTS OF OUTSIDE
PLANT

Circular and sustainable cities and communities

Guide to circular cities

Recommendation ITU-T L.1620

ITU-T L-SERIES RECOMMENDATIONS

ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

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Recommendation ITU-T L.1620

Guide to circular cities

Summary

Recommendation ITU-T L.1620 contains a circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent method for assessing, prioritizing and catalysing different circular actions. Recommendation ITU-T L.1620 has been developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting.

Recommendation ITU-T L.1620 starts with an assessment of the main developmental and sustainability challenges that cities are facing and the ways in which the concept of circular economy can be extended beyond the economic sphere and be applied to different city assets.

Recommendation ITU-T L.1620 further defines key components of the circular city implementation framework. These components include: city assets and products (i.e., infrastructure, resources, as well as goods and services available for urban use); circular city actions (i.e., outcome-oriented actions that can be applied to city assets and products); circular city outputs (i.e., the outputs of circular city actions applied to city assets and products); and circular city enablers (i.e., complementary activities that support or accelerate implementation of circular city actions). Each of these components have different qualities and potential for facilitating circularity in cities. Interactions between these components form the basis of the circular city implementation framework.

Finally, Recommendation ITU-T L.1620 explains the circular city implementation framework. This framework utilizes four different steps to assist city stakeholders in enacting circular actions: 1) establish a baseline for circularity; 2) determine the potential of circularity in different assets and prioritize circular actions based on the availability resources; 3) apply city enablers to catalyse different circular actions; 4) evaluate the impacts of these actions.

Cities are invited to use Recommendation ITU-T L.1620 to identify a course of action to improve circularity. Recommendation ITU-T L.1620 also includes practical recommendations for preparing circular city actions and their implementation. Recommendation ITU-T L.1620 is complemented by 17 case studies that illustrate the application of the circularity concept based on experiences from cities around the world.

History

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

The way physical goods are produced and consumed remains largely linear: goods are manufactured from raw materials, sold, used (consumed) and then mostly disposed of as waste. At the same time, the sheer quantity of physical goods far outweighs our actual needs, with most consumer products not in use over 90% of the time – and some purchased solely for single use.

This linear model has been successful in providing affordable goods, services and resources to consumers and material welfare. However, this linear model of production and consumption is material- and energy-intensive; it relies on the principle of economies of scale to produce large amounts of goods at minimal cost, typically builds on more complex and international supply chains and creates large amounts of waste, much of which is not only avoidable, but potentially valuable. This model of production and management of goods, services and resources encourages short-term consumption, creates a range of negative externalities and is leading the planet to a potentially unsustainable future. In this context, the concept of a circular economy has recently emerged as a vision for how to gradually move away from this linear model to one that, by using resources better, is not only more sustainable, but also creates a range of new opportunities for inclusive economic growth.

The circularity concept can be extended beyond the sphere of economy. Cities are home to a staggering amount and variety of assets and resources that can not only be produced, but also used much more efficiently and sustainably. The efficiency of each item can be improved by applying circular design, resulting in positive social, economic and environmental impacts on a much larger scale. Transitioning to a circular economy will also support city leaders in reaching the Sustainable Development Goals and other global climate objectives.

Promoting circularity in cities is one of the strategic topics of the United for Smart Sustainable Cities [b-U4SSC] initiative, which brings together 17 UN agencies with the International Telecommunication Union (ITU), United Nations Economic Commission for Europe (UNECE) and UN-Habitat serving as the secretariat. The key performance indicators (KPIs) of U4SSC are among the most effective tools for evaluating circularity in cities. The KPIs are developed based on [b-ITU-T Y.4903]. These indicators support the efforts of cities to evaluate their smartness and sustainability performance. The KPIs were endorsed by the UNECE Intergovernmental Committee on Urban Development, Housing and Land Management (CUDHLM), as well as the ITU-T Study Group 5, *Environment, climate change and circular economy*, which is a global expert group under ITU that develops standards on sustainable and circular cities.

This Recommendation, which was developed within the U4SSC initiative, will be very useful for cities to implement circular activities and to promote circularity and urban sustainability.

Recommendation ITU-T L.1620

Guide to circular cities

1 Scope

This Recommendation establishes a circular city implementation framework that is designed to improve circularity in cities and support stakeholders in implementing circular actions. The framework consists of a four-step methodology that provides a consistent and scientific method to assess, prioritize, apply and catalyse different circular actions in the city setting. This Recommendation introduces the concept of city assets and products (i.e., city infrastructure, resources, services etc.), circular city actions (which can be applied to assets and products), circular city output (i.e., the results of applying circular actions to city assets and products) and circular city enablers (i.e., complementary actions that support the implementation of circular city actions). The Recommendation helps cities to identify a clear course of action to improve sustainability and achieve Sustainable Development Goal (SDG) 11, *Sustainable cities and communities*, and the related targets.

This Recommendation has been developed in response to the growing sustainability challenges that cities are facing and the emergence of the circular economy concept and its applicability and extension in the city setting. This Recommendation was developed based on the United for Smart Sustainable Cities (U4SSC) initiative deliverable of the same name [b-U4SSC GCC].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 greenhouse gas [b-ITU-T L.1430]: Gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds.

NOTE – GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and additionally nitrogen trifluoride (NF₃).

3.1.2 incineration [b-ISO/IEC 29142-3]: Disposal method that involves combustion of waste material converting it into heat, gas, steam, and ash but not including smelting.

3.1.3 landfill [b-ISO 472]: Waste disposal site for the deposit of waste onto or into land under controlled or regulated conditions.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ICT	Information and Communication Technology
KPI	Key Performance Indicator
NGO	Non-Governmental Organization
PESTEL	Political, Economic, Social, Technological, Environmental and Legal
PPP	Public-Private Partnership
PPPP	Public-Private-People Partnership
R&D	Research and Development
SDG	Sustainable Development Goal
SME	Small and Medium-sized Enterprise

5 Conventions

None.

6 Concept of circular cities

6.1 Challenges facing cities

More than half the world's population now lives in urban areas. In 2016, an estimated 54.5% of the human population lived in urban settlements, and that figure is expected to rise to 60% by 2030. These urban areas consume 75% of natural resources, produce between 60% and 80% of global greenhouse gas emissions, and generate 50% of all waste.

The number of cities with at least 1 million inhabitants was estimated to be 512 in 2016. This number is projected to reach 662 by 2030. In the same year, there were 31 "megacities", that is, cities with more than 10 million inhabitants. The number of megacities is expected to reach 41 by 2030 [b-UNDESA]. Hence, cities play a crucial role in driving sustainability in production and consumption of goods and services.

Cities are dense and highly congested physical spaces that are prone to a myriad of challenges such as population growth, urban sprawl, climate change, environmental degradation and fiscal pressures [b-UNECE]. In 2014, more than 80% of cities were located in areas vulnerable to a high risk of mortality or economic losses associated with natural disasters or other environmental challenges. Demographic changes such as: ageing populations; volatile economic growth; unemployment; low-wage, low-skilled jobs; income inequality; social polarization; and segregation are fuelling urban sprawl. Furthermore, the current consumption levels in cities are starting to exceed their economic capacity and biocapacity, ultimately affecting the well-being of all city dwellers.

Each city has its own unique characteristics and specific social and economic structure, along with the associated challenges. In order to start injecting circularity into different city assets, it is important for cities to assess their current status and identify the appropriate starting points with respect to circularity. The gap between the current state and the intended circular future creates an enormous innovative potential for cities and communities.

Stakeholders, including the public and private sector, non-governmental organizations (NGOs), civil society and the city dwellers themselves, can work collectively as partners to close this gap. Creating public-private-people partnerships (PPPPs) through the involvement of relevant stakeholders is crucial for circularity. PPPPs enable innovative and alternative financing mechanisms for circular city initiatives. In addition, engaging and working with stakeholders through global platforms such

as United for Smart Sustainable Cities (U4SSC) offer a reliable way to make the best use of the collective capital of cities and to ensure inclusivity throughout the implementation process.

6.2 Moving from a circular economy to a circular city

This Recommendation attempts to identify a list of city assets and products that would broaden the circularity concept beyond economy to include different aspects of city management, hence the term "circular" city". For example, public spaces in the city (which are not economic products but public assets) may be used for different social activities at different times (i.e., sharing public spaces as a city asset). Similarly, household items may be shared among individuals and households or re-used for different purposes. These examples transcend economic activities and enhance the utilization of city assets beyond them.

The circularity approach proposed in this Recommendation is meant to increase the efficiency and effectiveness of city assets and products by extending either their own utilization and lifespan or those of their constituents or components. This increase is achieved by applying targeted action items (referred to in this Recommendation as circular action items) on city assets and products, such as sharing, recycling, refurbishment, re-use, replacement and digitization. Action items are a set of specific, discrete, outcome-oriented tasks that can be applied to city assets and products to improve their utilization and lifespan.¹ This Recommendation explains the purpose and vision behind a circular economy, while providing an implementation framework on how to establish circularity within the context of cities.

6.3 Definitions of circular economy

The Recommendation does not provide a new definition for circular economy. Instead, it has compiled a list of existing definitions of circular economy, in order to illustrate the concept. In general, a circular economy is an economic system where products and services are traded in closed loops or cycles. Table 1 lists some of the well-known circular economy definitions and their interpretations.

Table 1 – Existing definitions of circular economy

Definition	Source
A circular economy is restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value at all times, while reducing waste streams. A concept that distinguishes between technical and biological cycles, the circular economy is a continuous, positive development cycle. It preserves and enhances natural capital, optimizes resource yields, and minimizes system risks by managing finite stocks and renewable flows, while reducing waste streams.	[b-ITU-T L.1020]
Circular economy is the "production and consumption of goods through closed loop material flows that internalize environmental externalities linked to virgin resource extraction and the generation of waste (including pollution)".	[b-Sauvé]
Circular economy is an approach that would transform the function of resources in the economy. Waste from factories would become a valuable input to another process – and products could be repaired, re-used or upgraded instead of thrown away.	[b-Preston]

¹ The action items are explained in detail in clauses 7 and 8.

Table 1 – Existing definitions of circular economy

Definition	Source
Circular economy "refers mainly to physical and material resource aspects of the economy – it focuses on recycling, limiting and re-using the physical inputs to the economy, and using waste as a resource leading to reduced primary resource consumption".	[b-EEA]
A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extracting the maximum value from them whilst in use, then recovering and re-using products and materials.	[b-Mitchell]
Circular economy is "an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair re-use, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models". The overall objective is to "enable effective flows of materials, energy, labour and information so that natural and social capital can be rebuilt".	[b-EMacAF 2013a] [b-EMacAF 2013b] [b-EMacAF 2015]
The circular economy is an economy "where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised".	[b-EC 2015]

Circular economy in cities aims to create a sustainable system that allows for the optimal use of city assets and products through re-use, refurbishment, remanufacturing, recycling, etc. This Recommendation explains the concept of circular cities and provides a methodology for the implementation of circular actions at city level, as well as offering good practices and concrete recommendations for promoting circularity in cities. It also demonstrates the positive impacts and challenges of the implementation of circularity concept.

7 Circular cities

Components of the circular city implementation framework

The following four components constitute key components in the circular city implementation framework. They are the necessary components for implementing circularity in cities.

- City assets and products – encompass various parts of the infrastructure, resources, goods and services available for urban use or consumption.
- Circular actions – specific, outcome-oriented actions that can be applied to city assets and products that include sharing, recycling, refurbishment, re-use, replacement and digitization.
- Circular city outputs – results of application of circular actions to urban assets and products.
- Circular city enablers – various supplementary and complementary items that are used to catalyse and support circular city outputs.

7.1 City assets and products

Figure 1 presents various city assets and products. They are classified into three categories: city infrastructure; city resources; and city goods and services (as potential inputs to circular action items described in clause 7.2).