Youth Participation in Developing Sustainable Green Cities

2022-1-DE04-KA220-YOU-000085135

# GUIDELINES FOR TRAINERS

**Project Reference**
**Acronym**: GreenCities
**Title**: "Youth Participation for Developing Sustainable Green Cities"
**Programme:** Erasmus + Programme of the European Union
**Grant Agreement: "**2022-1-DE04-KA220-YOU-000085135 - GreenCities"

**Prepared by – Nikoletta Simon (KKKE)**

**Partnership**

*Lead Partner***:**
L4Y Learning for Youth GmbH – Germany

*Partners:*
Sdruzhenie Walk Together - Bulgaria
Cankaya Belediyesi - Turkey
Kaán Károly Környezetvédelmi Egyesület - Hungary
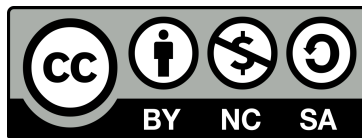Kyttaro Enallaktikon Anazitiseon Neon KEAN - Greece
C.I.P. Citizens in Power - Cyprus

**CREDITS AND DISCLAIMER**

This document is the collective effort of many individuals and the partner organizations working on behalf of the project "Youth Participation for Developing Sustainable Green Cities" and every attempt has been made to ensure that the contained information is true and accurate. Every reader and user is expressly advised to use the content and information of this document on his/her own responsibility. The European Commission's support of the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

**Disclaimer**

**Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.**

# Table of Contents

# Summary

As the world moves towards sustainable development, the youth's role in shaping our cities' future is paramount. The Erasmus+ KA220 Youth project. "Youth participation for developing sustainable green cities" is an exemplary initiative to unite young minds and help municipalities create a greener, brighter urban landscape.

The project aims to make it easier for cities and youth to work together to make cities more sustainable:

- establish a network of self-sufficient, independent youth-led NGOs in partner cities.
- increase awareness among young and adult citizens about the importance and potential of having their own innovative, green city.

The guide will guide trainers through the chapters of the curriculum. Most of them are discussed chapter by chapter, while the last two chapters are summarized.

The guide is aimed both at assisting the instructor by providing theoretical and practical instructions to complement the course materials and at supporting the instructor in the delivery of the course material. In this comprehensive document, we explore the details of modern urban development, focusing on the evolution, challenges and innovative solutions for smart cities.

The module begins by exploring the basic concepts in the first part of Part II. Here, the history and evolution of smart cities is described. The legal environment in the European Union and its alignment with sustainable development objectives will be examined, highlighting the regulatory framework that shapes smart cities initiatives.

It addresses the challenges facing urban environments, from rapid population growth to resource constraints and environmental degradation.

In the second chapter, the thematic sub-systems or pillars underpinning Smart City 3.0 are examined. From creating a smart environment and improving governance through public services to promoting economic viability and citizen engagement, each subsystem plays a crucial role in realising the vision of the Smart City. We will also delve into topics such as smart transport, living spaces and the environment, highlighting their combined impact on urban sustainability and resilience.

The third chapter focuses on technology as a transformative factor in urban development. Here we explore the diversity of technologies - from IoT sensors to AI - that are revolutionising the way cities operate and deliver services.

Through best practices, we will look at how technology is being harnessed as a solution to complex urban challenges to drive efficiency, innovation and inclusion.

# PART I.

## Introduction – the aim and expected results of the training course

The project aims to foster ***municipalities*** to develop sustainable smart green cities cooperating with ***youth*** by creating a network of independent, self-sufficient ***youth-led NGOs*** in partner cities. Besides, to raise awareness among *young* and *adult citizens* having a smart green city of their own.

The objective of the training is to provide a quick and comprehensive overview for the participants about the sustainability, green/smart city development, its functioning and benefits. It will give participants a relevant and up-to-date landscape of the main barriers and the incentives and measures to eliminate these problems. The training also aims to share ideas experiences and know-how in the field of transnational partnership with stakeholders from different institutions that can contributes to the development of green cities.

**The main objectives are:**

- *Educate on Sustainable Practices:* Provide comprehensive information on Smart City 3.0., including sustainable urban development and its challenges and practices, energy-efficient infrastructure, waste management, green transportation, concepts and tools of digitalisation.

- *Raise Awareness:* Increase awareness among urban planners, policymakers, young people and citizens about the importance of adopting green practices to mitigate environmental impact and promote resilience.

- *Promote Collaboration:* Encourage collaboration between various stakeholders such as government bodies, non-profit organizations, and young community groups to foster a holistic approach to green city development.

- *Provide Practical Guidelines:* Offer practical guidelines, tools, and best practices to help stakeholders implement sustainable solutions tailored to their specific urban contexts.

- *Encourage Policy Implementation indirect way:* Advocate for the adoption and implementation of supportive policies and regulations at the local, regional, and national levels to facilitate the transition to greener cities.

**The training framework and module structures allow:**

a) young trainees will be prepared better for future sustainable smart green cities, with skills and competencies to start to develop a green city for themselves.

b) higher confidence of the Municipalities and stakeholders involved in the project to implement educational activities related to smart green cities.

Mechanisms, procedures and capabilities will be improved to enable trainees attending the events related to green training to react better green issues of the cities.

**The expected results of the training:**

The training will improve the awareness of general concept of sustainable smart cities in order to stimulate cooperation, innovation, technology transfer. At the end of the training the participants will be more equipped with the knowledge to elaborate better cooperation and a successful and effective partnership.

After participating on the training, the participants will be able to:

- Understand the conceptual framework of Green Cities.
- Play a vital role in knowledge exchange.
- Develop future cooperation to implement a capacity building.

## The general landscape: the main advantages, barriers and long-term challenges of sustainable cities

Green cities offer numerous **advantages**, encompassing environmental, social, and economic benefits.

- It prioritizes environmental conservation and sustainability by reducing pollution, conserving natural resources, and promoting biodiversity, which helps mitigate climate change, and protect air and water quality.
- It promotes healthier lifestyles by providing ample green spaces, pedestrian-friendly infrastructure, and access to clean air and water.
- It prioritizes energy efficiency through the use of renewable energy sources, green building practices, and efficient transportation systems.
- It offers a higher quality of life for residents by providing amenities such as parks, gardens, and recreational areas.
- Sustainable transport options such as public transport, walking and cycling infrastructure are preferred. This reduces traffic jams, air pollution and greenhouse gas emissions.
- Green cities serve as hubs for innovation and technological advancements in sustainability.
- Green cities strive for social equity by ensuring that environmental benefits are shared fairly among all residents, regardless of income or ethnicity.

**Barriers and challenges can hinder young people full participation to creating sustainable cities**:

- A **lack of educational opportunities** can hinder young people's ability to contribute meaningfully to their communities if they **do not have access** (or they have **limited access**) to quality education and vocational training programs that equip them with the skills they need for sustainable urban development.
- Youth **unemployment** and/or **underemployment** limit young people's access to decent and sustainable job opportunities in urban areas.
- **Inadequate public transportation infrastructure** and lack of safe and accessible mobility options can restrict people's ability to access education, employment, and recreational opportunities, particularly in low-income communities.

- **Disparities in access to digital technology and internet connectivity create barriers** for young people to access online education, information, and employment opportunities, exacerbating social and economic inequalities.
- The **effects** of climate change, such as extreme weather events, sea level rise and heat waves, are having a major impact on people living in urban areas.
- Young people often face barriers to **participation in decision-making processes** related to urban planning and development, which obviously limits their ability to have a meaningful influence/impact on policies and initiatives that affect their future.
- **Inadequate representation** of young people in political institutions, community organizations and decision-making bodies, which hinders efforts to create sustainable cities for the next generation.

## The importance and role of the youth sector in sustainable green cities

Research shows that 70% of the projected 9 billion people will live in cities. The United Nations Economic Commission for Europe (UNECE) and the International Telecommunication Union (ITU) define a smart sustainable city as: "An innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects."[1]

Making cities productive and healthy places to live is one of the most critical challenges to achieving the Sustainable Development Goals, and young people play a key role in this process. Two demographic patterns stand out in today's global landscape: rapid urbanisation and a large young population.

In most countries, urban planning and development is traditionally carried out by local authorities and government agencies, but most of them do not have the skills to implement a full smart city project. This is why there is a need to involve all interest groups, especially young people, to find new solutions to the problems of modern cities.

Around the world, there were many initiatives to empower young people around the millennium, but the potential of these initiatives was not taken seriously by the various stakeholders.

Main reasons:

- Governments tend to lean on older age groups for decision-making,
- Young people do not have equal access to the same tools, resources and opportunities to promote local ownership to make their cities more sustainable.

Urbanisation is seen as one of the greatest intergenerational challenges of the twenty-first century. In this rapidly urbanising world, young people need to find solutions to the unprecedented challenges they face, such as building adequate housing, ensuring access to adequate public transport, providing safe drinking water, ensuring green spaces, etc., as this is the environment in which people can live healthy and productive lives. However, the positive potential of involving young people has still not been fully exploited.

Lioni Siamak - *Global Youth Coordinator of the UN Sustainable Development Solutions Network* - in her article "Cities of The Future*"*, concludes that those born around the turn of the millennium have limited influence on policy-making processes in the field of urban planning.

---

[1] https://earth.org/youth-smart-sustainable-cities/

According to her, young people are progressive and entrepreneurial, skilled technologically and committed to social justice, and it is therefore essential to involve young people in the political decision-making process.

**Why is this important? What are the benefits of involving young people in decision making?**

- Young people often bring fresh perspectives, innovative ideas and creative solutions to complex problems that can benefit technological design in the context of green cities, preserving the environment and reducing carbon emissions.
- Awareness and education: young people can raise awareness of environmental issues and make credible arguments for sustainable practices in their communities. They can educate their peers, local authorities and decision-makers about green initiatives such as recycling, energy saving and alternative transport methods.
- Youth-led organizations can take initiatives to influence decision-makers to prioritise green infrastructure, renewable energy and environmentally friendly policies.
- Involving young people in sustainable development projects provides them with valuable leadership skills and supports them in becoming the environmentalists of the future. Through leadership roles in youth organizations, young people can gain practical experience in project management, teamwork, and decision-making.
- Involving young people in community-based environmental projects promotes a sense of responsibility and ownership of our environment.
- By involving young people, cities can ensure that their long-term development goals are in line with the values and priorities of younger generations.

Young people are indispensable partners in the journey towards sustainable urban development. Their creativity, enthusiasm, and commitment to environmental stewardship make them valuable assets in addressing the complex challenges facing cities today. By empowering and investing in the youth, cities can harness their potential to drive positive change and build a more sustainable and inclusive urban future for generations to come.

## Unit 1: Introduction to Smart City 3.0

### 1.1. Smart area concepts (general smart city knowledge) - The concept, development and history of smart cities

**Objective of this module:** Introduce learners to the concept, development, and history of smart cities.

Teaching about smart cities requires a multifaceted approach that combines theoretical knowledge with practical applications, critical thinking exercises, and real-world case studies. It is essential to learn the basics in order to dive into the details and examine the function and operation of smart cities in a component-by-component way.

The training approach is to:

- *Understanding the Concept of Smart Cities*
- *Define what a smart city is and its fundamental principles.*
- *Discuss the evolution from traditional cities to smart cities, emphasizing the role of technology and data in improving urban life.*

It is very important to clarify the concept of smart city at the beginning. So, first, we have to define what a smart city is and its significance in modern urban development.

*Definition: a city that utilizes technology and data-driven solutions to enhance quality of life, sustainability, and efficiency.*

After that, explain that smart area concepts involve applying these principles to specific areas within a city to address unique challenges and opportunities.

Important to highlight the core components of a smart city, such as technology integration, sustainability, and citizen-centric services. Let's look at the evolution of smart cities from traditional urban planning to the digital age. Take a look at the key milestones, including ICT (Information and Communication Technology), IoT (Internet of Things) and data-driven decision-making.

**Main steps:**

- Discuss the importance of understanding the specific needs and characteristics of different areas within a city.
- Discuss about key components of Smart Areas – What are these elements? – *Optional*: *Interactive section*
    - Integration of Information and Communication Technology (ICT) infrastructure.
        - Connectivity infrastructure: Wi-Fi, IoT sensors, etc.
    - Data-driven decision-making processes.
        - Data collection and analysis: Gathering and analyzing data to inform decision-making.
        - Digital divide and equitable access to technology
        - Privacy and data security concerns (See Unit 3)
    - Citizen engagement and participation in governance.
        - Involving residents in the planning and implementation process.
    - Sustainability and environmental considerations.
        - Sustainability initiatives: Renewable energy, waste management, green spaces, etc.
    - Innovation and collaboration among various stakeholders.
        - Provide case studies or examples illustrating each component in action.
- Challenges and Considerations - *Encourage participants to brainstorm potential solutions or strategies for overcoming these challenges. E.g.:*
    - Cost and funding issues
    - Regulatory and policy barriers.
- Highlight examples of smart area projects from around the world, such as Barcelona's Smart City District and Amsterdam's Smart City Neighborhoods. See Unit 4.

*Optional interactive Activities: Engage participants with case studies of renowned smart cities like Singapore, Barcelona, and Amsterdam. Analyze their strategies, challenges, and outcomes to provide real-world insights into smart city development. (This can be also part of Unit 4)*

**Additional Resources (Optional)**

Provide participants with additional resources for further learning, such as articles, reports, or websites related to smart city initiatives and smart area concepts.

## 1.2. European Union legal environment in brief (and SDG's)

**Objective of this module:** to provide an understanding of the European Union's legal environment, its intersections with sustainable development goals, and the implications for various stakeholders, thereby contributing to informed decision-making and action towards sustainable development. By the end of this lesson, students will be able to analyze the alignment between European Union (EU) legal frameworks and Sustainable Development Goals (SDGs), and evaluate their implications for promoting sustainable development.

It is important to explain the purpose of the module: why it is important to talk about this topic. It may also be useful to engage students with a thought-provoking question or real-life example, even at the beginning of the lesson, that highlights the importance of aligning the legal framework with the SDGs.

Some example:

1. How might the absence of regulations regarding environmental protection in a specific region impact the health and livelihoods of local communities?

2. What legal mechanisms could be implemented to address this issue and promote sustainable development?

3. Imagine a scenario where a government prioritizes economic growth over environmental conservation, leading to the exploitation of natural resources and degradation of ecosystems. What legal measures could be enacted to balance economic development with environmental sustainability, ensuring the protection of natural resources for future generations?

4. Consider the global impact of climate change and the urgency of reducing greenhouse gas emissions to mitigate its effects. How can international agreements, such as the Paris Agreement, serve as legal frameworks for coordinating efforts among countries to combat climate change and achieve sustainable development goals?

After the above, let's overview the legal environment in the EU:

- Highlight key areas of EU law relevant to sustainable development, including environmental protection, social policy, and economic governance.
- Introduce the United Nations Sustainable Development Goals (SDGs) and their significance as a global framework for addressing social, economic, and environmental challenges and explore how EU legal frameworks align with specific SDGs:
    - *Example 1: EU environmental regulations and SDG 13 (Climate Action).*
    - *Example 2: EU social policies and SDG 8 (Decent Work and Economic Growth).*
    - *Example 3: EU consumer protection laws and SDG 12 (Responsible Consumption and Production).*
- Facilitate a discussion on the interplay between EU laws and SDGs, including areas of alignment and potential areas for improvement.

Optional exercises:

**Exercise 1: Case Study Analysis**

- Divide participants into small groups and provide each group with a case study involving a specific EU legal issue related to sustainable development (e.g., a recent environmental regulation, social policy initiative, etc.).
- Ask each group to analyze the case study and discuss:
- How does the EU legal framework address the issue?
- What are the potential impacts on achieving SDGs?
- Are there any gaps or areas for improvement in the EU's approach?
- Reconvene as a whole group to share insights and discuss potential solutions or recommendations.

**Additional Resources (Optional)**

• Provide participants with additional resources for further learning, such as EU publications, SDG progress reports, and relevant academic articles or reports.

## 1.3. Challenges of the urban environment

**Objective of this module:** The aim of the module is to give students a better understanding of the multiple challenges of the urban environment, exploring in more detail its social, environmental and economic dimensions. Students will be able to identify and discuss the various challenges posed by urban environments, analyze their impact on society, and propose potential solutions.

They will gain some insight into the implications of urbanisation for public health, social justice and environmental sustainability. They will also explore possible solutions and interventions to effectively address these challenges.

They will gain a better understanding of urban problems through real-life examples and case studies. The overall aim is to empower students to make a positive contribution to a sustainable and liveable urban environment in the future.

**The module should address the following questions with short, guided answers:[2]**

*a.)  What are some key features of the urban environment?*

- *High population:* urban areas typically have a concentration of people living in a relatively small geographical area.
- *Infrastructure development:* Urban environments are characterised by extensive transport networks, including roads, railways and public transport systems.
- *Cultural diversity:* Cities attract people from different backgrounds, leading to cultural exchange and diversity.
- *Economic opportunities:* A wide range of employment opportunities and access to goods and services.

*b.)  How does urbanisation affect the natural environment?*

- Habitat loss: urbanisation often leads to the conversion of natural landscapes into built environments, leading to a loss of biodiversity and ecosystem services.
- Pollution: Increased human activity contributes to air, water and soil pollution, which harms the environment and public health.
- Resource depletion: Urbanisation puts pressure on natural resources such as water, energy and land, leading to overuse and degradation.
- Climate change: urban areas contribute significantly to greenhouse gas emissions.

c.)  *What are the social challenges in densely populated urban areas?*

---

[2] https://geographycasestudy.com/characteristics-of-urban-places/

- Housing affordability: there is often a housing shortage and high rents, leading to housing insecurity and homelessness.
- Social inequalities: urbanisation can increase socio-economic inequalities and marginalised communities face barriers to accessing health care, education and employment opportunities.
- Crime and safety: Highly populated urban areas can have higher crime rates and public safety challenges, which affect the well-being and quality of life of residents.

*d.) What economic inequalities can exist in cities?*

- Income inequalities
- Access to services
- Gentrification: wealthier individuals and businesses displace low-income residents, changing the socio-economic structure of neighbourhoods.

Some suggested additional exercises for the module:

**What are the environmental challenges:**

- *Air Pollution:* Discuss the sources and effects of air pollution in urban areas. How does it affect public health and the environment?
- *Water Scarcity:* Explore the issue of water scarcity in cities. What are the causes, and how can water resources be managed sustainably?
- *Waste Management:* Analyze the challenges of waste disposal and recycling in urban environments. What are the implications for public health and sanitation?

*Some examples with solutions:*

*Example 1: Air pollution*

Problem: Traffic jams lead to severe air pollution in large cities, causing respiratory diseases and environmental degradation.

Proposed solution: Stricter emission standards for vehicles, promotion of public transport and clean energy initiatives.

*Example 2: Water scarcity*

Problem: Rapid urbanisation of cities like Cape Town in South Africa strains water resources, leading to drought and water scarcity.

Proposed solution: implement water saving measures, invest in desalination technology, promote rainwater harvesting

*Example 3: Waste management*

Problem: There are cities, such as Jakarta, with inadequate waste management infrastructure. There is a build-up of garbage that pollutes watercourses, endangering public health.

Proposed solution: Improve waste collection systems, encourage recycling and composting, and raise public awareness.

## **What are the social challenges?**

See c.) part.

*Housing Affordability:* How does gentrification impact marginalized communities?

*Social Inequality:* What are the consequences for social cohesion and mobility?

*Public Safety:* How can communities work together to create safer environments?

### *Example 1: Housing affordability*

Problem: Housing prices in San Francisco have become very high, which makes it difficult for low-income residents to afford housing, leading to displacement.

Proposed solution: affordable housing policies, rent control measures.

### *Example 2: Social inequalities*

Problem: In cities like São Paulo, socio-economic inequalities lead to spatial segregation, as richer neighbourhoods have access to better infrastructure and services.

Proposed solution: Invest in equitable urban development, ensuring access to education and health care in underserved areas.

### Example 3: Public safety

Problem: Cities such as Johannesburg have high crime rates, which reduce public safety and hinder economic development.

Suggested solution: Implement community policing initiatives, improve street lighting and urban planning.

## What are the economic challenges?

*Unemployment:* discuss the challenges of unemployment and underemployment in urban areas. How does automation affect job opportunities?

*Infrastructure gap:* Examine whether infrastructure investment is needed to support economic growth. How can cities finance and maintain critical infrastructure projects?

*Example 1: Unemployment*

Problem: High youth unemployment rates in cities such as Athens and Madrid contribute to social and economic instability.

Solution: Invest in vocational training programs, support small and medium enterprises and encourage entrepreneurship.

*Example 3: Infrastructure deficits*

Problem: Ageing infrastructure in cities such as New York City (USA) threatens public safety and economic competitiveness.

Solution: Implement infrastructure renewal programs, leveraging public-private partnerships and sustainable infrastructure practices.

Talking about any of these examples and reviewing them with your students will help them to better understand the material and complement it.

## 1.4. Smart City Strategic Planning and Management

The topic requires a multidisciplinary approach that combines theoretical concepts with practical applications.

It is essential to highlight the importance of strategic planning in guiding smart city initiatives towards specific goals and outcomes.

It is crucial to define smart city strategic planning and its significance in guiding the development and implementation of smart city initiatives.

*What can be the key components of smart city strategic planning:*

- *Vision and goals: Establishing a clear vision for the city's future and setting specific goals to achieve it.*

- *Stakeholder engagement: Involving diverse stakeholders, including residents, businesses, and government agencies, in the planning process.*

- *Data-driven decision-making: Utilizing data and analytics to inform strategic priorities and action plans.*

- *Innovation and technology integration: Identifying innovative solutions and integrating technology to address urban challenges.*

- *Provide examples of successful smart city strategic plans from around the world.*

It is advisable to introduce frameworks such as SMART (Specific, Measurable, Achievable, Achievable, Relevant, Time-bound) criteria for setting targets.



## What does SMART mean?

| **S** | **M** | **A** | **R** | **T** |
|---|---|---|---|---|
| **Specific** | **Measurable** | **Achievable** | **Relevant** | **Time-bound** |
| Be as specific as possible with the desired goal. | Set a measurable goal to track and quantify the progress. | Set a realistic but challenging goal that is reasonable to achieve. | Align the desired goal with the broader business goal. | Set a goal with a target end date. |
| EXAMPLE | EXAMPLE | EXAMPLE | EXAMPLE | EXAMPLE |
| Close $10,000 in sales by the end of the quarter. | Aim to walk one mile, three times a week. | Increase newsletter sign-ups by 10% month over month. | Create and test two versions of the email before sending out the email blast. | Grow the number of monthly users for the mobile app to 1,000 by the end of four months. |

©2022 TECHTARGET, ALL RIGHTS RESERVED TechTarget

Source: https://www.techtarget.com/whatis/definition/SMART-SMART-goals

It is important to highlight the importance of involving different stakeholders, including government, business, academia and citizens in the strategic planning process.

Here are some examples of the role of each target group:

1. **Government**:
   - Governments set the overall policy framework and regulatory environment for smart urban development, including for example urban planning rules and financing mechanisms.
   - They allocate financial and human resources to support smart city initiatives, such as infrastructure development, research programs and public-private partnerships.
   - They have a coordinating role, bringing together different stakeholders to work together.

2. **Business sector**:
   - Businesses, in particular tech companies and start-ups, drive innovation and provide the technological solutions and expertise needed to deliver smart city projects.
   - Businesses can invest in smart city projects, providing funding, expertise and resources to support implementation.

3. **Academic sector**:
   - The academic sector conducts studies, experiments and pilot projects to advance knowledge and understanding of smart city technologies, policies and best practices. It has an important role in research and development.
   - The academic sector educates and trains the next generation of smart city professionals.
   - Knowledge sharing and collaboration between researchers, practitioners and policy makers.

4. **Citizens**:
   - Citizens provide valuable information about their needs, preferences and priorities, which helps to develop smart city strategies and initiatives.
   - Citizens participate in the planning of smart city projects through various channels such as public consultations, community forums and digital platforms.

- Citizens play an active role in shaping the future of their cities by supporting policies and initiatives that promote sustainability, equity, transparency and accountability.

From a management perspective, the strategic management of smart cities focuses on key principles and frameworks adapted to the specific challenges and opportunities presented by urban environments undergoing digital transformation.

**What are the things we need to review? Some examples here:**

*1.  SWOT Analysis*

Introduce the SWOT (Strengths, Weaknesses, Opportunities, Threats) framework and its application in the context of smart cities.

*Optional:* It is useful to present fictive or real smart city scenarios, identifying internal and external factors that influence strategic decision making.

*2.  Resource allocation*

How to efficiently allocate resources to support smart city initiatives, taking into account factors such as budget constraints, stakeholder priorities and return on investment.

*3.  Change management*

To familiarize students with the principles and techniques of change management to facilitate organizational and cultural change within city governments and other stakeholders.

**What are common steps of the change management process?[3]**

- Determine the reason for the change.
- Set specific goals for the change.
- Establish key performance indicators (KPIs) and milestones to monitor progress.
- Refer to change management models.
- Create a change management plan and implementation strategy.

*4.  Ethical and legal considerations*

Explore ethical and legal considerations related to smart city governance, including privacy, security, transparency and accountability. Discuss the role of government regulations and policies in addressing these issues and ensuring that smart city initiatives benefit all residents equally.

By focusing on these management principles within the context of smart city development, students will gain a solid foundation in strategic management theory and practice, enabling

---

[3] https://www.coursera.org/articles/change-management-process

them to effectively lead and contribute to the transformation of urban environments into smarter, more sustainable, and inclusive cities.

## 1.5. Urban design

**Objective of this module:** to provide students with a comprehensive understanding of the concept, development, and historical context of urban design. By the end of the module, students should be able to define urban design and its principles, analyze the evolution of urban spaces over time, and critically evaluate the impact of urban design on communities and the environment.

At the beginning of the module, introduce the concept of urban planning and its importance in shaping cities.

**What are these important factors? (Some examples)**

*Effective Land Use*: By strategically allocating land for residential, commercial, industrial, and recreational purposes, planners ensure efficient land use, minimize sprawl, and protect valuable natural areas from overdevelopment.

*Infrastructure Development:* Urban planning coordinates the development of essential infrastructure such as transportation networks, utilities, and public services. It is important for the future growth that infrastructure investments are strategically located, adequately sized, and efficiently managed to support the needs of urban populations.

*Quality of Life:* Urban planning aims to enhance the quality of life for residents by creating safe, healthy, and livable communities. The aim is to design neighborhoods with access to amenities such as parks, schools, healthcare facilities, and cultural institutions, fostering social interaction, physical activity, and a sense of belonging.

*Environmental Sustainability:* Urban planning promotes environmental sustainability by integrating principles of resource conservation, energy efficiency, and climate resilience into land use decisions and development policies. Planners prioritize green infrastructure, sustainable building practices, and alternative transportation modes to minimize environmental impact and mitigate climate change.

There are some additional topics that can be mentioned: social equity, transportation, and mobility, After above mentioned section, provide a historical overview of urban planning, highlighting key developments and influential figures from different periods (e.g. Renaissance urban planning, Haussmann's renovation of Paris, Jane Jacobs' advocacy of community-based planning). You can also use the following resources to complement the module: https://www.britannica.com/topic/urban-planning

The principal phases of an urban planning process are[4]:

- Preparatory / exploration phase
- Feasibility / planning phase
- Formal planning / zoning phase
- Design and implementation phase
- Operational phase



Source: http://www.urbanlearning.eu/toolbox/planning-process/
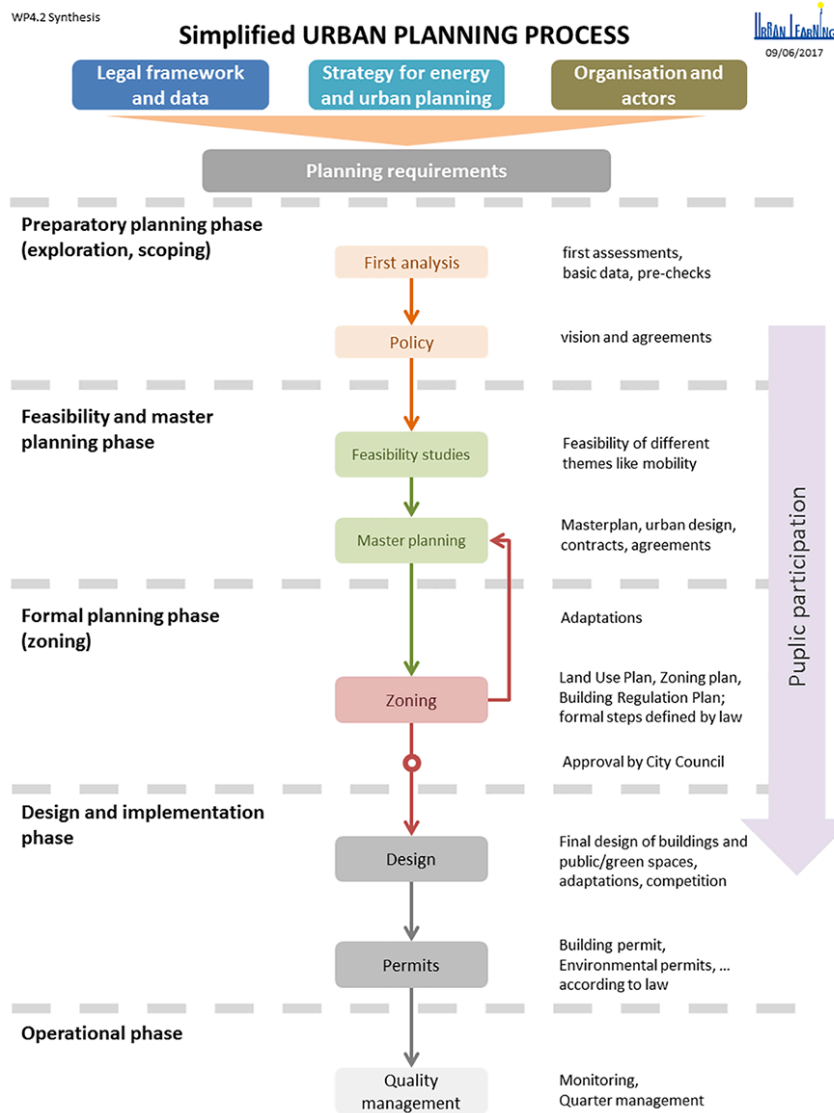
If there is time, it is worth reviewing the diagram and going through the steps.

**Unit 1 is available on the training platform: https://training-greencities.eu/courses/unit-1-introduction-to-smart-city-3-0/**

---

[4] http://www.urbanlearning.eu/toolbox/planning-process/

# Unit 2: Thematic subsystems/pillars

## 2.1. Smart environment

**Objective of this module:** is to provide students with a comprehensive understanding of the concept of smart environments, including their underlying technologies, applications, benefits, and challenges. The curriculum provides students with a detailed introduction to the topic, its importance, key factors and good practices, which provides a strong base for students to learn the topic in detail.

To teach the subject effectively, it is important to use a multidisciplinary approach that integrates theoretical concepts with practical demonstrations and hands-on activities.

**The module has 4 sub-chapters:**

1. **Sub-topic 1: Defining smart environments - Core concepts and features in the context of green cities.**

   Start by defining the smart environment and why it is becoming increasingly important in today's world. Discuss the key features and components of smart environments, such as connected devices, sensors, actuators and communication networks.

2. **Sub-topic 2: Evolutionary stages of smart environment development within environmentally sustainable urban settings**

   The course then describes the stages in the development of the smart environment, which is also very important to understand.

   a. The early stage is the initial implementation of basic technologies and infrastructure to support environmental sustainability initiatives in the urban environment. This phase includes activities such as the emergence of energy-efficient buildings, waste management systems and the development of basic infrastructure for renewable energy production.

   b. At advanced stage, cities are already starting to integrate IoT devices to collect data on various environmental parameters (air quality, temperature, energy consumption, waste generation).

c. At mature stage, automation and control systems are already being introduced at this stage to improve efficiency and reduce environmental impact. Integrated systems work in dynamic interaction. Circular economy principles are applied to minimise waste and maximise resource efficiency, creating a sustainable and resilient urban ecosystem.

3. **Sub-topic 3: Objectives and motivations driving smart environment initiatives in green cities.**

The next step is to discuss about the objectives and motivation driving smart environment initiatives in green cities which are multifaced and interconnected. The module mentions 5 main aspects:

a. Environmental Sustainability

   *What are the topics we can focus on?*

   One of the main objectives is to reduce greenhouse gas emissions by building energy-efficient buildings, using renewable energy sources and introducing sustainable transport solutions. Another is to conserve natural resources. This can be achieved most effectively by promoting the concepts of a circular economy. Furthermore, biodiversity conservation is a particular priority in green cities.

b. Climate Change Mitigation and Adaptation

   It is important to define these two concepts. What do they mean?

   *"**Mitigating** climate change means reducing the flow of heat-trapping greenhouse gases into the atmosphere. This involves cutting greenhouse gases from main sources such as power plants, factories, cars, and farms. Forests, oceans, and soil also absorb and store these gases, and are an important part of the solution. Reducing and avoiding our emissions requires us to reshape everything we do — from how we power our economy and grow our food, to how we travel and live, and the products we consume. It is a problem felt locally and globally."*[5]

   *"Climate change **adaptation** means altering our behavior, systems, and—in some cases—ways of life to protect our families, our economies, and the environment in which we live from the impacts of climate change."*[6]

   The above two concepts can be complemented by a third: **resilience.**

---

[5] https://www.eea.europa.eu/en/topics/in-depth/climate-change-mitigation-reducing-emissions
[6] https://www.worldwildlife.org/stories/what-s-the-difference-between-climate-change-mitigation-and-adaptation

*"**Resilience** is a measure of an area's ability to deal with the effects of climate change and 'bounce back' or recover from an event like a storm or an extreme high tide if one occurs."*[7]

4. **Sub-topic 4: Showcase of global examples illustrating diverse smart environment implementations tailored for environmental sustainability.**

This chapter gives examples of how cities are using smart technologies to address pressing environmental challenges.

**Possible exercise:**

Assign students to calculate their own carbon footprint using online calculators or carbon accounting tools. E.g.: https://www.climatestewards.org/offset/

Have students identify areas where they can reduce their carbon footprint through lifestyle changes such as energy conservation, transportation choices, waste reduction, and dietary habits.

Encourage students to set personal goals for reducing their carbon footprint and track their progress over time.

a. Quality of Life Improvement

QoL is defined as smart city services that improve the quality of life, providing advanced integrated services based on information and communication technologies. This can include economic, environmental, transport and governance factors. Research exists to support the notion that smart cities can improve quality of life for residents, including reductions in crime of 30% - 40% and 15% - 20% less time spent commuting.

There are many examples of how connected technology is improving citizens' quality of life:[8] [9]

- Reducing traffic congestion
- Improving Air Quality
- Improving access to government services
- Improving Healthcare
- Public safety

[7] https://www.somersetwildlife.org/blog/steve-mewes/mitigation-adaptation-and-resilience

[8] https://www.forbes.com/sites/insights-inteliot/2018/10/24/5-areas-where-smart-city-technology-improves-quality-of-life/

[9] https://www.forbes.com/sites/insights-inteliot/2018/06/14/6-ways-the-internet-of-things-is-improving-the-quality-of-urban-life/#1a1c7ba43a03

- Optimization of energy consumption

b. Economic Competitiveness

The economic competitiveness of smart cities is paramount due to its multifaceted impact on urban development.

- it attracts substantial investments from both public and private sectors, fueling infrastructure development, technological innovation, and sustainable initiatives.
- it stimulates job creation across various sectors, bolstering employment rates and fostering economic growth.
- it cultivates a conducive environment for business growth and entrepreneurship by providing access to advanced infrastructure and supportive ecosystems.
- it enhances the efficiency and productivity of businesses through the deployment of smart technologies.
- it promotes sustainable economic development by prioritizing resource efficiency, environmental conservation, and social inclusion.
- it facilitates international trade and collaboration, strengthening economic ties and partnerships on a global scale.
- it fosters innovation and knowledge exchange, driving forward-thinking solutions to urban challenges.

c. Citizen Engagement and Empowerment

The involvement and empowerment of citizens in smart cities is key to promoting inclusive, sustainable and responsive urban communities. First, involving citizens in decision-making processes and policy development promotes transparency and accountability in governance. It increases the effectiveness of smart city initiatives by using local knowledge, expertise and feedback from residents. It enables the collaborative creation of solutions to urban challenges, harnessing the creativity of different stakeholders. It promotes civic engagement and active citizenship. It fosters innovation and entrepreneurship by creating opportunities for cooperation between citizens, businesses, academia and government.

5. **Sub-topic 4: Showcase of global examples illustrating diverse smart environment implementations tailored for environmental sustainability.**

In the following section, review these case studies with the students and then test their knowledge using the questions.

## 2.2. Smart governance (public services)

**Objective of the module:** The objective of this module is to introduce learners to the concept of smart governance and its significance in modern urban management. Additionally, the module seeks to explore real-world examples of smart governance initiatives and their impact on enhancing efficiency, transparency, and citizen engagement in city management. The module aims to equip participants with the knowledge and skills necessary to contribute to the development and implementation of smart governance solutions in their respective contexts.

In the first phase, it is important to define the concept itself and then review the importance of smart governance in urban management and its key principles.

Definition: *Smart governance is a concept that uses modern technology to manage public services effectively, transparently, and participatively. It digitalizes traditional governance models and employs technologies like data analysis, IoT, and AI, aiming to enhance sustainability and efficiency in areas like urban planning, traffic management, and energy use.*

Smart governance could be defined as the pursuit of the enhancement of citizens' quality of life, involving a high level of citizen participation, public and non-public collaboration, improving accountability, decreasing costs, and providing excellent service.

It is also important to highlight and explain the connection between smart governance and sustainable cities.

   a.) Efficient Resource Management

      Smart governance uses technology and data-driven approaches to optimise the allocation of resources, including energy, water and transport infrastructure. With real-time monitoring and analysis of results/data, cities can identify when they are not operating efficiently, so they can implement targeted interventions to address the problems that arise.

      Some examples of it:

- *Smart Energy Grids* to monitor electricity usage in real-time. By analyzing consumption patterns and optimizing distribution, smart grids help reduce energy waste, lower costs, and promote the integration of renewable energy sources.

- *Smart water management systems* use IoT sensors and data analytics to monitor water quality, detect leaks and manage water networks efficiently. Leaks are a major problem for municipalities. However, by detecting them early, cities can conserve water resources, reduce non-revenue water losses and ensure equal access to clean water for all citizens.
- *Intelligent waste management solutions* use IoT sensors and predictive analytics to optimise waste collection routes, minimise collection costs and reduce landfill. There are smart bins equipped with sensors that monitor fill levels, which cities can use to optimise collection schedules, reduce collection truck emissions and promote recycling and composting initiatives.

b.) Transportation and Traffic Management

Transportation and traffic management are critical aspects of urban governance, significantly influencing a city's livability and environmental sustainability. Efficient transport and traffic management systems are essential to support economic activity by facilitating the mobility of goods and services. Reliable transport networks reduce congestion, minimise travel time and improve accessibility for businesses, thereby stimulating economic growth and competitiveness. Well-managed transport systems contribute to a better quality of life for urban residents. Accessible public transport, pedestrian-friendly infrastructure and cycling networks promote active lifestyles, reduce dependence on private cars, improve air quality, and improve public health, leading to happier and healthier communities (see quality life).

c. Participation and Innovation

There are two main things to highlight here: citizen engagement and empowerment and innovation. It is important to allow residents to give ideas, feedback and collectively create solutions for sustainable development. By promoting a culture of transparency, accountability and inclusiveness, smart governance strengthens the social functioning of cities and builds trust between citizens and government institutions.

Smart Governance also fosters innovation and knowledge sharing, encouraging cities to experiment with new technologies, policies and business models to address sustainability challenges.

d.  Environmental Monitoring and Protection

Why is it important to install sensor networks and data analytics in cities? To monitor environmental parameters such as air quality, noise pollution and waste levels in real time. This will allow authorities to identify environmental risks/problems immediately, and implement preventive or corrective measures and prepare long-term strategies to protect the environment.

The material also presents four good practices on the subject. If there is time, it is recommended to analyse the good practices in more detail and discuss what factors may have influenced the success of the good practice in the country.

**It is also important to highlight the role of young people, which is discussed in detail in Part I.**

A better quality of urban living can be achieved by unifying public resources, human and social capital, and information and communication technology.

Technology serves as the backbone of smart cities, driving efficiency, sustainability, innovation, and citizen empowerment to create cities that are more resilient, responsive, and enjoyable places to live. Smart governance values social engagement and innovative technologies along with the consideration of people's needs.

- It plays a pivotal role in transforming public services, delivering essential services, and manage resources.
- It enhances accessibility by providing citizens with convenient digital channels to access government services, such as online portals, mobile applications, and chatbots.
- It improves transparency and accountability by digitizing government processes, increasing the visibility of decision-making, and enabling citizens to track the status of their requests and transactions in real-time.
- It enables data-driven governance by leveraging big data, machine learning, and artificial intelligence to analyze large datasets, identify trends, and inform evidence-based policy-making and decision-making processes.
- It promotes inclusivity by designing digital services and interfaces that are accessible to people with disabilities, seniors, and individuals from diverse socio-economic backgrounds, ensuring that no one is left behind in the digital age.

- It empowers governments to build smarter, more sustainable cities by deploying smart infrastructure, IoT sensors, and data analytics to optimize resource management, reduce environmental impact, and improve the overall quality of life for residents.

If there is time, it is recommended to analyse the good practices and discuss what factors may have influenced the success of the good practice in the country.

## 2.3. Smart economy

**The objective of the module:** The Smart Economy module aims to explore the links between technology, sustainability and economic development. It aims to equip students with the knowledge and skills to understand the importance of this area of the economy. Through the lesson, learners will be exposed to the definition of the smart economy, which is the use of digital technologies and data-driven approaches to optimise resource allocation and increase productivity while minimising environmental impacts.

It is important to start the module by defining the topic: **What is smart economy?**

**Definition:** "A smart economy integrates digital technologies and innovation with traditional economic models to create a more efficient, sustainable, and competitive structure. It optimizes business processes, uses resources efficiently, supports environmental sustainability, and promotes social inclusion. Key elements include digitalization, innovation, data analytics, Internet of Things (IoT), and Artificial Intelligence (AI)." – see module presentation.

It is based on technological innovation, resource efficiency, sustainability and high social welfare as engines for success. To get a better understanding of this area of the economy, it is very important to clarify the concepts:

**a.) Technological innovation**

*Innovation: „An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations." [...]*

*Innovation can occur in any sector of the economy, including government services such as health or education [10]*

**Main type of innovation:** product innovations, process innovations, organisational innovations and marketing innovations

*Technological innovation: "any scientific, technical, organisational, financial and commercial activity, including investment in new knowledge, which leads, or is intended to lead, to the realisation of technically new or improved products, processes and services."*

---

[10] https://ec.europa.eu/eurostat/documents/3859598/5889925/OSLO-EN.PDF

Technological innovations also influence economic and social development and the impact of economic and social systems on the natural environment.

They affect the economy both directly and indirectly, as the use of inputs (raw materials, energy, labour, capital) in economic activities is influenced both quantitatively and qualitatively by the availability and use of physical assets, practices and knowledge, etc. Technological innovations can help to bring economic and social systems into harmony by creating a complementary balance between human, financial and material capital. Technological innovations can also bring changes in consumption patterns and lifestyles.[11]

**b.) Resource efficiency**

The main principles of smart economy are based on the resource efficiency. This efficient usage of resources is achieved via technological innovations. Therefore, the smart economy will facilitate the innovative development and contribute to sustainability, and this environment will create a beneficial situation for social welfare**.**

**c.) Sustainability**

The issue of sustainability was also addressed in chapters 1.1 and 2.7, so we refer back to the related theoretical material.

**d.) High social welfare**

It refers to a state or condition in which the well-being, prosperity, and quality of life of individuals and communities are prioritized and maximized. High social welfare reflects a commitment to building resilient, inclusive, and sustainable societies. It requires collaboration between governments, civil society, businesses

Smart economy integrates innovation, connectivity, and sustainability principles to create efficient and resilient economic systems. It affects a wide range of sectors: energy, transport, health, agriculture and manufacturing, where technology-driven solutions are transforming traditional practices, addressing complex challenges and creating new opportunities for economic development.

---

[11] Deutsch N. (2012): A technológiai rendszerek innovációja. Az elosztott villamosenergia-termelési technológiák fenntarthatósági értékelése és rendszerinnovációs potenciáljának vizsgálata az Európai Unióban. PhD-értekezés. Pécs: Pécsi Tudományegyetem

Key components:
- digital infrastructure (such as high-speed internet and smart grids),
- innovation ecosystems (involving collaboration between government, academia, and industry),
- sustainable practices.

The curriculum specifically highlights the role of green technology in the economy, which should also be discussed in a little more detail, as it is one of the priorities in the EU today.

Green technologies offer sustainable alternatives to traditional practices, reduce carbon emissions and promote resource efficiency. Governments and local authorities play a key role in implementing policies and infrastructure that support innovation, sustainability and digitalisation at local level. They are responsible for creating a business-friendly environment and promoting public-private partnerships.

**Here are some examples of green technologies:**
- Energy Storage: Examples include battery storage systems, pumped hydro storage, and thermal energy storage.
- Energy Efficiency: Examples include energy-efficient lighting, smart thermostats, building insulation, and energy management systems.
- Electric Vehicles (EVs) and Transportation: Examples include electric cars, buses, bicycles, and charging infrastructure, as well as smart transportation systems and mobility-as-a-service (MaaS) platforms.
- Green Building and Construction: Examples include passive solar design, green roofs, energy-efficient HVAC systems, and sustainable materials such as recycled steel and bamboo.
- Waste Management and Recycling: Examples include composting systems, recycling facilities, anaerobic digesters, and waste-to-energy technologies.
- Water and Wastewater Treatment: Examples include water filtration systems, rainwater harvesting systems, and wastewater treatment technologies such as membrane bioreactors.
- Sustainable Agriculture and Food Production: Examples include precision agriculture, vertical farming, aquaponics, and agroforestry systems.
- Circular Economy and Resource Recovery: Examples include closed-loop manufacturing processes, product life extension, and remanufacturing technologies.

- Renewable Energy: Examples include solar photovoltaic (PV) panels, wind turbines, hydroelectric power plants, and bioenergy systems.

It is also important to emphasise the role of young people in the smart economy, as they are the drivers of innovation. They bring new perspectives and digital skills to industries such as renewable energy, artificial intelligence and sustainable agriculture. They bring fresh perspectives and digital fluency, leveraging technology to address pressing social and environmental challenges. Their commitment to social and environmental responsibility is shaping corporate practices and influencing policy decisions. Through collaboration and networking, they build relationships that facilitate knowledge exchange and the co-creation of solutions. In addition, their active participation in education and capacity building programs empowers individuals to thrive in the evolving environment of the smart economy.

The curriculum also provides examples of the use of green technology listed above. It can be interesting to have an interactive discussion with students to think about the key concepts covered in the lesson. Encourage students to share their ideas, ask questions and explore how they can apply the principles of the smart economy to their own communities and future careers.

## 2.4. Smart human resources - Citizen engagement

**The objectives of the module:** One of the objectives is to increase citizen participation, encouraging citizens to take an active part in government initiatives, policies and services. To promote cooperation between citizens, government agencies and other stakeholders to address community challenges.

The curriculum covers the subject in detail. It covers all the elements that help to underline the importance of the topic. That's why we prefer to present practical exercises to complement the training, so that the participants can put active engagement into practice.

**1. Interactive Activity: Citizen Engagement Simulation**

Description: Participants will engage in a simulation that replicates real-world scenarios of citizen engagement. They will take on different roles, such as government officials, community leaders, and ordinary citizens, to experience various perspectives and challenges associated with citizen engagement.

**Instructions:**
- Divide participants into small groups and assign each group a specific role, such as government agency, local community organization, or group of citizens.
- Present a scenario that involves a community issue or project, such as implementing a new public transportation system, revitalizing a neighborhood park, or addressing a public health concern. Provide background information, including the stakeholders involved, their interests, and potential conflicts.
- Role-playing: Each group will assume their assigned roles and discuss how they would approach the scenario from their perspective. They should consider factors such as communication strategies, stakeholder engagement, resource allocation, and decision-making processes.
- Interactive Negotiation: Encourage groups to interact with each other, negotiate agreements, and find common ground to address the community issue or project. Facilitate discussions and provide guidance as needed to keep the simulation on track.
- After the simulation, discuss the challenges encountered, successful strategies used, and lessons learned about citizen engagement principles.

## 2. Group Exercise: Designing a Citizen Engagement Initiative

Description: In this group exercise, participants will work together to design a citizen engagement initiative aimed at addressing a specific community issue or promoting civic participation. They will brainstorm ideas, develop a plan of action, and/or create a presentation to pitch their initiative to the rest of the group.

Instructions:

● Facilitate a discussion to identify a community issue or challenge that participants are passionate about addressing through citizen engagement. It could be related to education, healthcare, environmental sustainability, or any other relevant topic.

● Brainstorming Session: Divide participants into small groups and give them time to brainstorm ideas for a citizen engagement initiative that addresses the chosen issue. Encourage creative thinking and consider various approaches, including community events, online campaigns, workshops, and collaborative projects.

● Each group will develop a plan of action for their citizen engagement initiative, including goals, target audience, activities, timeline, and resources needed.

● Groups will prepare a brief presentation to showcase their initiative.

● After all groups have presented their initiatives, facilitate a reflection and discussion session where participants share their thoughts on the different ideas presented.

**Additional resource**

This is also one of the most important topics for the project, so it is important to understand the processes in practice in addition to the theory. For this reason, we also recommend the following handbook to the reader (and students): https://smart-cities-marketplace.ec.europa.eu/sites/default/files/2021-02/scis_solution_booklet_citizen_engagement.pdf

## 2.5. Smart transport

**The objective of this module:** The objective of this training module is to provide students with a comprehensive understanding of smart transportation principles, benefits, and best practices. By exploring key components, objectives, and roles of smart transportation, trainers will be equipped to convey its significance in shaping the future of mobility and urban development. Additionally, the module aims to showcase real-world examples and/or case studies to illustrate the tangible benefits of smart transportation for various stakeholders.

**As the first part of the module, it is important to define intelligent transport and its importance in addressing today's transport challenges:**

Every day, people face many obstacles in getting to their desired destination. The modern world is full of inconveniences that stem from fundamental flaws in our transport systems. Inadequate, sub-optimal transport infrastructure impacts the economy, accelerates environmental impacts and reduces the overall quality of life. Fortunately, new technologies and approaches to traffic management systems allow us to make improvements. The solution is intelligent transport. Smart transportation aims to revolutionize traditional transportation systems by integrating advanced technologies to enhance efficiency, safety, and sustainability.

**Definition: "The application of advanced sensor, computer, electronics, and communication technologies, and management strategies in an integrated manner to improve the safety and efficiency of the surface transportation system"[12]**

Briefly discuss the evolution of transport systems and the role of technology in driving innovation.

Regarding the evolution of transport systems here is a link where more information can be found:

https://www.hit.bme.hu/~jakab/edu/litr/V2X/History%20of%20ITS.pdf

---

[12] Gregor R.V., Eng P., MacIver A. Regional its architectures—From policy to project implementation; Proceedings of the The Transportation Factor 2003. Annual Conference and Exhibition of the Transportation Association of Canada.(Congres et Exposition Annuels de l'Association des transport du Canada) Transportation Association of Canada (TAC); St. John's, NL, Canada. 21–24 September 2003.

It is also important to mention the key components, which are highlighted in the curriculum. ITS is an integrated set of technologies, communication systems and management strategies to improve the efficiency, effectiveness, safety and sustainability of transport networks. It includes a wide range of applications and solutions to address today's transport challenges in urban and rural areas.

**Technologies of intelligent transport system**

- Traffic monitoring systems: Using sensors and cameras to collect real-time data (speed, traffic volume, congestion).
- Traveler information systems: These systems provide real-time information to travellers on traffic conditions, public transport timetables and other relevant information.
- Automated vehicle systems: Using sensors and artificial intelligence to make vehicles self-driving or able to communicate with each other and with the road infrastructure.
- Public transportation systems: For example, providing real-time information on the arrival times of buses and trains.

**Key components intelligent transport system[13]:**

Although not all the components are mentioned in the curriculum, we have expanded the topic in this handbook.

- **Traffic Management and Control:** Real-time monitoring and control of traffic flows
- **Advanced Traffic Information:** This includes information on traffic conditions, road closures, accidents and alternative routes.
- **Electronic Toll Collection:** Automated toll collection systems..
- **Public Transportation Management:** Real-time monitoring of buses and trains, fare collection systems and passenger information systems.
- **Vehicle-to-Infrastructure Communication:** This technology allows vehicles to communicate with roadside infrastructure such as traffic signals and road sensors.
- **Incident Detection and Management:** ITS systems use sensors, cameras and algorithms to detect and respond to events such as accidents, breakdowns and road hazards.
- **Parking guidance and management system:** these intelligent parking systems use sensors and data analytics to help drivers find free parking spaces.

---

[13] https://orbital.co.ke/components-of-intelligent-transport-management-system-its/

- **Data analysis and decision support:** The use of ITS generates huge amounts of data, the analysis of which helps to make informed decisions on transport planning, policy and resource allocation.

**What are the benefits?** - *The curriculum lists the possible benefits, which are explained in more detail in this handbook.*

**Increasing efficiency with:**

- Introduction of Intelligent Transport Systems (ITS) to monitor traffic flows in real time using sensors and cameras.
- Use of predictive analytics to forecast traffic congestion and adjust traffic light timing accordingly.
- Integrating intelligent route planning algorithms into navigation applications to offer drivers alternative routes to avoid congestion hotspots.
- Encourage the use of shared mobility services and multimodal transport options to reduce traffic.

**Increased security with:**

- Accident reduction: preventing accidents and reducing risks on the roads.
- Improve emergency response: these systems enable faster emergency response times by providing accurate incident data to responders.
- Pedestrian safety: intelligent pedestrian crossings and pedestrian detection systems alert drivers.

**Sustainability:**

- Reduction of emissions: This contributes to improving air quality.
- Energy efficiency: The integration of renewable energy sources and energy efficient infrastructure minimises energy consumption and environmental impacts.

**Economic benefits:**

- Cost savings: optimising transport systems reduces fuel consumption and maintenance costs.
- Economic growth: efficient transport networks stimulate economic growth.
- Innovation and job creation.

## *Interactive Activity: Smart Transportation Simulation Game*

1. Divide participants into small groups.

2. Explain that each group will participate in a simulation game where they will act as city planners tasked with optimizing transportation systems using smart technology.

3. Provide each group with a scenario card outlining a fictional city's transportation challenges and goals. Example scenarios could include reducing traffic congestion, improving air quality, enhancing pedestrian safety, and promoting sustainable mobility.

4. Assign roles to group members, such as transportation planner, technology specialist, community representative, and environmental advocate.

5. Give each group a set amount of time (e.g., 20 minutes) to brainstorm and develop a smart transportation plan to address the challenges outlined in their scenario. Encourage them to consider various technologies and strategies discussed in the training module.

6. Have groups use sticky notes and markers to map out their transportation plans on the whiteboard or flip chart. They should include key elements such as infrastructure upgrades, technology integration, policy recommendations, and community engagement strategies.

7. After the brainstorming session, facilitate a group discussion where each team presents their transportation plan to the rest of the participants. Encourage groups to explain their rationale behind their decisions and how they expect their plan to address the city's transportation challenges.

8. After all groups have presented, facilitate a debriefing session where participants reflect on the different approaches and strategies proposed by each team. Discuss the strengths and weaknesses of each plan and identify common themes or best practices.

9. Conclude the activity by highlighting key takeaways and reinforcing the importance of collaboration, innovation, and creativity in developing effective smart transportation solutions.

## 2.6. Smart living

**The objective of the module**: to introduce learners to the principles and applications of integrating technology into daily life to enhance convenience, efficiency, and sustainability. The module aims to equip learners with the knowledge and skills to design, implement, and optimize smart living solutions tailored to individual and community needs. By fostering critical thinking and problem-solving abilities, learners will be prepared to address real-world challenges and opportunities in the rapidly evolving field of smart living. Ultimately, the objective is to empower learners to leverage technology to create smarter, more connected, and sustainable living environments at least in at least on a theoretical level.

It is essential to start by defining the concept.

### What is smart living?

Smart living as a trend involves improved quality in many aspects of everyday life. The trend in building construction has shifted towards the emergence of innovative, faster, cheaper and more efficient construction technologies, materials and processes.

These new technologies offer a number of benefits: reduced costs; lower carbon emissions during the construction, use and decommissioning of buildings; improved building performance, quality and longevity; and improved quality of life for users. Smart living is about integrating technology into many aspects of everyday life, including comfort, efficiency and sustainability. The aim is to create an environment that is not only comfortable but also adaptable and responsive to the needs of individuals and communities.
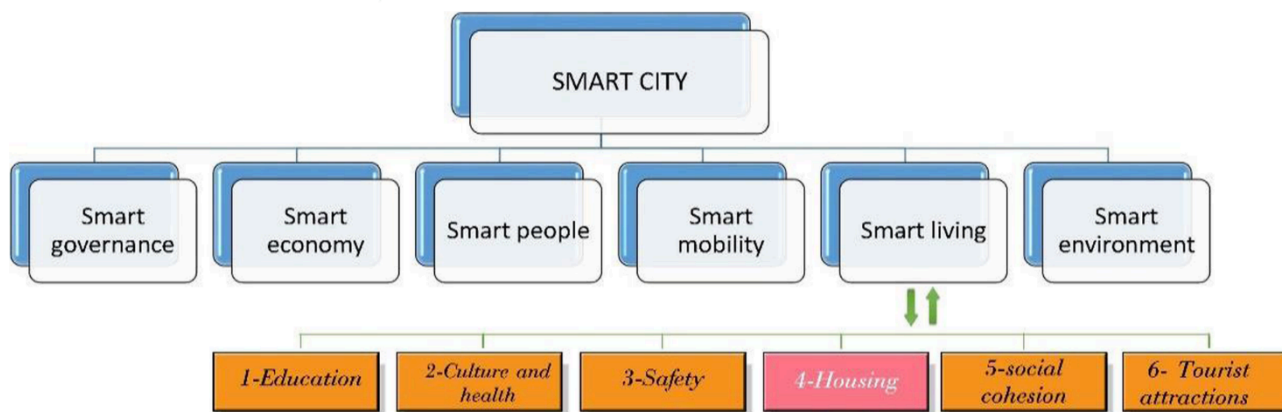
The lesson continues with a video following the definition. After watching the video, it is recommended to review the information contained in the video and add the following:

Monitoring topics to be covered:

- **Housing**

  In the context of smart living, recognizing housing as a fundamental human right is paramount. The objective of integrating smart technologies into housing is not only to enhance comfort and convenience but also to ensure equitable access to essential amenities and services. By acknowledging housing as a fundamental right, the focus shifts from mere technological advancements to addressing societal needs and disparities. Smart living solutions should prioritize inclusivity, affordability, and sustainability, aiming to improve living conditions for all individuals regardless of their socioeconomic status. Housing conditions determine the quality of life in cities, for both owners and renters, and especially for those in need of assistance. Successful cities need to operate a housing structure and strategy that offers the widest range of opportunities to those who move there.

- **Social cohesion**

  Promoting social cohesion in smart living is not just a goal, it is a principle. Smart housing technologies enhance communication and cooperation between individuals and communities, fostering a sense of belonging.

Integrating social cohesion into smart living initiatives aims to use technology to bridge social gaps, promote inclusion and build resilient communities. For example, through online platforms, they can facilitate community engagement, enabling residents to participate in decision-making processes and organise collective activities. They can help tackle social isolation and build trust between neighbours. This is particularly important in urban environments where rapid urbanisation and demographic change often lead to social fragmentation.

- **Culture and Health**

In urban planning, we have already talked about quality of life and its elements in the context of the smart city. One of the main elements of this is culture and health. Culture influences health behaviors, and practices, while health outcomes are shaped by socio-cultural factors such as values, norms, and traditions. The objective of incorporating culture and health into smart living and smart cities initiatives is to ensure that technology-driven solutions are culturally relevant, sensitive, and responsive to the diverse needs and contexts of different communities. This involves recognizing and respecting cultural diversity, understanding local health beliefs and practices, and fostering community participation and ownership in the design and delivery of health services.

From the digital tools integrated into the local health system to the significant impact of artificial intelligence (AI), this element of the smart city framework is one of the most visible and can have a major impact on the way citizens perceive their localities. There are many cities around the world that have successfully implemented the smart living/lifestyle/safety and health component, ranking at the top of global liveability rankings, attracting more tourists, businesses and people willing to work or even settle there.

- **Education**

A socially and technologically responsive city, based on the ability to acc Modern/future education must be compatible with the knowledge and technological development needed in smart cities. The aim is to make learning more interesting, collaborative and focused on developing the talents and skills that will enable us to solve the problems around us. Cities, through responsible local authorities, civil societies and commercial organizations, need to streamline their education systems and policies to meet emerging trends, skills and learning needs in order to develop.ess data and apply the right knowledge, needs an education that meets these needs.

- **Safety**

    Smart cities have a responsibility to safeguard citizens, and they have the tools to do so. The EU and industry-funded S4AllCities project developed technological solutions to enhance existing security measures. They developed low-cost innovations that improve both cyber and physical security while striking a balance between safety, maintaining the open character of public spaces and preserving individual privacy.[14]

## Group exercise

**Smart Home Design Challenge:**
- Divide participants into small groups and assign each group the task of designing a smart home system for a specific scenario (e.g., energy management, security, health monitoring).
- Provide a set of requirements and constraints for each scenario, such as budget limitations, environmental considerations, and user preferences.
- Encourage groups to brainstorm ideas, sketch out designs, and select appropriate sensors, devices, and technologies to meet the specified requirements.
- Have each group present their design to the rest of the participants, explaining their rationale and discussing the advantages and challenges of their proposed solution.

---

[14] https://cordis.europa.eu/article/id/443633-smart-cities-are-safe-cities-enhancing-security-for-all

## 2.7.Climate Impacts, Environmental Conservation, and Water Management

**The objective of the module:** The curriculum aims to familiarize participants with fundamental concepts and interrelationships related to climate impacts, environmental conservation, and water management. Participants have the opportunity to understand the impacts of human activities, and explore opportunities for sustainable solutions. The curriculum will include interactive elements and exercises through which participants can learn about the topics based on their own experiences and develop their opinions.

Climate change, environmental challenges, and water management are among the most pressing global issues of our time. Changes induced by human activities have profound impacts on ecosystems, human life, and well-being. Therefore, it is crucial to understand these processes and take effective measures to preserve the environment and ensure sustainability. Climate change is increasingly manifesting its effects across the globe. The emission of greenhouse gases and the temperature rise caused by human activities such as industry, transportation, and agriculture have severe consequences. Extreme weather events like heatwaves, droughts, and hurricanes are becoming more frequent and intense. This adversely affects ecosystems, agriculture, infrastructure, and human health.

*The curriculum explains the importance, definition and pillars of sustainable development. In addition to the above, other chapters also deal with the topic, so in this handbook we will go into a little more detail on water management and its important elements from the pedagogical point of view.*

Water management is a very important subject and as a subject it covers a wide range of interdisciplinary concepts and skills.

However, from a pedagogical point of view, the following topics should be addressed in the teaching of the curriculum:

**Understanding water systems:** the hydrological cycle, the interconnection between surface water and groundwater, and the importance of river basins

**Water quality and pollution:** educating students about water quality parameters (in very general way), sources of pollution and the impact of pollutants on human health and ecosystems is essential to raise awareness and promote responsible management of water resources.

*Of course, this is a very wide range of material, so it is the instructor's freedom to choose the topics within this range that he or she wishes to discuss in more detail.*

**Water saving:** teaching water saving strategies, such as reducing water waste, using water efficient technologies (giving examples). The aim is to foster a sense of environmental responsibility.

**Climate change and water:** exploring the link between climate change and water, the increasing frequency of extreme weather events and their consequences, such as sea level rise.

**Water governance and policy:** to familiarise students with the legal and regulatory framework governing water resources management at local, national and international levels.

**The importance of community engagement and participation:** providing students with opportunities to engage with local water issues through service-learning projects, citizen science initiatives or partnerships with water utilities and conservation organizations promotes active citizenship and fosters a sense of connection with their environment.

**Technological innovations:** exploring emerging technologies in water treatment, desalination, wastewater recycling and smart water management will expose students to innovative solutions to address water scarcity and water quality challenges in a rapidly changing world.

*Each of the above sub-topics can be discussed as a separate longer chapter, depending on the instructor's time and focus. Additional resources are provided which can be shared not only with the teacher but also with the students.*

**Additional resources:**

Video on Smart City and Sustainable Water Resources Management Strategies: https://www.youtube.com/watch?v=lagvUUeT9qI

Water Framework Directive: https://eur-lex.europa.eu/eli/dir/2000/60/oj

Barcelona's Innovative Smart Water Management: https://www.tomorrow.city/barcelonas-innovative-smart-water-management-makes-the-most-of-every-drop/

## Unit 3. Technology usage as a solution

The module "Using technology as a solution" offers a comprehensive examination of digital transformation, covering five main sub-themes. The topic itself is very specific anyway, and each chapter deals with the topic in a clear way, so we do not highlight each topic separately.

### 3.1. Concepts and tools of digitalisation (general digitalisation knowledge)

It starts with an in-depth exploration of the **basic concepts and tools of digitalisation**, emphasising the importance of basic digital literacy and proficiency in data analysis.

The module introduces the relationship between urbanisation and digitalisation, and the challenges and problems associated with it. The group exercises in the module will help students to understand the processes. *The video is highly recommended for students*.

See also in the module: https://www.youtube.com/watch?v=uM6-yuKnFis

### 3.2. Digital infrastructure, Geo-Informatics

The next chapter then moves on to **digital infrastructure and geo-informatics**, highlighting their role in promoting connectivity, efficiency and informed decision-making. Digital infrastructure lays the groundwork for seamless connectivity and information exchange in the digital age. Geo-informatics, an interdisciplinary field integrating geospatial data and technologies, plays a pivotal role in urban planning, environmental management, and disaster response. This subtopic delves into the intricacies of digital infrastructure and geo-informatics, elucidating their significance and applications.

### 3.3. Advanced technologies of the smart cities

3.3. module focuses on the **advanced technologies** used in the top 3 Smart Cities of the World. Smart cities epitomize the symbiosis between technology and urban development, fostering efficiency, sustainability, and quality of life. From Internet of Things (IoT) sensors to renewable energy solutions, advanced technologies are reshaping the urban landscape. This

subtopic elucidates the diverse array of technologies driving the smart city revolution and their implications for urban governance and citizen engagement through best practices.

## 3.4. Cyber security

**Cybersecurity** is a critical issue in the connected world, which encourages students to understand common cyber threats and to adopt proactive measures to protect their digital assets. The module on cybersecurity delves into the multifaceted landscape of cyber threats and risks, offering insights into the challenges faced in safeguarding digital assets and privacy.

Through real-world examples, the module highlights the pervasive impact of cyber threats across industries and sectors, underscoring the importance of proactive risk management strategies.

Participants gain a deeper understanding of the anatomy of cyber attacks, dissecting common attack vectors and tactics employed by threat actors to infiltrate networks and exploit vulnerabilities. The module also addresses the human element of cybersecurity, recognizing the critical role of user awareness and behavior in mitigating cyber risks. In the second part of the module, through case studies and real-world examples, learners gain insights into the effectiveness of various mitigation strategies in mitigating cyber risks and minimizing the potential impact of security incidents.

## 3.5. AI as the new key elements in the future smart cities

Finally, the module explores the potential of artificial intelligence as a tool to shape the future of smart cities. This chapter has 3 sub-topics:
● How will AI change the cities we live in?
This section explores the transformative impact of AI on future urban landscapes, how AI technologies can revolutionize transportation, energy management, public safety, and urban planning. Additionally, it will examine the potential benefits and challenges of integrating AI into city infrastructure.
● AI applications in smart cities.

This section explores specific applications of AI in smart city environments, such as traffic management, public transportation, waste management, environmental monitoring, and public health initiatives.

- Future smart cities planned by 2050.

This section introduces futuristic smart cities currently under construction worldwide. Students will watch a video showcasing innovative urban planning concepts and AI integration in city design.

**In summary, through a combination of theoretical knowledge, practical examples and possible case studies, the module will equip students with the knowledge and skills needed for digital transformation.**

**Unit 3 is available on the training platform: https://training-greencities.eu/courses/unit-3-technology-usage-as-a-solution/**

**Additional resources:**
https://www.oecd.org/cfe/regionaldevelopment/Smart-Cities-FINAL.pdf
https://op.europa.eu/en/publication-detail/-/publication/864bbbe7-f1d9-11ec-a534-01aa75ed7
1a1/language-en#

# Unit 4. Good examples worldwide

Smart Cities are an innovative approach to urban development that integrates information and communication technologies (ICT) to improve the quality and efficiency of urban services, reduce resource consumption and improve the quality of life for residents. This chapter presents key examples and initiatives from around the world.

## 4.1. Good Examples Outside Europe:

This module provides students with a comprehensive overview of prominent smart cities outside Europe. The first learning objective is for students to understand the main characteristics and initiatives of such cities. The learning material will provide a detailed description of how these cities approach urban development, sustainability and technological integration. The second learning objective is to help students to identify the different strategies used by smart cities to address urban challenges and improve the quality of life of their inhabitants. In this context, the module will highlight how each city adapts its specific solutions to local needs and circumstances. The third learning objective focuses on giving students an insight into the advanced technologies being used in smart city initiatives. These technologies have a significant impact on urban mobility, environmental sustainability and digital governance. During the module, students will learn how such technologies contribute to improving and optimising different aspects of urban life. The aim of the module is to provide students with a comprehensive and in-depth knowledge of how smart cities work and the opportunities and challenges they present. By the end of the module, students will be able to critically evaluate the effectiveness and sustainability of smart city initiatives and understand their global relevance.

Cities such as Singapore, Tokio, São Paulo and Dubai have implemented cutting-edge smart city projects. Singapore's Smart Nation initiative, for instance, uses ICT to improve public transport, healthcare, and urban planning, featuring smart traffic management and predictive analytics. Dubai leverages technologies such as artificial intelligence, blockchain, and IoT to enhance urban mobility, optimize resource utilization, and improve quality of life for residents.

## 4.2. Good Examples from Europe:

This module provides students with a detailed introduction to the key features and initiatives of European smart cities. The first learning objective is for students to understand the urban development, sustainability and technological integration approaches of such cities. The teaching material will discuss in detail initiatives in different cities, such as Amsterdam's smart mobility solutions and sustainable urban planning strategies.

Barcelona's citizen-centred initiatives and digital transformation solutions are also presented, with a focus on sustainability and social inclusion. Copenhagen is a leader in sustainable urban development, with an emphasis on electric public transport and renewable energy projects. Helsinki's innovative solutions include energy efficient buildings and smart waste management systems. Stockholm's initiatives focusing on environmental sustainability and digital innovation are also important examples in the module. Tallinn's e-government initiatives and digital transformation efforts stand out among European smart cities. Zurich's sustainable urban development and intelligent transport systems are exemplary.

Oslo focuses on sustainability and innovation in its smart city developments. Ljubljana has earned recognition for its sustainable urban development and community involvement approaches. Bilbao's exemplary urban mobility and economic development initiatives are also included in the module.

The second learning objective is to enable students to recognise the different strategies used by smart cities to address urban challenges and improve the quality of life of their inhabitants.

The third learning objective focuses on providing students with insights into advanced technologies that have a significant impact on urban mobility, environmental sustainability and digital governance.

By the end of the module, students will be able to critically evaluate the effectiveness and sustainability of smart city initiatives and understand their global relevance.

### 4.2.1. The Smart Cities Marketplace

The Smart Cities Marketplace is an initiative by the European Commission designed to foster the development of smart cities across Europe. This comprehensive platform brings together cities, industries, small and medium-sized enterprises (SMEs), investors, researchers, and other stakeholders to collaborate on sustainable urban solutions. It aims to accelerate the development, implementation, and scaling up of smart city projects, focusing on sustainability, energy efficiency, digitalization, and social inclusion.[15]

The importance of the Smart Cities Marketplace lies in its multifaceted approach to addressing urban challenges. As cities around the world face increasing pressures from population growth, climate change, and resource constraints, innovative solutions are essential for sustainable development. The Marketplace facilitates this by providing a collaborative space where stakeholders can share knowledge, resources, and best practices. By promoting projects that enhance energy efficiency, renewable energy use, and smart technology integration, the platform contributes to the creation of resilient, sustainable, and inclusive urban environments.

For students, the Smart Cities Marketplace is an invaluable resource. It offers a wealth of information on cutting-edge urban projects, policies, and technologies that are shaping the future of cities. Students can learn about various aspects of smart city development, including energy systems, mobility solutions, and digital infrastructure. The platform also provides access to case studies and success stories, which can serve as inspiration and practical examples for academic projects and research.Students can see firsthand how diverse fields such as urban planning, engineering, environmental science, and information technology converge to address complex urban issues. This knowledge is essential for those aspiring to work in urban development, sustainability, or related fields.

There is an interactive video exercise at the end of the module, which is highly recommended to be done with the students.

---

[15] https://smart-cities-marketplace.ec.europa.eu/

## 4.3. Good Examples in Partner Countries:

Highlighting good practices in partner countries is very important, as the young people we want to reach can also learn about the progress of smart cities in their own countries. The module explores the concept, development, and history of sustainable practices and presents examples from Germany, Greece, Cyprus, Turkey, Bulgaria, and Hungary.

The primary learning aims are to understand the concept of green good practices, explore the development and history of smart cities, and analyze examples of these practices in partner countries. Methodologically, the module includes a 5-minute introductory video on sustainable practices, a Kahoot quiz to assess understanding, and case studies of green good practices.

In Germany, the Energiewende initiative is a comprehensive strategy to transition the energy system to renewable sources, phasing out nuclear power and reducing greenhouse gas emissions.

Greece's agroecological farming enhances soil health and biodiversity through techniques like crop rotation and integrated pest management. Cyprus focuses on sustainable water management, employing desalination, rainwater harvesting, and recycling to mitigate water scarcity.

Hungary's Budapest Bike Sharing System promotes sustainable urban mobility, reducing traffic congestion and pollution. Turkey's Istanbul Zero Waste Initiative minimizes waste generation and promotes recycling through community engagement and infrastructure development. Bulgaria's Bansko Ski Resort adopts sustainable practices in energy use, waste management, and eco-friendly transportation, promoting responsible tourism and preserving the natural environment.

These diverse examples highlight the range of innovative strategies being employed to promote sustainability across different contexts.

## 4.4. Case studies

The teaching topic includes a sub-topics on case study overview, aiming to understand the practical applications and benefits of smart city technologies through global case studies and evaluate their effectiveness in addressing urban challenges.

The methodology involves watching a 12.31-minute video titled "Smart City: How do you live in a Smart City?" and engaging with interactive video activities for approximately 8 minutes. The video introduces learners to various smart city concepts and technologies.

The sub-topics provides an introduction to the case studies of Cape Town, Chicago, Dubai, and Singapore, highlighting each city's unique approach to smart city initiatives, the technologies implemented, and the objectives of these projects.

**Case Study 1** focuses on Cape Town's implementation of a License Plate Recognition solution as part of its video surveillance and analytics initiative, aiming to enhance the safety of a main street leading to a wealthy suburb by monitoring up to 300,000 cars per hour with 42 day/night cameras.

**Case Study 2** examines Chicago's Smart Lighting Project, which aims to modernize the city's infrastructure by replacing outdated street lights with energy-efficient LEDs to improve public safety and reduce energy consumption.

**Case Study 3** discusses Dubai's Smart City and Smart Tourism Initiative, which integrates the smart city concept with smart tourism to transform the city into a leading destination by leveraging digital innovation and data mining techniques to analyze perceptions and improve visitor experiences.

**Case Study 4** highlights Singapore's Smart Nation Initiative, a government-led effort to harness ICT, big data, and connectivity to improve living conditions, create economic opportunities, and build a closer community, covering key areas like health, transport, and public services.

All modules include exercises, which are suggested that students should complete independently and then discuss the answers together.

**Unit 4 is available on the training platform: https://training-greencities.eu/courses/unit-4-good-examples-worldwide/**