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Possible Cities

Integrated toolkit
for climate neutrality

MOO
Mirror Mission
Cities Hub Romania

Youth for climate neutral cities

Resources, educational scenario, and usage guide
for workshops with high school and university students

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Introduction

The genesis of this material

The initiative to create this educational resource and to envision concrete ways of using it emerged as part of a complex approach, the one of **M 100 National Hub**.

In Romania, the **M 100 National Hub** acts as a **Mirror Mission** of the **EU Mission for 100 Climate-Neutral Cities by 2030**, assisting Romanian cities in their green transition process. M100 provides assistance not only to the three Romanian cities already selected under the EU Mission (Cluj-Napoca, Bucharest - Sector 2, and Suceava) but also other cities aiming to achieve climate neutrality, thus encouraging a collective and coherent path towards a greener horizon.

As part of this endeavor, a significant effort has been dedicated to the educational component. **The Romanian Order of Architects (OAR)**, together with experts and members of the **De-a Arhitectura Association** (who facilitated the local conditions for implementing pilot versions of the educational scenarios through successive workshops, in four different cities), responded to a simple yet highly impactful question:

Since we want young people to engage with the topic of climate-neutral cities, what are the most suitable ways to achieve this?

The **M 100 National Hub** is a joint effort among multiple partners[1] aimed at increasing both interest and expertise in reducing the carbon footprint of Romanian cities. It is therefore crucial to raise awareness about the concrete actions each of us can take to make our cities more sustainable.

In **October 2024**, following an open call, 10 Romanian cities were selected by an international jury to benefit from technical assistance and capacity building through the project "**Towards Climate-Neutral and Smart Cities through Mutual Learning, Engagement and Capacity-Building**". These cities—Alba Iulia, Bistrița, Brașov, Bucharest, Buzău, Constanța, Iași, Oradea, Reșița, and Timișoara— are currently receiving intensive support **to prepare climate city contracts** (CCCs), further reduce their carbon emissions by 2035 and become **greener, smarter and more citizen-friendly**.

However, implementing the projects and programs outlined in these contracts will require significant effort and involvement in each city—not only from local public authorities but also from private sector stakeholders, non-profit organizations, the media, and others. This mobilization depends on several key factors:

— Information – cognitive competencies,
— Capacity to act – skills,
— Alignment with core values – attitudes, including the responsibility to contribute to solving today's complex global challenges.

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https://m100.ro/ – Partners from Romania: UEFISCDI (Executive Agency for Higher Education, Research, Development and Innovation Funding), OAR (The Romanian Order of Architects), Urbanize Hub (Institute for Local Development Association – Romania), as well as international partners: Nordic Edge (Norway), NTNU (Norwegian University of Science and Technology), RANNÍS (The Icelandic Centre for Research).

Who Is This Material For?

This material is primarily intended for youth - high school students and university students enrolled in various undergraduate programs. The definitions, explanations, and examples offered here aim to provide a foundation of knowledge, attitudes, and skills necessary for becoming active members of communities that consciously and responsibly work toward reducing their cities' carbon footprint.

Teachers in both pre-university and higher education can find essential guidelines in this material to introduce and deepen the topic of climate-neutral cities within their teaching process.

A direct way to use this resource is by applying the educational scenario – "*Young People for Climate Neutrality*" (Part Two - the teaching scenario), utilizing the explanations and examples provided (Part One). However, the material also serves as a valuable support for integrating the theme of climate neutrality in relation to the built environment in other educational contexts, whether during regular classes in different subjects or in extracurricular activities.

By applying this resource—either through role-playing scenarios or by using the provided explanations and examples—teachers can help young people better understand how cities can become more sustainable and who the key players in this process are.

This material can also be used by teachers during "*Green Week*", when schools and high schools focus their activities on education for sustainable development, allowing students to explore carbon footprint reduction solutions interactively and practically. Additionally, it can be adapted for "*Different School*" Week, providing an ideal framework for applied activities such as simulation workshops, thematic debates, team projects, or meetings with professionals in urban planning, architecture, and sustainability.

Teachers can utilize the resources in this material to guide students in developing concrete proposals—through Project-Based Learning (PBL)—to transform local urban spaces. This approach enhances critical thinking while fostering collaboration, creativity, and practical problem-solving skills.

Thus, the material supports educators not only in theoretically teaching climate neutrality but also in organizing applied learning experiences that actively engage students in environmental and urban issues, preparing them to be responsible citizens involved in shaping the future of their cities.

Non-formal education facilitators—including trainers, workshop facilitators, NGO members, youth club coordinators, mentors, and volunteers engaged in educational initiatives—play a crucial role in shaping a new generation aware of and involved in the transition to climate-neutral cities.

Unlike teachers in formal education, who integrate such topics into school curricula, non-formal education offers more flexible learning opportunities, making it easier to organize experience-based, experimental, and collaborative activities with immediate practical applications.

This material can be valuable for non-formal education programs, offering ready-to-use resources and suggestions in different contexts:

— Workshops and summer camps – Participants can explore the concept of climate neutrality and the impact of their actions on the environment through interactive methods like role-playing.
— Volunteer programs and civic initiatives – Young people can learn how to identify environmental issues in their communities and propose solutions inspired by examples in this material.
— Hackathons and sustainable city competitions – This guide provides both theoretical foundations and practical models for developing sustainable urban projects.
— Youth clubs and initiative groups – This material can support long-term learning modules, including thematic sessions on sustainable urbanism, green energy, and community engagement.

— Environmental events and festivals – Organizers can use this material to create exhibitions, interactive presentations, and hands-on activities based on the provided scenarios and examples.

By using this resource, non-formal education facilitators not only provide young people with relevant knowledge about climate-neutral cities but also create opportunities for active involvement, turning ideas into concrete actions within their communities.

Professionals working in the built environment—such as architects, urban planners, engineers, or those studying to enter these fields—can also benefit from this material by guiding participants in applying the educational scenario (their role is described in Part Two).

Moreover, this resource can inspire new ways to support community members in M100 cities (Part Three – Capitalizing Resources and the Teaching Scenario).

In addition, the material provides built environment professionals with:

— A solid foundation for developing teaching skills if they wish to engage in various educational initiatives.
— A reference on how to communicate technical concepts in an accessible way to the general public.
— Support for integrating these resources into workshops, community events, or pilot projects, helping people better understand urban transformation processes.

By using these materials, professionals can help build a culture of participation among young people, fostering engagement in sustainable urban development. Collaborating with students in such initiatives also presents an opportunity to identify fresh perspectives and innovative solutions for climate-neutral cities.

Additionally, professionals can use this material as a tool to:

— Facilitate dialogue between local authorities, communities, and the private sector.
— Organize workshops, debates, or participatory planning exercises, encouraging citizen involvement in decisions shaping urban spaces.

By doing so, they can expand their impact beyond design and execution, becoming catalysts for change within their communities.

This material, when used by built environment professionals, can contribute to educating a new generation that understands and values the principles of sustainable urbanism. By engaging with students, professionals not only help develop future specialists who are more aware of their environmental responsibility but also strengthen the foundation for well-planned, inclusive, and environmentally friendly cities.
(more on the capitalization - Part Three)

How Is the Concept of "Project" Defined in this Material?

This material is centered on the idea of reducing the carbon footprint, project by project. The transformation of the built environment is prepared through complex planning and design processes. However, this approach does not cover all aspects of urban planning that precede these transformations, which occur project by project. The educational scenario references pre-existing intentions outlined in approved urban planning documents or development strategies. These intentions are highlighted in specific locations where they are reflected (Annex 1 – *Map of the Net Zero City To Be*), and making it possible to correlate them with the **Climate City Contracts (CCCs)**. (see Part One)

The scale at which urban and architectural design is carried out, as well as the **project brief**[2], allows for a clearer understanding of the challenges involved in spatial transformation. This is because the physical environment we refer to is more tangible and concrete. When considering desired

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project brief - is a concise document outlining the project's objectives, requirements, and constraints. It defines the vision, functional needs, site conditions, budget, timeline, and key stakeholders, serving as a guide for the design process.

results that people can easily relate to, it is simpler to define a project's brief rather than the broader objectives and measures used in urban planning, which tend to be more general.

To define a project, three key elements need to be clarified: desired outcomes (goal), necessary resources (human, technical, financial), action timeline (logical sequencing of steps). (Figure 1.1 illustrates these aspects.)

The material focuses on analyzing and imagining interventions at a scale where it is easy for anyone to determine the boundaries of a given place in order to answer the question: **WHERE?**

Since the educational scenario is built around a role-playing game, it is essential to analyze and envision the roles and responsibilities needed to transform a space in a way that reduces its carbon footprint. This helps in formulating answers to the question: **WHO?**

For simplicity, the educational scenario does not include budget estimations for the project, nor does it track answers related to timelines. (**WHEN?**).

Instead, it focuses on:

— Expected results – answering **WHERE?** (by examining the before-and-after transformation of the space and the expectations of the involved stakeholders)

— Necessary resources – answering **WHO?** (by considering the contribution of each actor involved in transforming the space)

Figure 1.1.

The Project Triangle
source - the authors

By choosing a well-defined scale of intervention and clarifying the roles of participants before starting a project, the material allows learners to better understand the preparatory phase of urban transformations. This includes identifying the necessary conditions for a project to contribute to sustainable development.

Clearly defining benefits and contributions from the beginning significantly increases the chances of meeting carbon footprint reduction criteria in every urban project—whether it is a public or private initiative.

This material deliberately selects specific spatial and temporal parameters to help learners carefully follow the project initiation process, ensuring that the end result supports climate neutrality in urban areas. What better way to simulate this process than through role-playing? (See Part Two – The Educational Scenario.)

Part one

A. Resources

A.1. Highlights

1.1. What is the climate neutrality of cities?

Climate neutrality means a balance between the greenhouse gas (GHG) emissions generated by human activities and the ability of nature or technology to absorb these emissions. This concept is essential in combating climate change and is sometimes referred to as *net zero emissions*.

To achieve climate neutrality, it's essential to reduce greenhouse gas emissions as much as possible. And for the emissions that can't be reduced, we should offset them through measures that help nature absorb them (like planting trees, maintaining the oceans' capacity for physical and biological absorption through ocean currents) or through carbon capture and storage technologies (which are currently underdeveloped).

The goal of climate neutrality is central to the Paris Agreement, where the signatory countries commit to limiting the increase in global temperatures to a maximum of 1.5-2°C compared to pre-industrial levels. The European Union and other states and organizations have set specific targets, such as achieving climate neutrality by 2050.

We already know that greenhouse gas emissions are the result of human activities and the development of spaces where these activities take place.

We emit greenhouse gases by[1]:

— producing objects and construction materials: **29%**
— (the industrial production is mainly located in cities)
— producing electricity: **26%**
— (electricity is also needed for agricultural or industrial production, so it's very important that energy sources are as clean as possible)
— producing food through plant cultivation and animal husbandry: **22%**
— (agricultural production takes place in rural areas)
— moving goods and people: **16%**
— (it's very hard to determine how much of this percentage is caused by movements in our cities - but, at least in cities, we can reduce fossil fuel consumption by offering more diverse transport options for shorter distances)
— maintaining a comfortable indoor temperature by heating or cooling the air: **7%**
— (these percentages can clearly be influenced by designing and equipping spaces to consume as little energy as possible).

As a result of all these activities over time, greenhouse gases have accumulated in the atmosphere. Currently, only a fraction of them can be absorbed.

Let's imagine a quiet house on a winter evening, where someone is preparing for a relaxing bath. She turns on the tap and, as the water flows, she sits on the edge of the bathtub, getting lost in their thoughts and scrolling through social media posts.

A few minutes later, she remembered a book left on the table in the next room. When she finally returns to the bathroom, the tub is already almost full. In a brief moment of panic, she realizes that if she doesn't act quickly, the water will start spilling onto the floor. She swiftly turns off the tap and pulls the drain plug, but even so, the water level drops slowly—far too slowly.

The same thing is happening with our planet. For centuries, humans have left the "emissions tap" running, continuously pouring carbon dioxide into the atmosphere. Forests, oceans, and soil act as the drain, absorbing some of this excess. But, just like pulling the plug

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How to Avoid a Climate Disaster. Solutions We Have and Innovations We Need - Bill Gates, Penguin Books, p. 55

too late in a bathtub, nature cannot remove emissions as fast as we are producing them.

And now, the water level has risen dangerously high. If we don't reduce the flow—if we don't find solutions to slow it down—the bathtub will overflow, and the consequences will be devastating. The key isn't just finding better ways to drain the excess; we must turn off the tap before the damage becomes irreversible.

The metaphor of the "bathtub" explains how greenhouse gas emissions pile up in the atmosphere. The amount of carbon in the atmosphere is compared to water in a tub, where emissions are like the water flowing from the faucet into the tub, and natural carbon removal (through oceans, forests, etc.) is like the water draining away into the sewage system.[2]

This analogy shows that if the rate of emissions exceeds the rate of natural removal, the level of carbon dioxide in the atmosphere will keep rising, leading to negative effects on the climate. To stabilize carbon levels, emissions need to be cut down so that they're equal to or less than the capacity for natural removal.

Due to its simplicity, this metaphor is quite well-known, helping people understand that these emissions keep piling up and raising awareness about the need to reduce emissions, as well as the need to capture and store existing emissions to mitigate climate change.

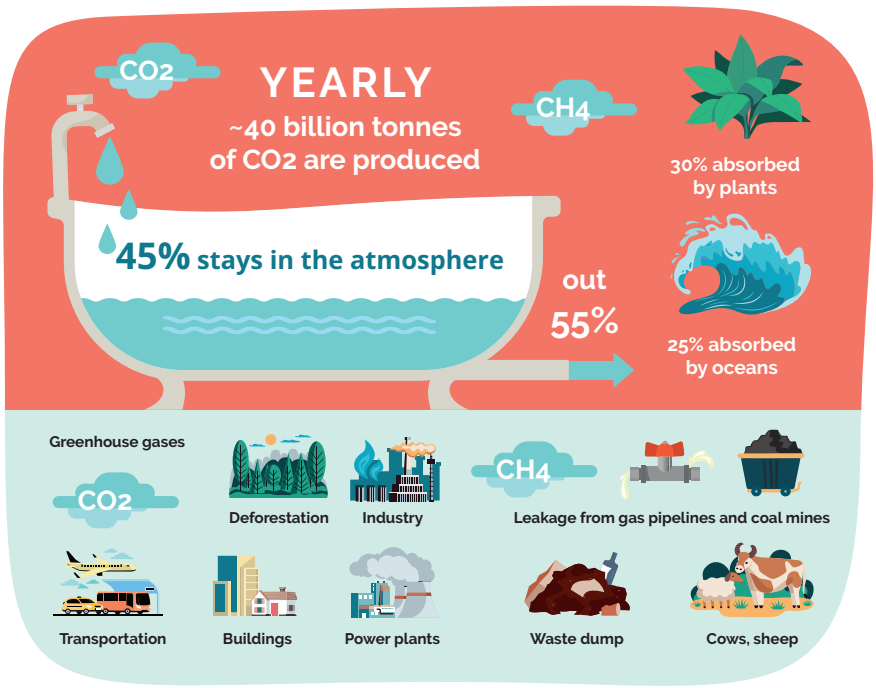

Figure 1.2

The Net-Zero Emissions Balance Explained Using a Bathtub Analogy

The sources of emissions are represented generically (for carbon dioxide (CO_2): transportation, heating and cooling of indoor spaces, construction materials, industrial production, electricity generation, deforestation, etc., and for methane (CH_4): gas leaks, landfills, livestock farming, etc.)

We have seen what happens when a bathtub fills too quickly because the water keeps flowing from the tap, while the drain cannot remove the excess fast enough. To prevent this disaster, we have two options: either reduce the water flow from the tap or improve the drainage system.

The same principles apply to greenhouse gas emissions: **reducing emissions**, meaning partially turning off the tap, involves transitioning to **green energy**, using renewable sources such as solar and wind power instead of fossil fuels. It also means improving **energy efficiency**, so that we use less energy for the same activities, such as better building

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Bathtub Dynamics.pdf System Dynamics Review Vol. 16, No. 4, (Winter 2000): 249±286 Copyright 2000 John Wiley & Sons, Ltd. Understanding climate change complacency | MIT News | Massachusetts Institute of Technology

insulation or using efficient appliances. Additionally, **material circularity**—reusing existing resources and reducing waste—is crucial.

However, even if we reduce the flow, the water level remains high. That's why the second strategy is **emission absorption**, which is the equivalent of improving the drainage system to remove water from the bathtub more efficiently. **Planting trees and preserving vegetation** function as a natural drainage system, capturing CO_2 through photosynthesis. Protecting **ocean health** is essential, as oceans regulate temperatures and absorb carbon dioxide. Developing **new technologies that capture and store carbon** directly from the atmosphere can further enhance this process.

Only by combining both solutions—reducing emissions and improving absorption—can we prevent the bathtub from overflowing. Otherwise, the planet risks facing irreversible consequences, just like a flooded bathroom that we can no longer control.

A. Emission reduction:

— **Green energy**: using renewable energy sources, such as solar and wind energy, instead of fossil fuels (oil, gas, coal).

— **Energy efficiency**: improving energy efficiency so that we consume less energy for the same activities.

— **Circularity in the use of materials**: reusing resources already in our homes and communities - avoiding waste of materials and limiting the extraction of resources from nature.

B. Emission absorption:

— **A lot of vegetation with efficient species**: through the process of photosynthesis, as well as planting trees that absorb CO2 from the atmosphere and grow their biomass.

— **Maintaining the health of the oceans**: keeping a balance in the photosynthesis processes for microalgae, protecting the biodiversity that uses carbon to form carbonate structures, and safeguarding the temperature differences that activate ocean currents.

— **New technologies**: developing efficient methods to capture CO2 from the atmosphere and store it.

These directions can be supported through ways of living and transforming spaces in our cities, especially since many of the activities we've seen that generate emissions take place in urban areas.

CITIES are complex systems, with concentrations of people and buildings, with intense flows of transport and energy, and large amounts of materials. And precisely because we have these higher densities in cities, reducing the carbon footprint can be achieved in multiple ways and with a very high level of efficiency!

1.2. How do we Recognize a Climate-neutral City?

A climate-neutral city is one where emissions and absorptions balance each other out. To achieve this balance, there need to be actions to reduce greenhouse gas emissions as well as steps that can be taken now for carbon dioxide absorption in cities.

These possible actions are translated into physical, concrete space through:

Constructions:

— **Existing or new buildings that are well insulated** – ensuring heat stays inside during winter and outside during summer (reducing energy consumption). Good insulation minimizes heat loss, reducing the need for heating and cooling systems. For existing buildings, essential solutions include thermal insulation of walls, replacing windows with energy-efficient glazing, and using high-performance insulating materials. New buildings can be designed to minimize energy consumption from the start by implementing passive strategies, such as optimal orientation toward the sun and natural ventilation.

— **Repurposed existing buildings** – instead of demolishing old constructions that no longer meet current needs, they can be rehabilitated and adapted for contemporary uses, preserving as many existing materials and equipment (which store carbon) as possible. Repurposing buildings reduces the need for new materials and limits the waste generated by demolitions. Existing spaces can be modernized and adapted to current requirements through structural reinforcements, improved energy efficiency, and the integration of new functions, while also maintaining their architectural value and reducing environmental impact.

— **Renovated existing buildings or new constructions that use technological innovations** – such as low-emission concrete (with fly ash or slag), mycelium bricks, and 3D printing, which reduces waste and optimizes material use. Innovative materials help lower emissions in the construction sector. Concrete with alternative additives, such as slag or fly ash, reduces cement consumption—one of the most polluting industrial materials. Mycelium bricks are biodegradable and can be produced with minimal resource consumption. 3D printing allows for efficient material use, reducing construction waste and enabling the creation of more energy-efficient structures.

— **New buildings that reuse already-produced elements – circularity principles** – repurposing materials that are simply reassembled into new projects. Recycling and reusing construction components, such as steel beams, facade panels, or prefabricated modular elements, reduce the consumption of natural resources and the emissions associated with their production. This makes buildings more sustainable and significantly reduces construction waste.

— **New buildings that use low-carbon materials** – such as wood (which also stores carbon as trees grow), bamboo, cork, and other bio-composite materials (fiberboard panels), unfired clay bricks (adobe) or compacted earth, and natural insulation materials (wool, straw, hemp, recycled paper, etc.). Using natural and renewable materials helps lower the carbon footprint of buildings. Wood and bamboo are sustainable choices due to their ability to capture carbon during growth. Materials like adobe, compacted earth, and cork offer high energy efficiency, providing excellent thermal insulation while being produced with low energy consumption.

— **New buildings that incorporate recycled materials** – such as recycled steel (not from ore), recycled concrete (crushed concrete debris reused in new projects), and recycled glass. Recycling materials reduces the consumption of primary resources and limits the environmental impact of the construction industry. Recycled steel has the same properties as steel made from raw ore but with a significantly lower carbon footprint. Crushed concrete waste can be reused as aggregates in new structures, reducing demand for cement. Recycled glass can be transformed

into insulating panels or decorative materials, offering a sustainable solution for building facades and interiors.

Vegetation:

— **Tree densification** – in parks, public gardens, squares (public green spaces) as well as in private gardens and yards (private green spaces for recreation or vegetable gardens).Planting a greater number of trees in both public and private spaces helps reduce the urban heat island effect, contributes to carbon dioxide absorption, and improves air quality. Additionally, trees provide shade, reducing the need for air conditioning in nearby buildings and creating a more pleasant environment for residents.

— **Urban forests** – though the term may seem contradictory, there are an increasing number of examples of forested areas small enough to fit within cities but large enough to support the species diversity required to qualify as a forest. Urban forests are specially designed wooded areas within cities or in peri-urban zones, aimed at increasing carbon absorption capacity and supporting biodiversity. These "green lungs" reduce noise pollution, improve thermal comfort, and have a direct positive impact on public health and community well-being.

— **Street tree plantations** – trees planted along streets and boulevards. Planting trees along roadsides reduces air pollution caused by traffic while also providing shade for sidewalks and bike lanes. These trees help regulate urban temperatures, prevent paved surfaces from overheating, and contribute to a more pleasant urban landscape.

— **Greening facades, rooftops, and courtyards as much as possible**. Green roofs and living walls are effective solutions for improving energy efficiency in buildings and enhancing cities' capacity to absorb CO_2. Strategically placed vegetation on buildings lowers surface temperatures, provides thermal and sound insulation, retains rainwater, and creates additional space for biodiversity in densely populated urban environments.

— **Living shorelines that provide shade for waterways, lakes, and enhance urban biodiversity**. Maintaining or restoring green areas along rivers and lakes supports aquatic ecosystems, stabilizes soil, and reduces erosion risks. Vegetation along shorelines regulates water temperature and provides a habitat for birds, insects, and wildlife, improving urban biodiversity and overall quality of life in cities.

All these contributions of vegetation to reducing the carbon footprint, as well as enhancing the quality of life for both people and the wildlife that shares the city space with us, have a greater impact if they are part of a network that provides access to nature in the city for all residents.

Social infrastructure

Public utility facilities are places where people go to benefit from social services: education, healthcare, sports, culture, social support for vulnerable groups, tax and fee administration, etc.

The buildings and surrounding spaces (schools, clinics and hospitals, sports fields, cultural centers, community centers, libraries, senior and youth clubs, as well as public administration offices, etc.) provide multiple opportunities to implement both directions of action for achieving net zero emissions (reducing emissions and absorbing them): modernizations and thermal insulation, equipping with energy-efficient technology, and producing energy from renewable sources, installing bike racks, creating areas for proper selective waste collection and composting, etc.

In addition to everything already mentioned regarding buildings and vegetation, behaviors can be influenced in such spaces by equipping them, as well as through awareness-raising actions for: reducing resource consumption, waste management, organizing courses and workshops on sustainability and climate change, exhibitions and plays that contribute,

through the means provided by art, to understanding the challenges we face—appealing to everyone's sensitivity is often more effective than a long series of explanations.

Infrastructure for public utility services

a. Sustainable Mobility

Local public transport for passengers is considered a public utility service, but the infrastructure we usually refer to in this context is the fleet of vehicles used for local passenger transport. To reduce the carbon footprint, it's clear that these vehicles should be electric and should be favored over individual transport.

However, very rarely is the **quality of public spaces considered here as support for sustainable mobility** options. This preference for ways of getting around that use bicycles/scooters or that don't use any vehicle at all: walking (which is so beneficial for health!) should be encouraged through public spaces that motivate you to walk and bike because they provide safety and comfort through:

— wide enough paths for pedestrians and bike/scooter lanes;
— public lighting,
— urban furniture for resting, for waste collection, etc.,
— attractive facades and interesting building volumes,
— relevant functions within reach.

Cities can be organized in a way that gives you access to everything you need for daily life within a reasonable walking distance: this is the basic principle of **the 15-minute city**.[3]

By shortening distances and prioritizing walking and bike/scooter mobility, the relationship each person has with urban spaces improves, and more connections are created among individuals who no longer sit isolated in their cars, increasing the chances for interaction.

In his book published in 2024, titled "*The 15-Minute City: A Solution to Save Our Time and Planet*" Carlos Moreno explains that the 15-Minute City is a neighborhood-based city where residents can access all essential services (schools, shops, restaurants, green spaces, public transport) within a maximum of 15 minutes on foot or by bike.

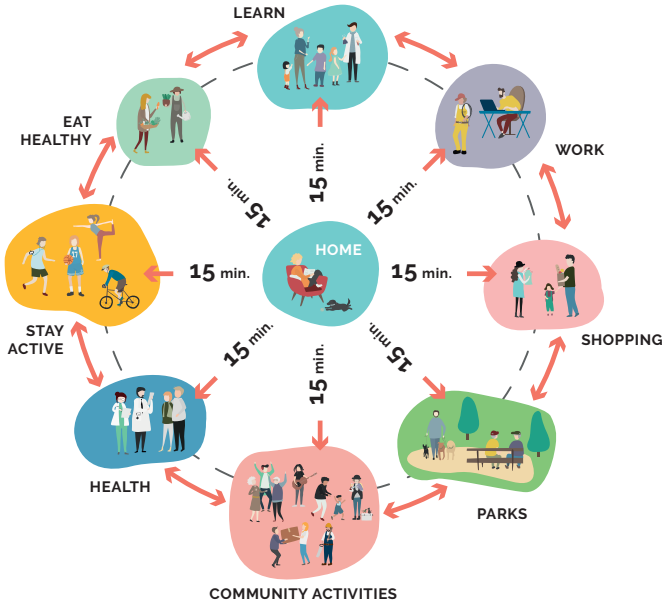

Figure 1.3

Diagram of the "15-Minute City" Inspired by Carlos Moreno's Concept

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Moreno, C., Allam, Z., Chabaud, D., Gall, C. L., & Pratlong, F. (2021). Introducing the "15-minute city": sustainability, resilience and place identity in future post-pandemic cities. Smart Cities, 4(1), 93-111. https://doi.org/10.3390/smartcities4010006

b. Water in the City

The proximity to water bodies available in some cities (rivers, lakes, sea or ocean shores) presents extraordinary opportunities for reducing the carbon footprint through:

— **Rehabilitating riverbanks and wetlands** to improve their natural capacity to store carbon and regulate water flows (see above – quality of public spaces).
— **Utilizing watercourses for micro-hydropower plants** or marine energy turbines (see below – infrastructure for energy production).
— **Creating conditions for biodiversity** around water bodies, which helps capture carbon and supports ecosystems (as discussed earlier in the vegetation section).

Collecting, channeling, and draining rainwater in support of climate neutrality can be done through:

— setups that slow down water runoff, like rain gardens, retention basins, or permeable green spaces, all of which not only reduce the risk of flooding but also improve water quality.
— storing rainwater in tanks for uses like irrigation, which reduces the demand for drinking water.
— planting trees and creating green roofs to enhance rainwater absorption before it's collected and channeled.

The interventions we can see that are transforming the urban landscape related to **water supply networks and wastewater management** that contribute to reducing the carbon footprint can be achieved through:

— modernizing networks to reduce losses,
— using technologies in water collection, treatment, and pumping systems to make efficient use of energy.
— harvesting rainwater or reusing gray water (from showers, sinks) for non-potable uses, like irrigation or toilet flushing.
— optimizing treatment processes with efficient technologies to reduce energy consumption while also utilizing waste from wastewater as a source of biogas or compost.

c. Centralized Heating/Cooling systems

What kind of energy is used to heat the water that circulates in the municipal central heating network? What upgrades have been made to the distribution network in recent decades? We've heard about municipal plants with outdated technologies that rely on fossil fuels and patchy networks that leave entire neighborhoods freezing in the middle of winter. The lack of investment in this public service means that central heating in our cities isn't always the most efficient way to maintain a comfortable temperature in built spaces. There are also heating plants that use municipal waste to heat the thermal agent. Research shows that municipal systems are the most economically efficient option when distribution networks are already in place in the area. This would also be the best approach regarding carbon emissions due to the need to heat homes, workplaces, commercial spaces, schools, hospitals, etc.

Furthermore, we're used to central heating, but what if we could also cool the air centrally without needing so many air conditioning units in every room? There are action-research projects testing the idea of using the thermal agent distribution system—hot water—that heats the radiators in buildings connected to the centralized heating system to also provide cooling—using the thermal agent in radiators and heat pumps that take advantage of this temperature difference to cool the air during the scorching summer months.

d. Sanitation and Waste Management

Waste collection and management is essential for reducing our carbon footprint, but especially for lowering methane emissions (which are

generated through the anaerobic decomposition of organic waste in landfills).

Clearly, the sizes needed for the waste collection infrastructure in our neighborhoods depend on the amounts of waste – and there's a strong need to reduce these amounts (less packaging, reusable products, repairs, circularity, etc.). The collection infrastructure must allow for the separation of organic waste to prevent it from going to landfills and provide options for composting, thus turning a problem into a resource: fertilizer for gardening. Sorting stations are necessary but not enough – sorting behavior needs to be learned, and the rules must be strictly followed. Recycling materials such as paper, plastic, and metals uses less energy than producing them from new raw materials, but if someone doesn't follow the sorting rules, it can ruin everything collected in the recycling bin.

Closing down landfills that don't follow regulations is crucial, and for those that do comply, there are technologies that capture methane and use it for energy generation. However, converting residual waste into energy must be done under controlled conditions, with minimal emissions.

e. Natural gas supply

To help reduce our carbon footprint through managing natural gas installations, it doesn't necessarily mean a complete withdrawal from them in the short term, but there should be a shift towards more sustainable alternatives (like biogas and green hydrogen).

In this transition, systems can be installed to capture carbon dioxide emitted during the burning of natural gas, and investments can be made in heating plants and appliances that are highly efficient.

Over time, gas heating plants should be replaced with electric heat pumps, and as green energy becomes more accessible, electric heating could become a main solution.

f. Electricity distribution network

Although it is not part of local public services but rather a national network, this electricity distribution infrastructure is essential for the ability to contribute (as a prosumer) to energy production from renewable sources, regardless of your location.

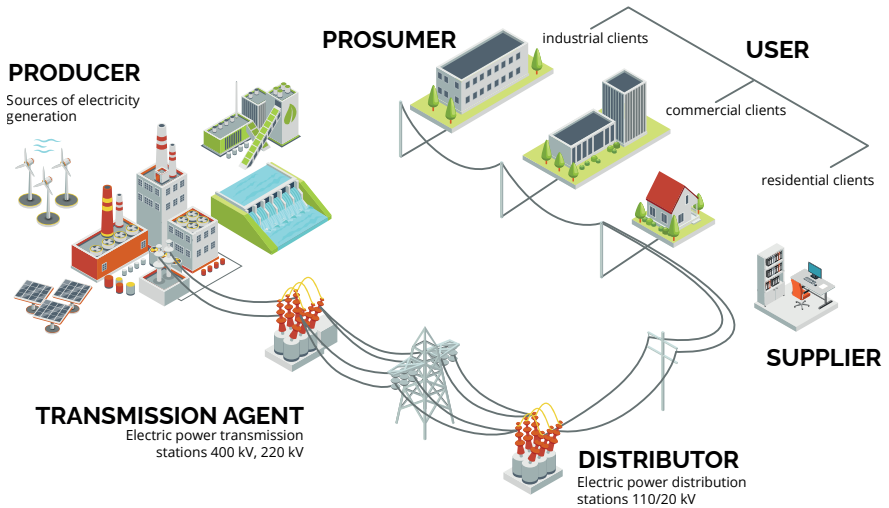

Figure 1.4.

Roles in Energy Production and Distribution, source: My School's Energy - *De-a Arhitectura Association*[4]

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https://www.de-a-arhitectura.ro/project/energie-si-mediu-construit/

g. Electricity production

In addition to the distribution network, a highly relevant topic for what we might see in a climate-neutral city is **the infrastructure for energy production.** The built environment thus includes the structures and facilities that people create (sometimes within cities, other times outside them) to convert raw materials (coal, natural gas, biomass, etc.), motion (waves, wind, river flow), temperature differences, or atomic motion into electricity.

We see constructions and equipment for energy production that are, in turn, sources of emissions. Although hydropower is considered clean, building a dam requires a large amount of cement and concrete. Of course, once constructed, such a plant will offset these emissions over time. For solar energy, if it doesn't utilize existing structures, it requires a significant amount of materials, some of which have a high carbon footprint unless they are recycled or made to be highly durable.

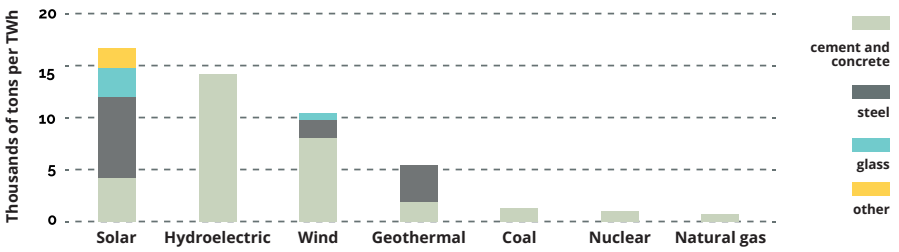


Fig. 1.5

roluri în producția și distribuția de energie
sursa: Energia școlii mele - Asociația De-a Arhitectura[5]

1.3. Ce reținem pentru a putea imagina neutralitatea climatică a orașelor?

Climate neutrality in cities is a key objective in combating climate change, requiring a balance between greenhouse gas emissions and the ability of natural ecosystems or technologies to absorb them.

To achieve this balance, a dual approach is necessary:

— **Reducing emissions** through energy efficiency, the use of renewable energy, and resource consumption optimization.
— **Increasing carbon absorption capacity** by expanding green areas, protecting ecosystems, and developing carbon capture and storage technologies.

Given their high density of activities and resources, cities offer significant opportunities to implement these strategies with major impact.

Visible transformations in the urban environment can take the form of:

— **Energy-efficient buildings**, repurposing existing structures, using low-carbon materials, and applying circular economy principles.
— **Expanding urban greenery**, including urban forests, street tree plantations, green roofs, and living walls, which directly contribute to carbon absorption and improving urban quality of life.
— **Sustainable infrastructure**, such as efficient public transportation, pedestrian-friendly urban design, and cycling networks.

5

https://www.de-a-arhitectura.ro/project/energie-si-mediu-construit/ - How to Avoid a Climate Disaster. Solutions We Have and Innovations We Need - Bill Gates, Penguin Books, p. 85

— **Smart water and waste management systems** that reduce resource consumption and integrate recycling and reuse solutions.
— **Optimizing energy systems** and transitioning toward decentralized networks powered by renewable sources, significantly lowering the carbon footprint of cities.

Each of these actions—from how we construct and transform buildings to how we manage resources and protect the environment—represents a concrete step toward more sustainable cities, better prepared for the future.

The next chapter will showcase real-world examples of how these principles have been successfully applied, demonstrating their positive impact and inspiring future urban transformations.

A.2. Examples

The Structure of the Analysis Sheet as a Link Between Explanations and Role-Playing

The examples provided in this material illustrate best practices for specific interventions in climate-neutral cities, offering a clear framework for understanding the necessary transformations and their impact. These examples are directly linked to the educational scenario, where participants are required to select promising locations from the map of an imaginary city and envision the outcomes and specific roles for project proposals that do not increase the carbon footprint—and ideally, contribute to the absorption of greenhouse gases.

Technical solutions for project design are not the primary focus of the educational scenario, but defining key elements for the design brief is necessary to ensure the role-playing exercise functions effectively. Therefore, the examples are not described in detail, as their purpose is not to dictate design decisions but to inspire project initiators and serve as a common reference point between the beneficiaries of design services and the project initiators.

The structure of the example presentation sheet has been designed to connect directly with both the explanations and definitions from the previous section and the educational scenario in The Second Part. This approach ensures that the examples are not only studied theoretically but also used as inspiration in the proposed exercise, helping participants understand the complex processes behind the transition to climate-neutral cities.

To organize the analysis of each example, the information has been structured around three essential categories, reflecting both the main areas of action for reducing the urban carbon footprint and the inclusive and participatory work processes that drive change.

The first two categories focus on **technical and environmental solutions**, answering **HOW?** emissions can be reduced through demonstrated measures.

The third category introduces the **WHO?** question, identifying the actors involved in these transformations. This prepares the discussion on the roles of different stakeholders, which will be explored further in the next chapter (A.3. The Roles of Urban Actors).

Later (in The Second Part), the educational scenario will guide participants to define a role (whether from the business sector, civil society, or media/communication). This exercise helps them understand the complexity of decision-making and practice negotiation and collaboration to implement solutions for climate-neutral cities.

This structure helps participants grasp not only the applied solutions but also the decision-making process and collaboration between different stakeholders in the transition to climate-neutral cities.

Explanation of the Categories in the Examples Analysis Sheet

1. Energy, Flows, and Functions

This category explores how energy is produced, used, and conserved in cities, as well as the optimization of material flows and urban functions. The included examples demonstrate strategies for reducing energy consumption through solutions such as modernizing existing buildings for energy efficiency, integrating renewable energy sources, and optimizing heating and cooling systems.

Additionally, measures for improving urban transportation are analyzed, either by promoting public transport and active mobility or by adopting sustainable infrastructure that reduces emissions.

2. Nature, Materials, and Circularity
This category highlights the role of vegetation and sustainable materials in the transition to climate-neutral cities. The example sheets briefly describe, in this section, demonstrations of either the importance of reintroducing nature into urban spaces—through urban forests—or solutions such as green roofs and facades, street tree plantations, and other strategies that contribute to emissions absorption. This section also presents intervention ideas aimed at reducing the impact of the construction industry, such as using low-carbon materials, recycling and reusing existing urban resources, and applying circular economy principles.

3. Community, Processes, and Roles
The last category emphasizes the involvement of urban actors in the transition process and how decisions are made and implemented locally. Climate-neutral cities are not built solely through technical solutions, but also through participatory processes that actively involve the community.

Each example includes information on collaborations between local governments, businesses, NGOs, and citizens to develop climate action projects.

Each analysis sheet includes a **project title** along with key **identifying details** (the city and the design team). It also mentions any **awards received** or **official certifications** that validate the project's performance, assessed by **competition juries or evaluators using certification criteria**.

An important aspect to highlight is the **careful selection of project names**, ensuring that **keyword searches** lead individuals seeking more detailed documentation to **reliable references**. Regarding information sources for each example, the references were chosen based on rigorous criteria, drawing from the expertise of a team composed of architects with experience in both design and research (the documentation sources are listed at the end of this section).

Each sheet also contains a more detailed description of a specific feature or an aspect that requires further clarification. This information is marked by a subtitle, diagrams, or accompanying photographs. These key ideas serve as a starting point for further research, encouraging participants to explore additional sources independently. At the same time, the suggested strategies can be replicated in their own project proposals for the imaginary Net Zero City To Be, as part of the educational scenario.

Another important aspect is the **cross-sectoral impact** of the solutions adopted in these examples. The interventions were selected not only for their emission reduction potential but also for their social, economic, and urban benefits. For instance, renovating a building can contribute not only to increasing energy efficiency but also to improving residents' quality of life, supporting vulnerable groups, or revitalizing degraded urban areas. This is why, in the educational scenario, participants are encouraged to analyze the multiple effects of an intervention, helping them develop a comprehensive understanding of the transition process toward climate-neutral cities.

category: buildings

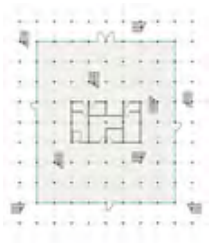
Pavillon in TU Braunschweig Campus - Braunschweig, Germany

Project team: Gustav Dusig & Max Hacke
Opening: 2023
Awards, certifications: 1st prize - 2024 Mies van der Rohe Award for Contemporary Architecture


1

energy, flows, usage	nature, materials, circularity	community, processes, roles
• Through its design, the pavilion optimizes (through orientation, shading, and thermal insulation) the use of natural light and ventilation, thereby reducing the need for electrical energy. • It is connected to the municipal heating network, which uses 80% renewable energy sources. • The use of spaces is highly flexible, and although the building is not large in size, it allows for multiple scenarios tailored to individual needs through: • Sound-absorbing curtains for individual work, • Furniture that can be easily moved, • Modular spaces that are easily accessible	• The primary material used is CLT (cross-laminated timber), and wood is considered one of the most suitable materials for reducing carbon footprint. • All materials are reusable because the pavilion can be disassembled and reassembled in other locations. This ensures that the materials used for this pavilion remain in use and nothing is wasted (in line with the principles of a circular economy). • The relationship with the surrounding vegetation is very close, with highly permeable, transparent facades featuring many entrances, terraces, balconies, and external stairs. • The floor-to-ceiling glass facade allows for optimal use of natural light. The roof provides shading for these facades, preventing the greenhouse effect	• The university wanted a pavilion that would respond to new study methods but also serve as a demonstration for students (in architecture, engineering, environmental sciences), faculty, visitors, etc. — a **living lab**. • Users can gather in small or large groups, encouraging collaborative work as a way to balance online learning. Traditional hierarchies within the academic environment or separations between departments are thus overcome. • It is a building where new ideas in design and technology are being tested, responding to the need for flexibility in use, as well as energy efficiency, circularity, and other sustainable principles

Flexibility in use



The objectives of **TU Braunschweig** took into account the changes brought about by digitalization, which also influence education. The pavilion was designed to serve new roles for learning spaces within the university campus. Users of this building can quickly configure their working space: they can easily move between the interior and exterior, rearrange lightweight and modular furniture, and use sound-absorbing curtains


2

Modularity and Assembly

The structure is lightweight (with material efficiency) and combines steel and wood. It is completely disassemblable. The structure defines a 3m x 3m grid, with the nodes of this grid not welded to the beams. The wooden floors are inserted into these frames. Expansions are possible by adding new platforms. All construction elements are assembled (not glued), and each of them can be reused either together with others or separately.

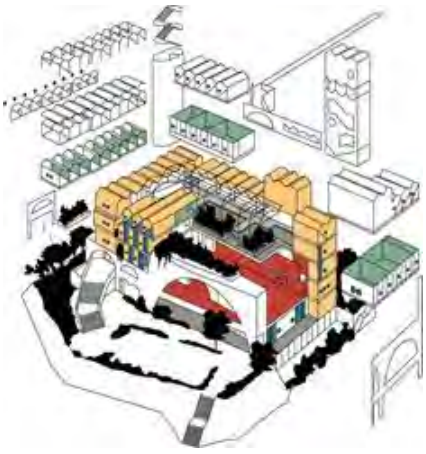
category: buildings

Reggio school - Madrid, Spain

Project team: Andres Jaque / Office for Political Innovation
Opening: 2022
Awards, certifications: finalist, 2024 Mies van der Rohe Award for Contemporary Architecture

energy, flows, usage	nature, materials, circularity	community, processes, roles
• Avoiding homogenization and unified standards, the school functions as a multiverse—a collection of diverse ecosystems, architectural traditions, and regulations—turning the building into a pedagogical tool. • The structure is organized like a vertical mini-city, with younger students at the lower levels and older students higher up. • The design follows a minimal-budget strategy to reduce ecological impact by: • Building vertically to minimize the ground footprint typical of schools, reducing foundations and plumbing systems by 27%. • Eliminating unnecessary structural elements and finishes	• The finishes are minimal, with exposed installations—an aesthetic that reveals things as they are—helping the school community better understand the built environment. The quantity of materials used has been reduced by 48%. • The façade is finished with cork, which provides insulation, waterproofing, and a habitat for vegetation and animals. • The concrete structure has been downsized, reducing material use by 15%. • A network of small gardens is scattered throughout the school, and a rooftop greenhouse serves as a relaxation space for older students	• Participatory Process – The architects drew inspiration from sketches and models created by the students. The school principal frequently brought students, parents, and teachers to meetings with the design team to ensure everyone's input was considered. • Students of different ages regularly interact, with older students often volunteering to care for the younger ones. • Sports and science activities take place in the nearby park, fostering a connection with the surrounding environment.

School building as a pedagogical tool



Axonometric view

The design of the Reggio School in Madrid is based on the idea that architecture can inspire children's desire for exploration, research, and learning. The building is envisioned as a complex ecosystem that allows students to learn independently through a process of self-guided collective experimentation—following pedagogical ideas developed by Loris Malaguzzi in the 1940s and tested in several primary schools in the Italian city of Reggio Emilia in the 1980s, which promoted learning driven by children rather than adults.

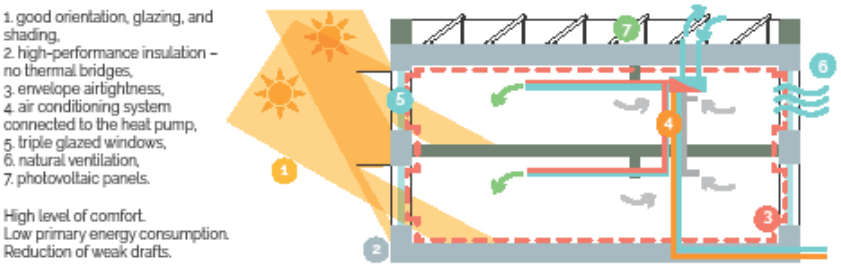
Students learn with the help of the building and about ecology in its broader sense, including their impact on the environment, their relationship with other forms of life, and decision-making within a community. The central area, spanning 5,000 square meters and standing 8 meters high, acts as an agora—a semi-open space where the air is cooled by nearby oak trees. A team of ecologists designed small gardens to host insects, butterflies, birds, and bats. Here, students can engage in physical activities or discuss how the school operates as a community and how they should interact with the surrounding nature. It is a place where everyone can learn to sense and understand the ecosystems they live in.

category: buildings

Hackbridge Primary School - Sutton, UK

Project team: Architype, Introba
Opening: 2020
Awards, certifications: Winner 2023 UK Passivhaus Awards non domestic category, UK's first Passive House Plus school RIBA London Award 2023, Certifier: WARM

energy, flows, functions	nature, materials, circularity	community, processes, roles
• Optimized building orientation to reduce overheating and the need for cooling. • The design applies rigorous PassivHaus building envelope insulation and air tightness requirements (triple glazed windows). • Highly efficient ground source heat pump system with inter-seasonal heat storage meets space heating demands and majority of domestic hot water demands • Central air handling unit to distribute fresh air, use of natural ventilation is encouraged. • Energy consumption monitoring system. • Photovoltaic panels generating more energy from renewable sources than the building consumes in a year.	• Located near a conservation wetlands area of Metropolitan Open Land. • Outdoor learning spaces to connect students with nature. • Stylized plants, birds, and insects featured in the decorations at the entrance and windows. • Bio-based and recycled materials, with low embodied energy, easy to construct and maintain. • Wooden slats on the building's exterior and large windows offering views of the surrounding landscape. • Green roof with wild plants to enhance biodiversity. • Flexibility through movable partitions in classrooms	• Located near the pioneering BedZED One Planet Living development (the first sustainable mixed-use eco-village in the UK). • The school is part of the council's commitment to 'One Planet Sutton' living (an initiative promoting healthier, happier lives while reducing the environmental impact of neighborhoods), as well as a continuation of BedZED's legacy. • Commitment of all stakeholders to achieving zero carbon emissions from the design phase. • Plans for an additional extension for future expansion.



The First Passivhaus School in the UK

This pioneering project combines insulation and airtight building envelopes with technologies that generate more energy from renewable sources than the building consumes throughout the year.

Reduced Environmental Impact and Encouragement of Exploration

Located in a wetland conservation area with protected species, the school building highlights natural aspects and encourages children to explore their surrounding environment.

cathegory: buildings

Primary School, *Gertrude Fröhlich-Sandner* - Wien, Austria

Project team: Kaufmann Wanas- architecture, Brigitte Lacina - landscaping
Opening: 2010
Awards, certifications: EU wide competition: 1st Prize in 2008
First building awarded with the Sustainability medal DGNB (German Council for Sustainable Buildings) from ÖGNI (Austrian Society for Sustainable Real Estate Management)

energy, flows, functions	nature, materials, circularity	community, processes, roles
• At the entrance, V-shaped columns create an urban signal, contrasting with the residential blocks. • The campus was built to low energy consumption standards. • The building's central feature is a three-level dining hall with a glass roof, offering visibility from all floors. • Numerous two-story courtyards bring natural light into the interior spaces. • Around the school, the streets have **speed restrictions**, the bus stops at the corner of the plot, and **vehicle access is prohibited** on the street in front of the school. • At the entrance, there are **bike, skateboard, and scooter parking** areas, used by the students.	• The school is adjacent to Rudolf Bednar Park (30,000 m²), designed through a project competition on the former site of the North Railway Station. The park features trees, flowering shrubs, grass, a children's and youth area (skatepark, streetball), zones with water mirrors and reeds, evoking the natural landscape of the Danube. • The space in front of the school is occupied by small vegetable gardens, herbs, flowers, and aromatic plants, serving as a sound buffer zone for the classrooms facing the street. • The classrooms have windows that open to green spaces (the park and gardens).	• Public-Private Partnership: This partnership spans from financing, implementation, and energy management to operation and maintenance • In the evening, a football club is allowed to use the sports area. • On the school's fence, there is a waterproof bag for books, where locals can share books with their neighbors, creating a mini public library. • The use of **public transport or alternative transportation methods** is encouraged.

Public-Private Partnership

An inclusive package, covering **financing, implementation, and energy management** to the **operation and long-term maintenance** of the building

Encouraging Public or Alternative Transport / Discouraging Personal Car Use

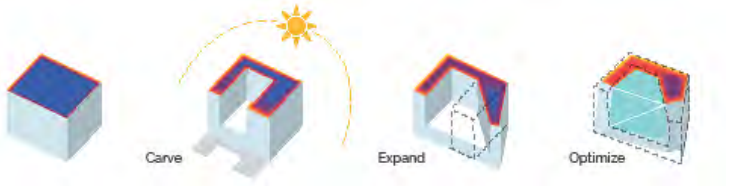
Using a personal car to commute to school can pose a risk and stress factor for other children who travel on foot or use human-powered vehicles (bicycles, scooters, skateboards).

category: buildings

Office building, *The Edge* – Amsterdam, Nederlands

Project team: PLP Architecture
Opening: 2015
Awards, certifications: BREEAM Outstanding (2016), Certificated WELL Building Standard (2016), many prizes for sustenabilitate, innovation and ecological design

energy, flows, usage	nature, materials, circularity	community, processes, roles
• The Edge achieved a record **BREEAM score of 98.36%**, making it the most sustainable building in the world at the time of this recognition in 2016. • The building consumes approximately **50% less energy** than most office buildings globally, with an annual consumption of **70 kWh/m²** compared to the European average of 150–200 kWh/m²/year. • Solar panels installed on the building generate sufficient energy to power both the building and the employees' vehicles, with any surplus energy stored for future use.	• The materials used in the building are both recycled and sustainable: • The aluminum used in the façade is largely recycled. • The wood used for finishes is FSC-certified (Forest Stewardship Council), ensuring it comes from sustainably managed forests that respect natural regeneration cycles. • Recycled concrete and concrete produced through less polluting technological processes are also used. • The building integrates vertical gardens in its central atrium, which contribute to improving indoor air quality and creating a pleasant environment for employees.	• The building consistently hosts community events, connecting the business environment with local initiatives. Public areas and the central atrium are used for cultural and educational events, thus opening the building to the community. • The Edge serves as an important catalyst for change at the local level. By integrating green technologies, optimizing workspaces, and fostering community connections, the project demonstrates how architecture can be a valuable tool for promoting a healthier lifestyle, a more sustainable city, and a more connected society.



Flexibility and Adaptability

Ample natural lighting, intelligent control systems, and interior green spaces create a pleasant and healthy environment, contributing to increased productivity and reduced stress. These features also encourage social interaction and collaboration among employees.
The offices are not traditionally partitioned, allowing for continuous adaptation of the interiors based on user needs. This promotes a dynamic and efficient work style, fostering innovation and collaboration with spaces such as quiet offices, conference rooms, and open areas.

Intelligent Automation

The building is equipped with **28,000 IoT sensors** (Internet of Things) that monitor temperature, humidity, light levels, CO2 concentrations, and the occupancy of each room. This system optimizes energy consumption by automatically adjusting temperature and lighting, reducing waste. It automatically regulates light intensity based on human presence and available natural light, and if an area of the building is unoccupied, lights and ventilation systems are automatically turned off.

category: buildings

High rise building, *CapitaSpring* - Singapore

Project Team: BIG+ CARLO RATTI ARCHITECTURE, ARUP
Opening: 2022
Awards, certifications: BUILDING OF THE YEAR 2023, Universal Design GoldPLUS certified, International High-Rise Award 2024/25

energy, flows, usage	nature, materials, circularity	comunity, processes, roles
• The façades have been optimized through parametric analysis to reduce the impact of wind and rain in open spaces, while maximizing natural light and minimizing solar heat gain in office and residential areas. This analysis also determined the optimal angle of horizontal louvers in the food court façade, effectively reducing the risk of rain intrusion caused by wind. • Passive design strategies include natural ventilation and the recycling of cooled air from air-conditioned offices, reducing temperatures by approximately 3–4°C. • The building is a **mixed-use development**, featuring offices, temporary residences, a market and food court, restaurants, cafes, co-working spaces, parking facilities, sports amenities, and public green spaces distributed across multiple floors	• The building hosts over **80,000 plants**, achieving a green space ratio of over 1:1.4—equivalent to more than 8,300 square meters of landscaped area, which is 140% of its land area. • The vertical landscape of the **"Green Oasis"** mimics the hierarchy of tropical forest plants, where leaf growth is proportional to light availability in different vegetation layers. Shade-tolerant plants with large leaves are found on the "forest floor," while trees in the "forest canopy" feature smaller leaves. • More than **150 species** of fruits, vegetables, herbs, and flowers are grown in five thematic gardens, providing fresh produce for the building's restaurants.	• The building transformed an abandoned site in the city center into **public spaces and green areas** accessible to everyone. These spaces seamlessly extend from street level to intermediate floors and the rooftop. • At street level, a section of the historic Market Street has been reconfigured into a public space, turning it into a pedestrian-friendly green oasis complemented by a covered public area. • This project is the result of a **co-design process** between the local public authority and developers, highlighting collaborative urban regeneration

Biophilic design

The concept focuses on integrating natural elements into the built environment, utilizing vegetation, natural lighting, ventilation, and natural materials.
CapitaSpring exemplifies this strategy through its integration of open green spaces throughout the building to reconnect people with nature.
A standout feature of the building is the **Green Oasis**, a four-story void rising 35 meters and filled with lush vegetation and trees. This space meticulously incorporates areas designed for social and recreational activities, optimizing natural light, wind, and thermal comfort for users.

category: buildings, rehabilitation

Museum of Contemporary Art Africa, *Zeitz MOCAA* – Cape Town, South Africa

Project team: Heatherwick Studio, Van der Merwe Miszewski Architects (VDMMA), Jacobs Parkers Architects, Rick Brown + Associates
Opening: 2017
Awards, certifications: Cultural Building of the Year (World Architecture Festival 2018)

energy, flows, functions	nature, materials, circularity	comunity, processes, roles
• Adapting the existing concrete cylinders to the new function significantly reduces environmental impact by avoiding the carbon emissions associated with demolition and reconstruction • Thanks to the advanced technologies used, such as renewable energy sources, HVAC systems, efficient lighting, climate control, ventilation, and insulation, the project offers a valuable example of urban revitalization, respecting the industrial past of the site and embracing a sustainable future.	• **Circular Economy:** Some of the original elements, such as windows and metal components, have been reused, encouraging the principles of circular economy. **Promoting Biodiversity:** Green spaces have been created around the museum and on the roof, using native plants. **Relationship with the Port:** The museum's proximity to the port has been utilized to create a harmonious connection between nature, architecture, and urbanism, promoting ecological awareness.	• The museum is a major attraction in Cape Town, revitalizing the port area and promoting African art on a global scale. • It organizes community events, guided tours, workshops, and educational programs aimed at both locals and tourists. • The museum collaborates with schools, universities, and local organizations to develop art education programs, exhibitions, and initiatives that encourage active community participation. • It also works with local artisans and designers to promote African products and crafts through the museum's store.

Respectful Adaptation to History

The building transforms a former industrial grain silo into a museum dedicated to contemporary African art, preserving its original structure while incorporating modern design elements. It maintains a connection to the site's history while applying modern principles of sustainability and innovative design, serving as an inspiration for integrating industrial heritage into modern functionality.
The current construction retained the original silo walls and tubes, modifying the existing cylinders to create spectacular interior galleries by cutting and sculpting the existing concrete. The architect transformed the silo’s concrete tubes into a 27-meter sculptural atrium, which serves as the visual core of the museum.

Zeitz MOCAA is a driver of social, economic, and cultural change, demonstrating how a reconversion project can blend art, heritage, and sustainability to create a positive impact on both micro and macro scales

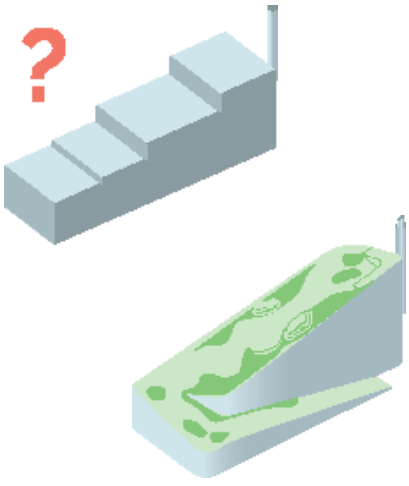
category: buildings + public space

Waste-to-energy plant, *Copenhill (Amanger Bakke*) - Copenhagen, Denmark

Project team: BIG – Bjarke Ingels Group, SLA- landscape
Opening: 2017
Awards, certifications: World Building of the Year 2021, 2020 Popular Science Best of What's New Award, 2020 ICONIC Innovative Architecture Best of the Best Award, 2020 German Design Council Innovative Architecture Best of the Best Award, 2020 Architizer A+ Awards Factories & Warehouses Popular Winner, 2020 Design Educates Award

energy, flows, functions	nature, materials, circularity	community, processes, roles
• The plant transforms 440,000 tons of waste annually into enough clean energy to supply electricity and district heating for 150,000 homes, producing 25% more energy than the original plant from the same amount of waste. • The façade, made of interwoven aluminum boxes, allows natural light to illuminate the interior of the plant. • The plant produces more clean water than it consumes, and thanks to the new filtration systems, emissions of sulfur, dioxins, and other pollutants are reduced by 99%	• Green roof/public space – a 10,000 m² park planted with over 400 species of local plants, wild vegetation, and biodiversity, which creates a specific microclimate, removes harmful dust particles, and minimizes rapid runoff of rainwater. • Since its opening in 2019, 119 new plant species have been observed to have spontaneously appeared on this artificial hill	• A new attraction and leisure hub in the city with an urban recreation center that includes a ski slope, climbing wall, hiking trail, and an environmental education center. • The building has become an urban landmark and a "manifesto" of the green city, contributing to the ambition of transforming Copenhagen into the first carbon-neutral city by 2025

just a power plant?



power plant+ski slope+park

Hedonistic sustainability

The building illustrates one of BIG's core principles—Sustainable Hedonism—demonstrated through projects that address sustainability issues while prioritizing the pleasure and well-being of the users. Technology should not be an adversary of the natural environment; on the contrary, new technologies can be used to create innovative programs that benefit both the environment and our access to nature in an urbanized world. Thus, from an industrial infrastructure, a waste-to-energy plant, Amager Bakke has, through its new design, transformed into a new destination for over 50,000 locals and visitors annually, sparking numerous discussions about urban sustainability.

Barrage ansamble,
Marina Barrage – Singapore

Project team Architects Team 3 Pte Ltd, Singapore, Nature Landscapes Pte Ltd, Elmich Pte Ltd
opening: 2008
Awards, certifications: BCA Green Mark Platinum for excellence in sustainable design and energy efficiency, Global Water Award (2011) for Innovative Water Management Solutions and FIABCI Prix d'Excellence Award for Excellence, recognizing the integration of functionality and design

energy, flows, functions	nature, materials, circularity	comunity, processes, roles
Freshwater Reservoir: The Marina Barrage transforms Marina Bay into a reservoir that supplies 10% of the city's annual potable water demand. The complex is a testament to a unified vision of creating integrated urban solutions for a sustainable future, demonstrating how it can contribute to urban resilience and community well-being. It is proof that sustainable engineering and architecture can create a significant positive impact, both on the environment and society. **Flood Prevention:** The barrage protects against flooding caused by high tides and torrential rains.	• The 11,000 m² green roof helps reduce the urban heat island effect, provides a popular recreational space, and creates an important microhabitat for birds and pollinator insects, contributing to urban biodiversity. The project supports biodiversity by improving the aquatic ecosystem of the artificially created basin, as it helps prevent saltwater intrusion into the freshwater reservoir, protecting the flora and fauna that depend on freshwater	• Public space: Locals and tourists have permanent access to the green roof and promenade for recreational activities. • Environmental education: The visitor center hosts interactive exhibits about renewable energy and sustainability. • Public events: The complex is a popular venue for numerous events, strengthening the connection between infrastructure, various entities, and the community

Multifunctionality

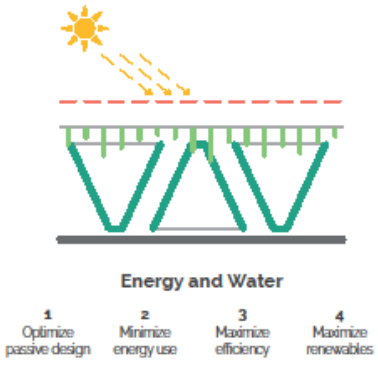
Marina Barrage serves three main functions: freshwater reservoir, flood prevention, and multifunctional urban space. The building features an extensive green roof, which serves as a community gathering place. It is used for community festivals, cultural events, national holidays, fireworks, kite competitions, regattas, and nautical events, picnics and social gatherings, outdoor sports, guided tours and sustainability-themed galleries, corporate and social events, film screenings, concerts and outdoor performances, temporary exhibitions, cultural and art fairs, and more. The space brings together diverse groups of people and promotes social cohesion.
By integrating culture, entertainment, and sustainability, Marina Barrage contributes to improving the quality of life and strengthening the connections between people, the community, and the environment.
Marina Barrage is much more than a hydraulic infrastructure; it is a symbol of sustainability integrated into a modern urban context.

category: buildings, universal expo

Singapore Pavilion, *Nature.Nurture.Future* Dubai World Expo 2020, UAE

Project team: Woha Architects
Opening: 2021
Awards, certifications: finalist 2024 Mies van der Rohe Award for Contemporary Architecture

energy, flows, usage	nature, materials, circularity	comunity, processes, roles
• Net-zero energy consumption through solar panels (517 panels generating 161 MWh), • Passive strategies such as overhangs for shading, an open floor plan for natural cross ventilation, and high volumes for natural daylighting. • "Dry Mist" cooling system for enhanced visitor comfort and energy efficiency, • Solar desalination with a flow rate of 40m³ per day to produce drinking water, • Closed-loop water system and efficient irrigation (drip) to reduce water consumption, • Systematic integration of photovoltaic panels, biogas digesters, and water desalination processes.	• A three-dimensional garden, with over 170 species of native plants from Singapore, contributed to cooling and removing PM10 particles from the air. • Climbing robots were used to care for the vertical gardens, checking the health of plants and collecting environmental data. • The created microclimate attracted various bird and insect species. • Solar tubes capture light from the roof and direct it into the building, along with energy-efficient lighting. • Recycled materials and prefabricated steel components were used to minimize environmental impact, making the structure easy to assemble, disassemble, and reuse	• The collaboration between the Singaporean government, various government agencies, private companies, and research institutions aimed to design, build, and operate the pavilion. • The message of "designing with nature" reached 1.2 million visitors. • The steel structure, solar panels, and mechanical equipment were reused locally, trees were planted again, and the pots from the green wall system were returned to the supplier. • The misting fans were repurposed at the Pan Pacific Orchard Hotel in Singapore.



Exploring Nature Through Technology: Digital Ecosystem

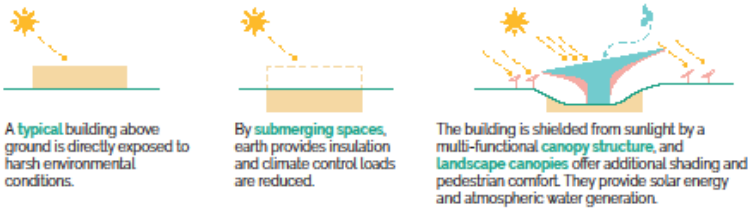
Universal exhibitions can serve as an interdisciplinary testing lab for sustainable architecture innovations. The Singapore Pavilion at Expo 2020 Dubai integrated nature and technology to enhance sustainability and visitor experience. Climbing robot prototypes, developed by Oceania Robotics, were used to monitor plant health and collect environmental data from the pavilion's vertical gardens. This technological innovation demonstrated the potential of robotics in maintaining urban green infrastructure. Furthermore, an interactive "digital ecosystem," combining elements of art and games, offered visitors an engaging and informative experience, familiarizing them with the sustainability aspects of the pavilion. This digital layer enriched the visitors' experience while raising public awareness of environmental issues and sustainable solutions.

category: buildings, universal expo

Sustenability Pavilion, *Terra* - Dubai World Expo 2020, UAE

Project team: Grimshaw Architects
Opening: 2022
Awards, certifications: The Plan Award 2022 in the Culture category, LEED Platinum certification

energy, flows, usage	nature, materials, circularity	comunity, processes, roles
Net Zero Water and Energy Design: • The central canopy and 18 "energy trees," covered with 4,912 photovoltaic panels, collect both rainwater and condensation, which is stored and used for various purposes. • A greywater recycling system treats wastewater from sinks and showers for reuse in irrigation, significantly reducing freshwater consumption. • The building design maximizes natural ventilation and minimizes direct sunlight penetration, reducing the energy needed for air conditioning. • The exhibition space is located underground, taking advantage of the earth's natural insulation to regulate temperature.	Efficient Water Irrigation and Sustainable Landscaping: • Efficient irrigation techniques, such as drip irrigation, minimized water waste in the landscaping, while the use of drought-resistant native plant species reduced the need for irrigation and promoted biodiversity. • The green walls served as thermal insulators, improving air quality and providing habitats for local wildlife. • The pavilion's design was inspired by natural processes, such as photosynthesis, with its shape optimized for solar energy capture and water collection from the humid air. • Recycled materials, sourced locally, and prefabricated components were used to minimize environmental impact.	• Terra promoted environmental responsibility and collective action for a sustainable future, raising awareness about environmental issues and fostering a deeper connection with nature among approximately 24 million visitors. • After the Expo, it was transformed into a science museum, continuing its educational mission on sustainability and serving as a community resource. • The project involved collaboration between Expo 2020 Dubai, Grimshaw Architects, various construction companies, and technology providers.



Architecture as a Self-Sufficient Organism

Functioning as a self-sustaining ecosystem, Terra not only minimizes its environmental impact but also serves as a powerful educational tool. Visitors can directly observe how a building can operate in harmony with nature, learning about renewable energy, water conservation, and sustainable living practices. This concept of a "living building" demonstrates the potential of a more sustainable future, where architecture and nature coexist to create a healthier and more resilient built environment.

category: buildings, universal expo

Morocco Pavilion
Dubai World Expo 2020, UAE

Project team: OUALALOU+CHOI
Opening: 2021
Awards, certifications: Gold prize for the best interior design from the International Bureau of Exhibitions (BIE)

energy, flows, usage	nature, materials, circularity	comunity, processes, roles
• The thick rammed earth walls acted as thermal mass, absorbing heat during the day and slowly releasing it at night, thus contributing to the natural regulation of interior temperatures. This helped to reduce the need for artificial cooling and heating. • The pavilion's design maximized natural ventilation through strategically placed openings and a central courtyard (patio), minimizing reliance on air conditioning. • The use of Mashrabiya-style wooden screens on the interior facades provided shading and helped control sunlight, reducing heat gain inside and enhancing the building's energy efficiency. • A greywater recycling system treated wastewater from sinks and showers, allowing it to be reused for irrigation and other non-potable purposes, further contributing to the pavilion's sustainability efforts.	• The hybrid construction, which combined rammed earth, reinforced concrete, and wood, reduced the need for energy-intensive cooling systems without compromising structural strength. • With an area of 4,000 square meters and a height of 33 meters, it was the largest rammed earth facade in the world. • To optimize construction and minimize waste, the rammed earth walls were prefabricated off-site and assembled at Expo. • The intercalation of green windows within the volume helps regulate temperature, ventilation, and air purification, as well as creating a psychologically beneficial state.	• Post-Expo it was transformed into a housing complex, which includes apartments, communal spaces, and recreational facilities (adaptive reuse). • The pavilion celebrated Morocco's diverse cultural heritage, including its Berber, Arab, and African influences, and brought together local crafts and traditions, such as wood carving and *zellige* (a type of traditional Moroccan mosaic made from hand-cut ceramic tiles in various geometric shapes).

Traditional Technique, Modern Application

The pavilion's design was inspired by traditional Moroccan villages, featuring 22 stacked rectangular volumes that form a vertical weave. The interior centered around a continuous "indoor street" that spiraled down from the top floor. Rammed earth (a technique used for centuries) was prefabricated into panels and then mounted on a lightweight concrete structure, creating an innovative and updated way of working with this traditional technique.

category: public spaces

Alexandra Road Park Rehabilitation- London, UK

Project team: Johanna Gibbons și Neil Davidson- landscape architects
Opening: 2016 rehabilitation, 1970 initial park
Awards, certifications: Landscape Institute Award UK

energy, flows, usage	nature, materials, circularity	community, processes, roles
• Restoring the original drainage system focused on low-impact environmental solutions and unblocking concrete channels. • Permeable materials were used for pathways to facilitate water drainage. • The design anticipated changes and how the landscape would evolve over 50-100 years, ensuring sustainability and the longevity of the solution. • The project aimed to conserve as much of the original intent and existing vegetation as possible, opting for minimal interventions.	• Surgical interventions on trees and planting new species adapted to climate change. • Ensuring an accessible and safe green space for recreation, exercise, and relaxation. • Raising public awareness about the importance of nature in urban environments. • Focusing on enhancing the ecological value of the landscape by introducing a wider variety of plant species, creating new habitats, and improving the overall health of green spaces.	• One of the goals of the project was to facilitate and increase the safety of pedestrians and cyclists. • The project aimed to promote social cohesion and a sense of community by providing spaces for interaction, play, and relaxation. • A strong emphasis was placed on community involvement throughout the design process, with extensive consultations held with residents to understand their needs and aspirations. • The collaborative approach ensured that the project was supported and embraced by the community.

Functional zoning: a way to organize a degraded urban fabric

Landscape architects introduced the concept of “home zones” to prioritize pedestrians and cyclists. This included enforcing reduced speeds, creating shared surfaces, and adding landscaping elements to naturally slow down traffic.
Play areas featured nature-inspired elements made from sustainable materials and ambiguous forms, allowing for open-ended play suitable for all ages.
The project incorporated community gardens to encourage residents to grow their own food and foster a sense of connection to the space.
Sustainable Drainage Systems (SuDS) were integrated into the landscape design, using rain gardens to manage surface water runoff while creating visually appealing landscape features.

High Line Park - New York, SUA

Project team: Diller Scofidio + Renfro - architecture, Field Operations - landscape design, Piet Oudolf - landscape design
Opening: 4 stages 2009, 2011, 2014, 2019
Awards, certifications: ASLA Professional Awards for Section 1 in 20103; ASLA Professional Awards for Section 2 in 2013

energy, flows, usage	nature, materials, circularity	community, processes, roles
• The park uses a combination of renewable and efficient sources, including LED lighting and sustainable irrigation systems. • Visitor flows are managed through multiple access points and well-defined pathways, ensuring smooth circulation. Permitted modes of transport include walking and the use of wheelchairs, as the park is accessible to people with disabilities. Additionally, bicycles, skateboards, and scooters are not allowed on the High Line to maintain a comfortable and safe visitor flow. • The park's features include green spaces, relaxation areas, art installations, and community events, all contributing to a dynamic and integrated urban environment.	• The park transforms an old railway track into a vibrant space by reusing as many existing construction materials as possible, including concrete, oxidized steel, and wood. • The park promotes circularity by using recycled materials and integrating sustainable practices in its maintenance. • It hosts a variety of native and perennial plants, contributing to the reduction of the urban heat island effect and providing a significant habitat for local species. • Inspired by the wild landscape that emerged after the line was abandoned, the team created a paving system that encourages natural growth, resulting in a pathless landscape.	• The nonprofit organization called Friends of the High Line has been advocating since its founding in 1999 for the conservation and reuse of the High Line as an open public space, elevated park, or greenway. • The local community plays an essential role in maintaining and using the park, participating in organized events and activities. The project aimed to promote social cohesion and community spirit by providing spaces for interaction, walking, and relaxation. • The High Line redefines urban roles, offering a vibrant public space that promotes social interaction and connection with nature.

Native Plants and Natural Pollinators

The park's planting scheme favors native species that are drought-resistant and require low maintenance, thus reducing the resources needed for the landscape. The plantings support wildlife and give the impression of spontaneously developed landscapes, both through the choice of plant varieties and their informal arrangement. Plants are allowed to spread, self-seed, and even compete with each other. The High Line ecosystem provides food and shelter for native pollinators. New York hosts over 400 species of wild bees, and the park is designed to be as welcoming as possible for these small visitors. The placement of "bee hotels" and the preservation of natural shelter sources, such as fallen plant debris and dried stems, contribute to this goal. Additionally, avoiding the use of pesticides and synthetic fertilizers is a priority. All garden waste is composted on-site, recycling valuable nutrients back into the garden soil.

category: public spaces

Vauban District – Freiburg, Germany

Project team: collaborative Process: it involved public authorities, non-governmental organizations, the local community, sustainability experts, urban planners, and architects, with urban planning coordinated by Stadtbau Freiburg
Opening: 2006
Awards, certifications: Habitat Scroll of Honour (UN-Habitat, 2004), European Green Capital pentru Freiburg (2010), Deutscher Nachhaltigkeitspreis (Premiul German pentru Sustenabilitate, 2012), ÖkoGlobe pentru mobilitate sustenabilă

energy, flows, usage	nature, materials, circularity	community, processes, roles
• The neighborhood was built on the site of a former French military base. After the French troops left the area in 1992, local authorities decided to transform the space into an example of sustainable urban planning. • Some of the old buildings from the base were renovated and integrated into the new neighborhood to reduce material waste. • Part of the former barracks were converted into housing or community spaces. • This project serves as a reference model for sustainable development, thanks to its transformation into an ecological neighborhood and the construction of energy-efficient buildings that use renewable energy.	• The materials obtained from the demolition of parts of the military base were recycled and reused: bricks, concrete, and steel. • Wood is one of the main materials used and is certified by organizations such as FSC (Forest Stewardship Council), ensuring it comes from sustainably managed forests that respect natural regeneration cycles. • The buildings' insulation was made with eco-friendly materials, including sheep wool and wood fiber. • The neighborhood includes green facades and rooftops, numerous green spaces between buildings, and community urban gardens.	• The design and development process was collaborative, involving both local authorities and future residents. • This participatory planning allowed the neighborhood to be adapted to the real needs of the community. • Among the objectives pursued were the creation of areas and spaces that promote social interaction, recreation, as well as the implementation of activities for ecological education. • It is a living example of an urban laboratory for sustainable cities.

Sustainable Mobility

Approximately 70% of the residents do not own cars, making Vauban one of the most pedestrian- and bicycle-friendly neighborhoods. Residents can use car-sharing systems for occasional transport.The roads are designed to prioritize public transportation, walking, and the use of bicycles/scooters.Impact: This approach reduces air pollution and noise, while creating a safer and more pedestrian-friendly urban space.

Vauban is a benchmark in the field: projects such as Hammarby Sjöstad in Stockholm and Masdar City in Abu Dhabi have been partially inspired by this neighborhood.

Atlanta BeltLine - Atlanta, Georgia, USA

category: public spaces

Project team: Kevin Burke, Perkins+Will, HDR, Inc., Tunnell-Spangler-Walsh & Associates (TSW)
Opening: began in 2006 - to be finalized by 2030
Awards, certifications: **Awards:**Award of Excellence in Urban Design by ASLA (American Society of Landscape Architects), 2024; Building Healthy Places Award Urban Land Institute, 2015; Honor Award Tri-State ASLA, 2014; Award of Excellence Georgia ASLA, 2014; Overall Excellence in Smart Growth US Environmental Protection Agency, 2014

energy, flows, usage	nature, materials, circularity	community, processes, roles
• The Atlanta BeltLine is a green, pedestrian-friendly transportation corridor that offers sustainable solutions for urban mobility and connectivity. • The project includes 22 miles of light rail tracks and multifunctional urban trails, allowing residents to move around the city without relying on cars. • The trails are accessible to pedestrians and cyclists, with multiple access points in various areas of the city. • The BeltLine connects to existing and future MARTA transit stations, facilitating access to jobs, services, and urban amenities. • Additionally, BeltLine incorporates eco-friendly technologies, such as solar canopies and solar-powered trash bins.	• The Atlanta BeltLine features an arboretum with over 9,000 plants and 369 species of trees and shrubs, providing a habitat for various species and contributing to urban biodiversity. • The landscaping incorporates recycled materials and a circular water management system, collecting rainwater for irrigation and promoting the recycling of construction materials to reduce waste and conserve natural resources. • Efforts to clean 450 hectares of contaminated land and plant over 3,000 native trees and grasses have helped restore biodiversity in a city where it had been considered lost over the past decade. • Residents in the park's area have already begun to notice the presence of bees, butterflies, fireflies, and other insects that were previously absent in their gardens.	• The project originated from a proposal in a student's thesis to redesign the area occupied by former railway tracks into a sustainable network that would connect 45 multifunctional neighborhoods. • After the idea was launched, public concern turned into enthusiasm.

Financial Savings through Green Innovation

With the development of the BeltLine, Atlanta discovered that environmental protection could save money. Initially, the city planned to build an expensive tunnel system and a reservoir to store rainwater, but the plans were changed in favor of a park that recycles rainwater to feed a lake, a fountain, and a waterfall, thus saving millions of dollars. Additionally, a future project will transform an abandoned quarry into a 300-acre green park, Westside Reservoir Park, which will provide water for 30 days, instead of the current three-day supply for Atlanta. Although the drought of previous years has ended, Atlanta residents still face water usage restrictions, as the city's main reservoir is below normal levels.
This ongoing project highlights the environmental protection theme for the city's residents, in a city once known more for its heavy traffic and polluted rivers from wastewater.

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A.3. Roles

WHO contributes to climate neutrality?

In addition to the section on definitions and key actions for achieving climate neutrality (section 1 - guidelines) and the showcasing of practical demonstrations where these ideas have already been implemented (section 2 - examples of completed projects), this section is also part of the RESOURCES chapter.

Here, questions related to the processes involved in initiating climate neutrality projects will be addressed. Furthermore, in line with the points made in the introduction, although this material does not focus on participatory planning but rather on projects that contribute to climate neutrality, this section presents the logic behind encouraging the use of research results as well as the urban planning strategies that create favorable conditions for such projects.

3.1. Climate Neutrality in European Cities – A Research-Based Effort

The examples from the previous section are compelling for how much can be done for climate neutrality by acting on the built and designed spaces of cities. The European Union has chosen the theme of climate-neutral cities as relevant for the resources allocated to research as well as concrete demonstrations. It is therefore one of the five missions of the Horizon Europe EU funding research program (2021-2027) .

Each Horizon Europe Mission is designed to act as a platform that brings together researchers from various fields (multi, inter, and transdisciplinary approaches), as well as decision-makers from public institutions, the business sector, non-governmental organizations, etc., to test practical solutions for using research results on an increasingly wider scale for maximum impact.

The missions have clearly defined objectives aimed at fundamental changes in health, environment, climate, and urban life. Through financial resource allocations from the European Union funds, by creating programs for experience exchange, access to consultancy, etc., these missions enable new partnerships, gather, and ensure open access to the knowledge and skills needed to achieve those objectives.

The fact that cities are concentrations of human activities that generate greenhouse gases, but also have a very high potential for reducing these emissions, has led to the invitation of municipalities from EU countries to participate in a competition to become part of **Mission 5 - Climate-neutral and Smart Cities**.

In April 2022, a total of 100 cities from Member States (12% of Europe's population) and 12 cities from Associated States (Albania, Turkey, Iceland...) were selected. Among the 100 municipalities selected within the EU Mission, three are from Romania: Cluj, Bucharest – Sector 2, and Suceava.

They have shown, through their participation in this competition, both that the will of the elected decision-makers is aligned with reducing carbon footprints and that they already have a series of intentions and access to specialists capable of making the necessary planning to achieve net zero emissions by 2030.

How are the cities involved in the Mission helped?

— The available resources from the Horizon Europe research-innovation program are allocated through competitions, which these

1

The five research and innovation missions of the European Union's Horizon Europe program are:
— Adaptation to climate change, including societal transformation;
— Reducing the impact of cancer on European citizens;
— Improving soil health to support sustainable agricultural systems;
— Protecting aquatic ecosystems and restoring water health;
— Climate-neutral and smart cities

cities and their partners can participate in, as well as to other cities that want to pursue the same direction.
— The online platform of the Mission https://netzerocities.eu/ contains publications and tools that are useful for any city interested in reducing its carbon footprint.
— Technical, financial, and regulatory consultancy for the 112 cities.

This support is important for municipalities to be ready to sign the **Climate City Contract (CCC)** with the European Commission.This contract has 3 sections: the commitments made by various actors within **partnerships** - the core of the contract, the **action plan** to be implemented by 2030 to reduce greenhouse gas emissions - coordinating interventions from different fields that all contribute to lowering the carbon footprint and, last but not least, **the investment plan**.

The label of "climate-neutral city" is awarded after the CCC is signed. Thus, with this label, the respective cities gain access to other funding sources to implement the projects outlined in their plans.

The high level of interest shown by the 377 cities that applied to join the Mission in 2022 demonstrates the urgent need for support that cities feel in order to transition to climate neutrality.

The European Commission recognizes the importance of expanding access to resources so that more municipalities can benefit from information, consultancy, and funding to reduce their carbon footprint. To support this process, regional and national platforms, consortia, and partnerships have been initiated to strengthen cities' capacity for climate planning and implementation. This broad approach ensures a fairer transition, allowing more communities to actively contribute to the climate neutrality goal.

In Romania, as briefly explained in the introduction, the M100 National Hub operates as a Mirror Mission of the EU Mission "100 Climate-Neutral Cities by 2030", providing support to Romanian cities in their transition toward sustainability.

M100 not only supports the three Romanian cities selected in the EU Mission—Cluj-Napoca, Bucharest – Sector 2, and Suceava—but also assists other cities aiming to achieve climate neutrality, facilitating a coordinated and collective urban transformation process.

In October 2024, following an open call, an international jury selected 10 Romanian cities to receive technical assistance and capacity-building support through the project "Towards Climate-Neutral and Smart Cities through Mutual Learning, Engagement, and Capacity-Building."

These 10 cities—Alba Iulia, Bistrița, Brașov, Bucharest, Buzău, Constanța, Iași, Oradea, Reșița, and Timișoara—are currently receiving specialized support to develop their Climate City Contracts (CCCs), reduce carbon emissions by 2035, and become more sustainable, smarter, and citizen-focused.

Through this material and the resources it provides, anyone who chooses to explore the topic of climate neutral cities can be more ready to become an active participant in transforming our cities. This is not just about the 10 selected cities but about any community that seeks to develop in harmony with sustainability principles.

This guide offers not only information on climate neutrality but also tools to design activities, initiatives, and projects that can be implemented in any locality. Whether in a high school, a youth group, a local organization, or a public administration, each of us can contribute to change.

Climate-neutral cities are not just a European objective, but a shared vision for a better future—a future that begins now, with every action we choose to take.

3.2. Planning for Climate Neutrality – Necessarily Participatory

Although this transformation of the built environment for a smaller carbon footprint is actually done project by project, there's a need for a clear framework for everyone who initiates and implements these projects to refer to. Planning ensures alignment among these projects, a logical ordering of them, and mobilizes the local community towards the same goals of a fair climate transition (which ensures social inclusion).

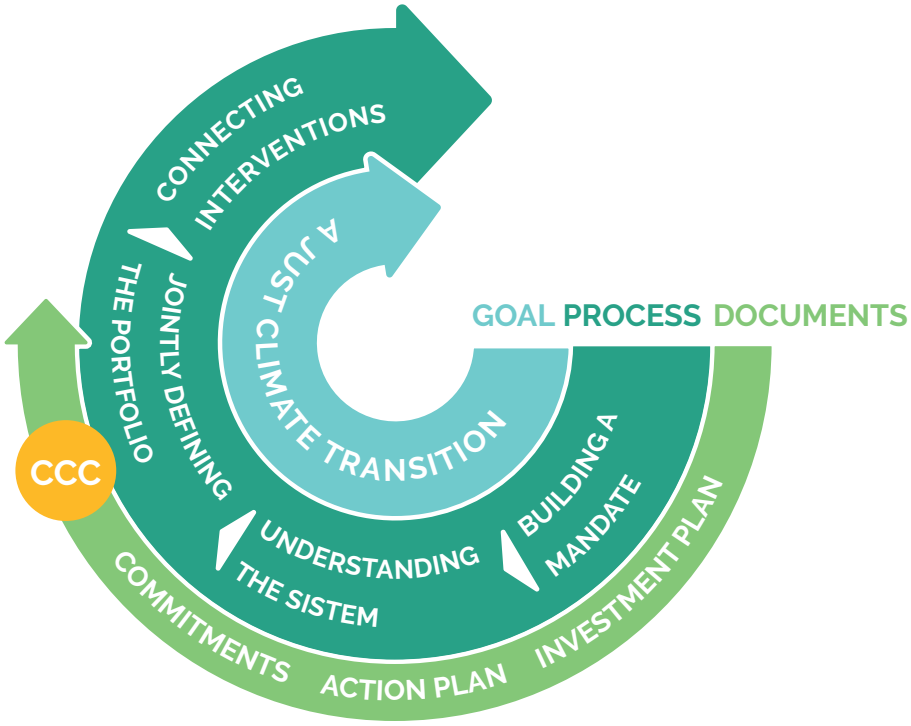


Figure nr. 3.1

source: https://netzerocities.app

Explanations:
Inner circle: GOAL = A Just Climate Transition
Middle circles: PROCESS

- Building a mandate – with the public administration team, the local ecosystem of actors, and other levels of governance.
- Understanding the system – collecting and interpreting data, understanding community needs, analyzing the network of actors with resources, obstacles, and connections, and developing scenarios.
- Defining the portfolio together – estimating desired outcomes and exploring funding options.
- Connecting interventions – impact measurement tools, financing strategies, and priority setting through local policies.

Outer circle: DOCUMENTS = Components of the Climate City Contract (CCC): Commitments, Action Plan, Investment Plan

For all the areas where local public administration can make important changes (energy, transport, buildings, or waste management, etc.), this institution's role is to align project ideas with the goal of reducing greenhouse gas emissions.

This planning effort doesn't start from scratch. In any city, there are already analyses that have shown the problems and potential of the

city, as well as approved plans, documentation that sets the building rules, and intentions for constructing and developing certain lands, rehabilitating existing buildings, and improving infrastructure (see GUIDELINES section and EXAMPLES section).

If the principles that the CCC is based on are respected by all local actors—not just the decision-makers and public officials in the city hall, but also by the profit-driven private sector and civil society organizations, as well as every citizen—the chances of achieving the goals outlined in the CCC, project by project, will increase.

Preparing this plan should involve as many people as possible, from various departments of the city hall, as well as researchers, specialists, citizens, businesses, and non-governmental organizations. It's important to identify and discuss the community's needs and the concrete solutions that can be implemented with those who will contribute to and benefit from these changes. Only in this way can we talk about respecting principles and being open to real change when intentions are translated into a design brief.

Participatory planning and design not only shape physical spaces, but also create a context for the behaviors that bring those places to life, showing that how spaces are used can be just as important as their original design.

A climate-neutral city is one where every individual plays an active role in reducing the carbon footprint and, whenever possible, in absorbing greenhouse gases. We are all users of urban spaces, whether as residents, through our mobility choices, waste collection habits, and consumption of goods and services. In our daily lives, we use and shape the city, but we are also influenced by its design and functionality, by the behavior of other residents, and by how public and private services are organized. The connections between people are also connections between institutions and organizations, shaping the way cities evolve and function.

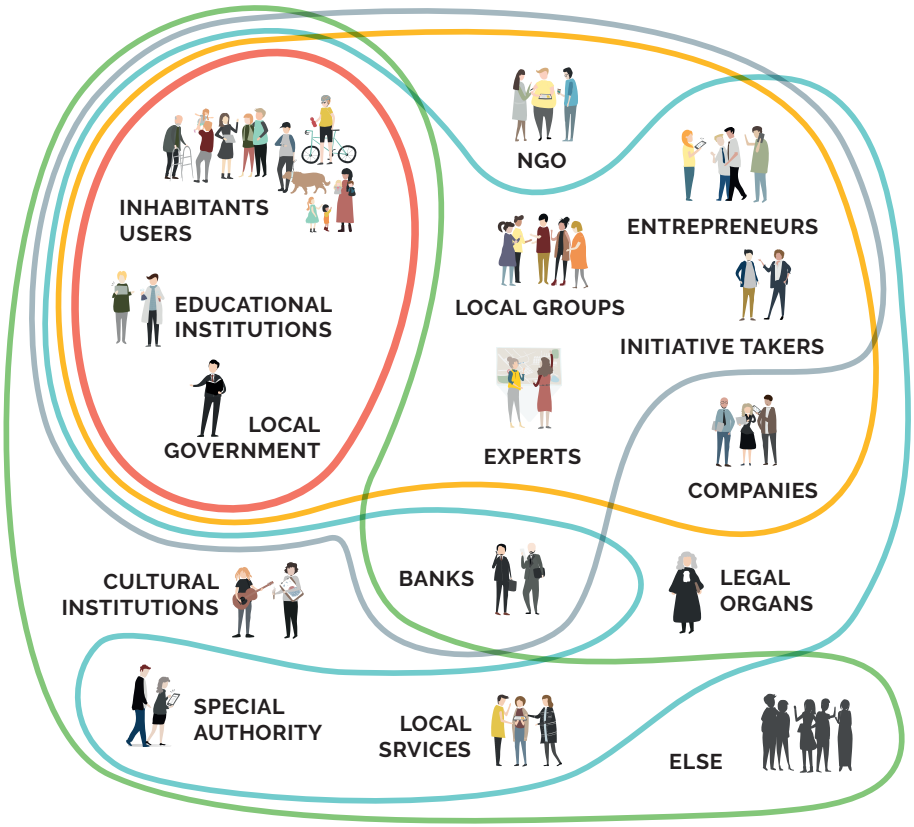


Figure 3.2.

collaboration within the system of stakeholders for Climate Neutral Cities

Partnerships cannot be imposed by law; they can only be encouraged through participatory planning and design processes that build trust and cooperation. Participatory planning methods create a framework for genuine collaboration, where community members are not just observers of changes in their cities but active participants in defining and implementing solutions.

The difference between a genuine participatory process and a superficial one lies in the level of influence that participants have over final decisions. Participation ranges from simple consultation, where opinions are merely collected, to co-creation, where citizens become equal partners in all stages of the process. Each level of participation determines how deeply collaboration impacts the final outcomes. The greater the community's involvement, the more inclusive and well-adapted the proposed solutions will be, increasing their chances of being supported and successfully implemented. (See figure below.)

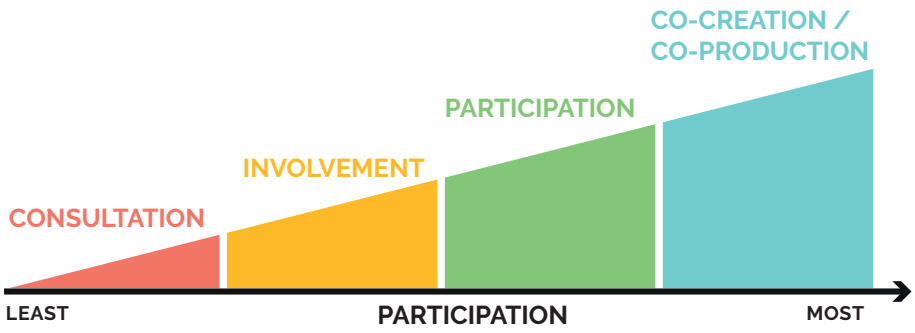


Figure 3.3.

the ladder of participation

Manipulation or mere one-way information sharing, without any verification of how the information has been received and understood, is not considered participatory planning. **Only participatory planning enables true collaboration, allowing stakeholders to jointly define the course of action and shape solutions together.**

Who Can Participate?

Inspired by project examples (Section 2) that apply carbon footprint reduction principles through transformation of built and landscaped spaces (Section 1), several **categories of actors contributing to climate-neutral cities could include:**

- Researchers – conduct studies and analysis reports to better understand needs and intervention possibilities with a climate impact.
- The academic community and research institutions – experiment with innovative solutions for renewable energy, energy efficiency, and collaborative governance methods for transparency, efficiency, and openness.
- Architects, engineers, urban planners, landscape designers, and other specialists – integrate green technologies and practices into their designs, considering at every step ways to reduce greenhouse gas (GHG) emissions.
- Course and workshop providers – help inform and raise public awareness about the importance of and methods for achieving climate neutrality.
- Facilitators of participatory planning and design – enhance the capacity of urban actors to collaborate effectively.
- Opinion leaders, media representatives, influencers[2], and NGO members – encourage residents to participate in local

2

Influencer is a person with a significant audience on digital platforms, capable of shaping opinions, behaviors, or decisions through the content they create and share. Their influence can extend across various fields, such as lifestyle, technology, education, environment, or fashion, and is often leveraged by brands and organizations for promotion and strategic communication.

sustainability initiatives, such as: selective waste collection and recycling, using public transport or electric vehicles, caring for urban greenery, reducing energy consumption, installing solar panels on private homes.

— Organizations and financial institutions that offer green investments and loans – including: financing and advantageous loans for renewable energy projects and sustainable infrastructure, sustainable investment funds / business angels[3] that create and manage funds for green companies and projects.

— Innovators and technology providers – develop products and services that contribute to reducing carbon emissions and increasing energy efficiency.

— Entrepreneurs launching sustainable start-ups – creating new businesses focused on innovative green technologies and solutions.

— Decision-makers in private for-profit companies – align business models with GHG emission reduction goals.

— **Teachers and school principals – use Green Week and Different School Week to: invite other actors into classrooms, organize visits to key stakeholders.This ensures that the education system plays a crucial role in sustainability education within cities that are committed to climate neutrality.**

3.3. Interests and Resources for Climate Neutrality

We have seen that for a city to become climate-neutral, it is not enough for the municipality alone to make decisions about its funds and projects. The transition must be a collective effort, where various organizations, companies, institutions, and citizens all play an active role.

The local administration is responsible for coordinating and implementing measures to reduce carbon emissions, but it needs partners to transform the city into a more sustainable and environmentally friendly place.

Although the local public administration is NOT the only institution that initiates climate neutrality projects, according to legislation, no construction or urban development can take place without a building permit signed by the chief architect (director of the urban planning department) and the mayor (as head of the executive).

Beyond authorizing constructions and urban developments, the local public administration is a key actor in partnerships because it has access to various resources and is motivated by its responsibility to ensure the sustainable development of the city.

A municipality relies on urban planning documents and approved strategies that define development directions. Before starting the specific planning process for reducing the carbon footprint (Climate City Contract - CCC), there are already a number of decisions in place regarding public investments or incentives for private investments (such as tax reductions or streamlined permit processes).

However, for a city to achieve climate neutrality, the municipality must effectively manage its resources and collaborate with partners from various sectors. Each emission reduction measure must be backed by **a balance between local administration interests and available or accessible resources.**

The "superpowers" of urban actors in a climate-neutral city come from resources (what each actor can offer) and motivations (the expected benefits they seek to gain). For RESOURCES to be allocated and INTERESTS to materialize, ACTIONS are needed—these represent the tasks and responsibilities that each actor commits to undertaking.

3

Business angels are individual investors who finance startups and early-stage businesses, providing not only capital but also expertise, mentorship, and access to business networks. Unlike investment funds, business angels invest their own financial resources and take on high risks in exchange for potential long-term returns.

In other words, the roles of urban actors are defined by how they use their resources to achieve their specific interests.

In the case of a PROJECT— defined as a set of logically connected actions, with clearly formulated expected outcomes, a timeline of activities, and well-specified financial, human, and spatial resources (project triangle) — this principle applies regardless of which urban actor is involved in the scenario.

Projects that contribute to reducing the carbon footprint or absorbing greenhouse gases are rarely initiated by a single urban actor. If a participatory co-creation process was followed to define the project triangle, a project contract can be established—similar in content to a Climate City Contract (CCC) — including: **commitments, an Action Plan, an Investment Plan**.

Once defined and agreed upon, this contract or agreement aligns the resources, motivations, and actions of partners in a shared direction, based on common interests and concrete collaboration opportunities.

Naturally, in a constantly evolving context, such a partnership must include flexible collaboration rules to allow for adaptation to new conditions, while still maintaining the core objectives for which the partnership was formed. Therefore, the contract/agreement should also specify: the decision-making processes for project implementation, acceptance criteria for new partners, conditions under which a partner may withdraw, adjustments to the Action Plan and Investment Plan, etc.

In the role-playing game proposed in the educational scenario described in the next chapter, the objective is to sign a partnership agreement between project initiators (participants representing the business sector, civil society, and media) and the local public administration, represented by facilitators.

The teacher is acting as the mayor and the resource person with expertise in the built environment, representing the chief architect, who plays a key role in approving and authorizing urban transformation projects.

a. Public Spaces and their role in CO_2 absorption

Interests of the Municipality	Resources of the Municipality and Other Actors
Expanding green spaces to contribute to carbon dioxide absorption.	Public lands (parks, squares, riverbanks, unused land).
Creating cooler and more resident-friendly public spaces, reducing the urban heat island effect.	Public funds for planting, maintenance, and expansion of green areas.
Integrating nature into the city to improve air quality and biodiversity.	Urban policies and regulations requiring green roofs, green facades, and the use of natural materials in construction.
Developing a sustainable urban landscape, making the city more attractive for residents and tourists	Partnership programs with NGOs, private companies, and local communities for the protection and maintenance of green spaces.

b. Databases, Up-to-Date Information, and Progress Monitoring

Interests of the Municipality	Resources of the Municipality and Other Actors
Assessing progress toward climate neutrality and ensuring compliance with commitments under the Climate City Contracts (CCC).	Collaboration with universities and research centers for data collection and analysis on pollution and energy consumption.
Access to accurate city emissions data to enable informed decision-making.	Tools for measuring air quality, traffic emissions, and resource consumption.
Developing effective emission reduction strategies based on data and research.	Digital platforms that provide public access to city progress data.
Justifying the use of public funds through measurable results	Support from environmental and urban planning experts, who can interpret data and suggest solutions.

c. Citizen Engagement and Community Participation

Interests of the Municipality	Resources of the Municipality and Other Actors
Raising awareness among citizens about the importance of reducing emissions.	Organizing education and awareness campaigns in schools, high schools, and universities.
Mobilizing the community to adopt more sustainable behaviors (e.g., using public transport, recycling, saving energy).	Partnerships with influencers, local leaders, and media to promote eco-friendly messages accessible to the public.
Creating an open dialogue between the administration and residents to define city priorities.	Community events, such as Urban Mobility Day, tree-planting actions, and public debates on city projects.
Developing an active ecosystem of local partners to support climate neutrality measures	Online platforms and apps that allow citizens to report issues and propose initiatives

d. Technology and Infrastructure for Smart and Sustainable Cities

Interests of the Municipality	Resources of the Municipality and Other Actors
Implementing technological solutions that reduce emissions without compromising quality of life.	Access to European and national funds for the modernization of urban infrastructure.
Developing efficient infrastructure to support sustainable mobility and the use of renewable resources.	Partnerships with technology companies to implement innovative solutions.
Increasing energy efficiency in public buildings, street lighting, and public transport.	Regulations enforcing energy efficiency standards in construction and transportation.
Attracting investments in green technologies and creating new jobs in the renewable energy and sustainability sectors.	Support for start-ups and innovation programs in the green energy sector.
	Installation of emission measurement devices and air quality sensors, providing real-time data on the impact of implemented measures.

For a municipality to achieve climate neutrality, it must use its resources efficiently and collaborate with multiple groups of actors. From smart management of public spaces and emissions monitoring to community engagement and green technology implementation, success depends on the local administration's ability to build strong partnerships.

A climate-neutral city cannot be built by authorities alone—it requires a collective effort, where citizens, companies, universities, and local organizations each contribute with ideas, resources, and concrete actions.

To make partnerships a common practice, the educational scenario presented in the next chapter can help not only to understand these mechanisms but also to practice them through a role-playing exercise.

Part Two

B. Scenario

Youth for Climate Neutrality Educational Scenario

The proposed educational scenario is an interactive method for organizing a teaching activity, guiding participants through a structured experiential learning process about climate neutrality, the built environment, and participatory planning.

Through the stages proposed in this scenario, facilitators (teachers and/or resource persons, professionals in the built environment) and participants will use the information presented in Chapter A (RESOURCES) to: Understand what climate neutrality is and how it can be achieved (guidelines), analyze implemented projects (examples), and explore the interests and motivations of the involved actors (roles).

The activity is designed to combine knowledge transfer with practical applications, helping participants develop analytical and communication skills while embracing values related to sustainable urban development.

By simulating a decision-making process in a model city striving for climate neutrality, facilitators and participants become better prepared to engage as active urban actors in their own communities.

Participants will follow the steps of the scenario by engaging with brief presentations using the provided resources, working with predefined information (localization of municipal intentions on the Net Zero City To Be Map – Annex 1), and preparing a concise project proposal to form teams based on shared interests.

Each **team of three participants** will then choose a **role (business sector, civil society, or media)**, imagine how their **urban actor contributes through ACTIONS** and combine **RESOURCES and INTERESTS** within the team **(Annex 2)**.

However, as they follow the resources and motivations of the municipality, participants will define the expected outcomes, necessary resources, and work phases for a PROJECT TRIANGLE that will be of interest to the facilitators playing the role of the elected decision-maker (mayor) and the head of the Urban Planning Department (chief architect).

Each team will present their proposals, which will be discussed with the representatives of the Net Zero City To Be municipality. Other participants will be invited to play the role of local council members, who will vote on the project proposal after it has been preliminarily approved by the facilitators.

Thus, by signing the partnership agreement (Annex 3) with the project initiators, the municipality can integrate the project into its Carbon Footprint Reduction Plans, ensuring that clear responsibilities and expected outcomes are established for each of the locations on the map.

In this way, the educational scenario becomes a space for experimentation, where students not only understand how cities transform to become more sustainable, but also learn how they can actively contribute to these changes.

This scenario can be used in high schools, as mentioned in the Introduction, through the Green Week and Different School Week programs. These moments within the school year provide extraordinary opportunities to connect schools with local professional organizations, universities, and the business sector. These connections can be facilitated by the local public authority (Chapter C - Valorization).

But this scenario can be applied in high schools not only during these two weeks. However, it requires the involvement of resource persons to guide the technical validation process. These built environment professionals, who can discuss project proposals from an expert perspective, may be found among parents, former graduates, friends of teachers, etc. Teachers can adapt this scenario to better fit their specific context—and invite the resource persons as mentors only at a key moment of their scenario, which may have been prepared over multiple sessions before the discussion on the partnership between project initiators and representatives of the Net Zero City To Be Municipality.

The explanations (RESOURCES) have been provided in accessible language, free from professional jargon. However, the processes of transforming spaces are complex, especially when aiming for sustainable development and the involvement of local actors.

The resources are not meant to be exhaustive—they can serve as a starting point for guided discussions, where participants read them before the workshop or class session. Alternatively, for facilitators who prefer to present this information themselves, selected explanations and examples can be used as visual classroom materials. However, the recommendation, at least for the examples section, is to allow participants to explore them individually, selecting from multiple cases the elements that resonate with their interests and experiences, helping them imagine a project they feel personally connected to.

The necessary information, examples, and the scenario itself have all been tested in four consecutive workshops in different cities (Constanța, Iași, Brașov, Timișoara) during the summer of 2024. From one workshop to another, adjustments and additions were made based on participant feedback and discussions with those who coordinated the scenario application, ensuring validation from both participants and facilitators.

Images from the Caravan – The Workshop Youth for Climate Neutrality were tested in cities that are now among the 10 selected in Romania: Constanța, Iași, Brașov, Timișoara. July and August 2024.
foto: OAR team

B.1. Learning Outcomes - Diverse Competencies

It is impossible to discuss climate-neutral cities in 2030 or 2050 without considering the incredible energy brought by Youth - high school students or university students - they are the ones who can significantly contribute to these much-needed changes.

This section provides the necessary support for implementing a workshop that brings the topic of climate-neutral cities closer to the education system. The definitions and explanations of what a net-zero emissions city entails (Chapter 1), examples of projects (Chapter 2), as well as the presentation of processes and possible roles in these decarbonization efforts in cities committed to this direction (Chapter 3), all serve as resources for the proposed educational scenario, tested and described in this material - the educational component of the M100 project.

The learning outcomes are ambitious, combining cognitive competencies (What do we know?), attitudinal competencies (What holds value for us?), and skills-based competencies (What can we do?). Although the approach is not directly applied to the reality surrounding the participants, it is conducted through a simulation for an **imaginary city: NetZeroCityToBe**.

Through the activities included in the Workshop, young participants:

— gain a better understanding of climate neutrality and the various ways urban spaces can be transformed to reduce GHG emissions by exploring the chapters in the first part;
— analyze the presented examples (either individually or through guided discussion) to identify inspiring aspects and create their own keyword-based description for a project proposal in one of the locations marked on the map of the imaginary city;
— present their ideas to the whole group, developing transversal communication skills;
— form teams (transversal competency) to combine individual proposals into a shared scenario, thereby clarifying the objectives of a common project;
— define a perspective within this shared scenario, assuming the role of a decision-maker in a private company, a non-governmental organization, or the media/social media—practicing critical thinking and applying the knowledge presented in the first part of this material;
— detail this role by outlining resources, expected benefits and actions that the character they are tasked to portray can undertake, preparing a partnership proposal for local public administration;
— present the team's proposal (communication – transversal competency) to mentors (who assume the roles of chief architect or mayor) and to the other participants (who act as local councilors when not presenting).

Recommendation: This second part could also be shared with participants in advance so they can become co-authors of the learning experience, ensuring clarity on both the objectives and the stages they will go through together.

B.2. The Benefits of the Role-Playing Method and the Roles of Facilitators

The information presented in the first part (especially in the ROLES section) demonstrates the need for behavioral change, increased collaboration, and the adoption of new roles, especially if each of us is at least a resident of a city committed to reducing its carbon footprint.

The education system is best suited to form the capacity of young people to operate in different conditions than before. In both pre-university and university education, young people gain direct access to the knowledge, skills and abilities associated with this enhanced capacity for collaboration. However, since learning to collaborate requires engagement and motivation, the teaching methods employed must, in turn, be able to spark and sustain motivation.

The role-playing method is particularly well-suited for developing and practicing openness to collaboration, as well as the willingness to participate in planning and design processes for climate-neutral cities.

Role-playing is a dynamic and interactive approach that facilitates experiential learning, allowing students to engage in simulated scenarios that mimic real-life situations. One of the fundamental aspects of role-playing is its ability to transform participants from passive recipients of information into active participants in their own learning process. Research shows that role-playing activities can significantly increase students' interest in the subject being studied, making the learning process more enjoyable and effective.[1]

The benefits of the role-playing method include fostering empathy and understanding others' perspectives, as well as helping to make abstract problems more concrete by connecting competencies already acquired in various subjects. Additionally, it involves the integration of knowledge, skills and abilities. Role-playing also makes room for emotions, but it also increases the tolerance for uncertainty because it offers opportunities to supplement the information received with elements imagined by each in other ways.

This scenario seeks to compensate for some of the disadvantages of the role-playing method—such as longer preparation time, reluctance due to shyness, and the difficulty of assessment.

— By providing this educational scenario as a lesson plan foundation, along with the necessary materials (resources) and suggested partnerships for organizing the workshop (final section – valorization), preparation should be easier and less time-consuming.
— Some students may be reluctant to participate due to shyness or discomfort in playing a role in front of their peers. Inviting at least one resource person to assist the teacher in guiding the workshop can help overcome these barriers.
— If the workshop is conducted during Different School Week or Green Week, the difficulty of assessment becomes less significant.

These challenges highlight the need for adaptation to the specific context of each group to ensure the method achieves its objectives. Teachers and non-formal education facilitators are already well-equipped to make these adjustments.

How do Facilitators Participate in the Role-Playing Game?

In this teaching method, the two facilitators reflect the responsibilities of the local public administration, a key actor in the city's transition toward climate neutrality.

One of the facilitators takes on the role of the **chief architect**, a public official responsible for evaluating technical documentation in the authorization process (regardless of who initiates a project involving construction and urban development).

Ideally, this role should be fulfilled by a resource person invited to support the organization of the workshop (details in The Third Part – Valorization).

1

Boakye, N. A. N. N. Y. (2021). Using Role-Playing and Explicit Strategic Instruction to Improve First-Year Students' Academic Competence. Reading & Writing, 12(1).

2

NZEB - NZEB (Near Zero Energy Building) refers to a building with almost zero energy consumption. It is designed and constructed to have very low energy demand, with the majority of its energy needs covered by renewable sources (such as solar panels, heat pumps, wind energy, etc.). NZEB buildings are energy-efficient, well-insulated, and utilize advanced technologies to minimize heat loss and electricity consumption.

Some guidelines for this role: In *NetZeroCityToBe*, the person occupying the position of chief architect is assumed to have solid knowledge of building energy efficiency . This individual is convinced of the benefits of participatory planning and design, has experience in architectural design and values heritage protection initiatives and the adaptive reuse of existing buildings. They are an advocate for innovative solutions that emphasize the increased role of nature in urban spaces. Perhaps most importantly, we can assume that this person is committed to the intentions already outlined in the approved plans and does everything in their power to bring those ideas to life.

One of the guides takes on the **role of the mayor** - the locally elected official who coordinates, as the head of the executive, all departments of the local public administration. The mayor not only signs building permits but also has the responsibility to present proposals for council resolutions to the local council, which is the decision-making body. They don't make decisions alone about how to use the resources of local public administration.

This role can be filled either by a teacher or by a resource person invited to organize this workshop (see section three - valorization).

A few pointers regarding this role:

We assume that, in NetZeroCityToBe, the person holding the mayoral position is already convinced of the importance of reducing the carbon footprint. We can assume that they managed to convince voters to elect them precisely because they took a strong stance on this issue during their campaign. This is a person who believes in the principles of good governance; they want to and know how to follow them: transparency, accountability, efficiency, citizen participation, respect for the rule of law, fairness, and sustainability in decision-making and resource use. They understand that this increases their chances of being mayor in the future. They want to attract partners from both the nonprofit and business sectors. They have experience working collaboratively with researchers from various disciplinary fields.

Recommendation:

The educational scenario needs to be thoroughly known by all the guides since, in facilitating the Workshop, there are these two roles that need to be played with conviction and skill in order to maintain a high level of interest. Ideally, the guidance should be provided by three individuals, one of whom should already know the participant group.

Logistical arrangements:

Support materials are provided online. www.m100.ro

A projector is needed (to avoid printing the Map – Annex 1) and to use a screen for collecting project ideas and forming teams. Printing the worksheets for each participant (Annex 2) or the Partnership Agreement (Annex 3) is optional, as ideas can be written on any type of support. All materials are printed in A4 format. Writing tools, post-its, and paper are also required.

B.3. Workshop sequences

The activities in the workshop can be divided into 10 sequences, and the time estimation for each of them was based on piloting[3], but, obviously, each group has specific needs, so these estimates are only indicative.

Sequence 0
Icebreaker, Participant Introductions

estimated duration: 20 minutes - ideas for questions or methods of getting to know each other - discussed and chosen in advance between teachers and guests.

Especially since the workshop is implemented with the help of resource people, some time for introductions is necessary.

Recommendation: the resource people can provide career guidance by talking about the connection between their profession and the climate-neutral city.

Sequence 1
insights about the climate-neutral city

estimated duration: 20 minutes - research based on the provided material and discussion, relying on the information included in the first part of this material Resources – GUIDELINES.

Recommendation: the guiding teacher should be familiar with this content and be able to lead a guided discussion to ensure that all definitions and explanations are understood by all participants.

The format of the material allows for projection, and those definitions can be reviewed in class, but it is preferable for the guides to provide the material for consultation before the workshop.

A Short break is recommended

Sequence 2
examples of projects for the climate-neutral city

estimated duration: 20 minutes - Research based on the provided material and discussion, relying on the information included in the first part of this material Resources – EXAMPLES.

Recommendation: the guiding teacher along with the guest resource people can choose to quickly present these examples with an emphasis on the elements contained in the table - the second part of the examples which includes more detailed information about an aspect considered relevant for each student to analyze on their own.

Considering that this workshop can be prepared in advance, it is recommended to send this section with examples before the workshop takes place, allowing this phase to focus only on a guided discussion.

Sequence 3
planning for the city of *NetZeroCityToBe*

estimated duration: 10 minutes - visual presentation - map is based on **Annex 1 - Map of the imaginary city *NetZeroCityToBe***

Recommendation: the guiding teacher together with invited resource people explains using a projection of the map that there are already a series of intentions included in plans and documents that have been approved in this city.

Each LOCATION on this map contains relevant clues, and it may be useful to read all this information and verify the understanding of the terms used. The city map includes clues about the municipality's intentions, as well as land and buildings owned or managed by the city hall, such as: redevelopment of the central square for community events, renovation of a collective housing complex, remodeling of an underground parking facility, restoration of a historic heritage garden, creation of an

3

In the four cities—the workshops within the M100 Caravan (summer 2024) previously mentioned—as well as an extracurricular activity with students from the Faculty of Urban Planning at the Ion Mincu University of Architecture and Urbanism, and with students from other Bucharest universities who participated in two events organized in Bucharest by the OAR – the Order of Architects of Romania (autumn 2024).

Annex 1 - NetZeroCityToBe city map

intermodal hub, vacant land designated for a municipal park, municipal land allocated for energy production, modernization of a tram depot, municipal land for a community garden, repurposing of a former coal mine, municipal land for housing projects, development of riverbanks, land designated for centralized heating/cooling, land for waste management facilities, etc., the existing infrastructure for education, health, and culture is symbolized at three key points in the city: a school, the municipal library, and a polyclinic.

A Short break is recommended

Sequence 4
proposals for the climate-neutral city

estimated duration: 15 minutes - individual work

It is based on the information included in the first part of this material – **EXAMPLES and on the map** that should ideally be visible throughout the sequence (projected, to avoid printing auxiliary materials as much as possible).

Recommendation: each participant describes in key phrases their proposal for transforming one of the marked places on the map, drawing inspiration from the examples provided and possibly from other places visited in the past or documented online - written in large enough letters to be read later and from a distance.

Sequence 5
proposals for the climate-neutral city

estimated duration: maximum 2 minutes per participant X number of participants - plenary presentations.

Each participant quickly presents the idea of intervention, being very careful to relate it to the chosen place, and to make both the expected results and the types of necessary resources easy to understand (referring to the project triangle).

Recommendation: the sheets on which they have written their proposals can already be grouped on the wall - based on the chosen places - as the ideas are presented (forming teams).

A break is recommended during which participants can discuss with each other to form teams.

Sequence 6
the roles of urban actors

estimated duration: 15-20 minutes - guided discussion with visual support from the explanations in RESOURCES.

This is based on information contained in the first part of this material – ROLES.

Recommendation: the guiding teacher should be familiar with this content and be able to lead a discussion to ensure that all participants have understood the definitions and explanations.

The format of the material allows for projection and it's possible to go through those definitions in class, but it's preferable for facilitators to provide the material for review beforehand.

Sequence 7
my role for our project

estimated duration: 20 minutes - teamwork

This is based on information contained in the first part of this material - ROLES and on a role sheet (Annex 2)that should be visible throughout the sequence (projected, to avoid printing auxiliary materials as much as possible).

Recommendation: each team member (of 3 people) should fill out their own sheet - for their role (representative of a company looking to make a profit / of an association wanting to promote a cause relevant to climate neutrality / of a communication channel that already has a fairly large audience) - but since a common project needs to be defined, communication among team members is necessary.

Individually, each participant fills out a team sheet, briefly describing their resources and motivations related to the project idea. We start from the premise that:

— The business representative wants to profit from the project idea.
— The association representative wants to promote a cause relevant to climate neutrality.
— The media representative (who already has a significant audience) wants to expand their audience by reaching people who were previously unaware of their communication channel.

Întrebările sunt:

— What resources do you have?
— What are your motivations for this PROJECT in this LOCATION?
— What ACTIONS can you take within this project?

Since the team must define a common project, intensive communication between team members is essential to adjust their initial intentions and combine their perspectives based on their assigned roles.

This way, the details of the project initiative take shape.

A Short break is recommended

Sequence 8
our project - presented to the city hall

estimated duration: 20 minutes - teamwork it

The activity is based on the information presented in the first part of this material – ROLES and on completing the sections of the Partnership Agreement (Annex 3).

Recommendation: The project initiative comes from the team to the municipality—so the team must prepare to convince the facilitators. The team will review:

— The resources contributed by each member
— The expected benefits
— The tasks and responsibilities assigned

Thus, the team's proposal for the content of the Partnership Agreement/Contract is prepared. Even though each partner briefly states what they offer and what benefits they expect from the project, these perspectives must be aligned with each other.

Additionally, an important section of the agreement includes the team's suggestions and requests regarding the contributions and benefits for the local public administration of *NetZeroCity ToBe*.

Sequence 9
contract negotiations

estimated duration: 5-7 minutes for presentation + 3-5 minutes for discussions = 10 minutes x number of teams

In this sequence, the two facilitators first wait for information from all team members and ask clarifying questions, but especially relevant questions for a negotiation.

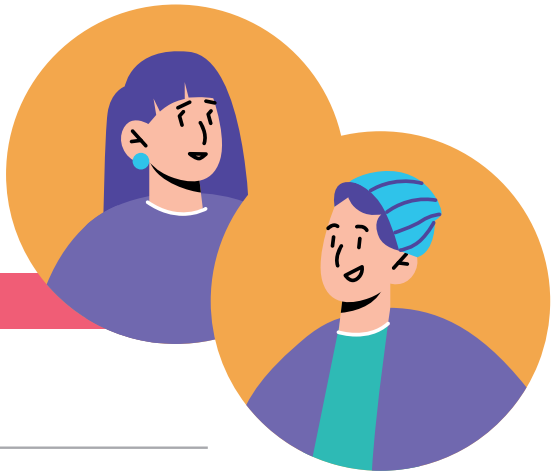
Participants who are not in that team and are local advisors can also ask questions to both the team and the facilitators playing the roles of mayor or chief architect.

Sequence 10
official signing of the contract

estimated duration: 3 minutes for each team - with photos

It is also recommended to award a certificate of participation, especially if the activity is organized in partnership with stakeholders who can effectively contribute to the local community's efforts to reduce carbon emissions (see the Third part - Capitalization).

Youth for Climate Neutrality



Self-Portrait

How do I prefer to be addressed?

_____

Which category do I belong to? What is the name of the legal entity?

1. Company: ☐ _____

2. NGO: ☐ _____

3. Media: ☐ _____

MY SUPERPOWERS related to the project are:

1. RELEVANT RESOURCES
(funds, knowledge, time for various actions necessary for the implementation of the project)

2. MOTIVATION
(benefits I expect to gain from the project)

3. ACTIONS
(specific ways of contribution)

ANNEX 2

Worksheet for Each Team Member serving as the basis for team discussions to define the details of the project idea.
(provided online)

Partnership Agreement
Youth for NETZEROCITYTOBE

Article 1 - THE PARTIES˘

This partnership agreement is signed between APL NETZEROCITY, represented by MAYOR,

PARTNER 1 _____ represented by: _____

PARTNER 2 _____ represented by: _____

PARTNER 3 _____ represented by: _____

Article 2 - PURPOSE

The purpose of this partnership agreement is to collaborate in detailed planning and joint actions for the implementation of the PROJECT: _____

Article 3 - DURATION

The partnership agreement is valid until July 31, 2030.

Article 4 - RESOURCES CONTRIBUTED BY THE PARTIES

APL NETZEROCITYTOBE will provide: _____

PARTNER 1 will provide: _____

PARTNER 2 will provide: _____

PARTNER 3 will provide: _____

Article 5 - EXPECTED BENEFITS FOR EACH PARTY

APL NETZEROCITYTOBE will receive: _____

PARTNER 1 will receive: _____

PARTNER 2 will receive: _____

PARTNER 3 will receive: _____

Article 6 - TASKS AND RESPONSIBILITIES OF THE PARTIES

APL NETZEROCITYTOBE will: _____

PARTNER 1 will: _____

PARTNER 2 will: _____

PARTNER 3 will: _____

Article 7 - DECISION-MAKING PROCEDURES

Decisions will be made according to specific responsibilities defined by law, as well as through PROJECT MEETINGS where each partner's ways of working are explained. Any partner can initiate such a meeting if they need opinions, resources, or ideas from the other partners.

Article 8 - NEW PARTNERS

If any partner deems it appropriate to invite a new partner, that partner will be invited to the PROJECT MEETINGS and will present the resources they offer, the benefits they expect, and the tasks and responsibilities they can assume. The decision is made by a majority vote of the already involved partners.

Article 9 - WITHDRAWAL OF A PARTNER

APL cannot withdraw from this partnership agreement. However, if any of the other partners decide to withdraw, they will seek a replacement for the tasks and responsibilities they have assumed and will ensure that the new partner follows the procedure described above.

Article 10 - AMENDMENTS TO THE AGREEMENT

Modifications to this partnership agreement will be made as needed to update the action plan for project implementation through discussions at PROJECT MEETINGS and a majority vote.

Signed today, _____ at _____

SIGNATURES

NETZEROCITYTOBE MAYOR **PARTNER 1** **PARTNER 2** **PARTNER 3**

ANNEX 3

Partnership Agreement (provided online)

C. Capitalization

The ability to use Resources and the Educational Scenario in Local Partnerships

For the educational scenario to have a real impact and contribute to the transition toward climate-neutral cities, it is essential that it be supported by strong partnerships between local actors. Climate neutrality education should not be limited to young people but should also involve teachers, parents, non-governmental organizations, the business sector, and local administration, making it a shared community concern.

This chapter provides concrete suggestions on how local actors can collaborate to implement the educational scenario and develop initiatives that promote awareness and engagement with climate challenges. By forming partnerships, they can ensure resources, expertise, and visibility for educational activities, turning climate neutrality from an abstract concept into a common goal with clear actions and visible results.

Whether it is teachers integrating the educational scenario into school activities, NGOs offering support and mentorship, companies backing sustainable projects, or local administrations facilitating access to spaces and resources, partnerships among these actors are essential to making climate neutrality education a collaborative and long-term process.

Furthermore, beyond their specific role as facilitators in the educational scenario, built environment professionals can use these suggestions to create additional ways to engage with formal education institutions, as well as with organizations and initiatives involved in non-formal education.

Students preparing to become built environment professionals can already team up with individuals experienced in learning processes and either act as facilitators playing the role of the chief architect in this scenario or use the resources to create new activity scenarios for high school students.

This hypothesis was tested on two occasions in the fall of 2024. The preparation activities for this material also included the organization of two consultation events with students from various Bucharest universities, exploring their interest in facilitating the implementation of the educational scenario – *Youth for Climate Neutrality*[1].

At the high school level (and even in middle school), having students involved in facilitating a workshop adds an extra layer of engagement and appeal. Both students and high schoolers benefit immensely from this interaction, as they are part of the same Generation Z and share common concerns.

During these two workshops, where students validated their willingness to act as facilitators for this scenario, they also created an invitation poster addressed to high schoolers for the workshop (see figure below).

This experiment demonstrates that when young people are actively involved in the learning process (such as by creating a poster), they not only better understand the information but also begin transforming it into real solutions. These activities are not just creative exercises—they act as bridges between theory and action, helping young people discover their role in shaping a more sustainable city.

1

October 30 – Within the M100 Forum, a workshop to test the interest and skills of student facilitators. November 15, 2024 – As part of a workshop in the Research and Design in Urbanism course, Department of Urban Planning and Territorial Development, Faculty of Urban Planning – UAUIM.

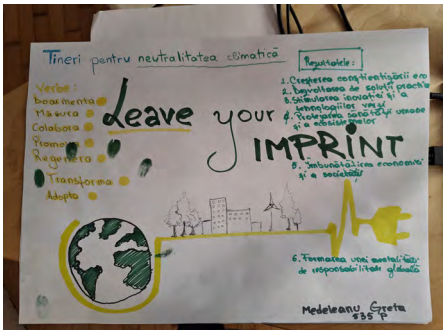


Figure C.1.

Two of the posters created by students – application of the workshop and discussions regarding the willingness to participate in Green Week Program in high schools

C.1. Why a Workshop on Climate Neutrality for Gen Z?

Generation Z (which includes individuals born approximately between 1997 and 2012) is significantly more aware of climate change and its impact on the planet's future compared to previous generations. This generation has witnessed extreme climate-related events and benefits from constant exposure to information on the topic through mass media, social networks and education. As a result, many young people in this generation experience heightened anxiety about the planet's ecological future, a phenomenon known as "eco-anxiety."[2]

Younger generations (including Gen Z) perceive climate change as an imminent global threat that impacts not only natural ecosystems but also economic and social life. A 2024 report by the World Health Organization highlighted the link between climate change and mental health, stating that young people are more likely to experience eco-anxiety due to uncertainty about the future.[3]

Many young individuals are discouraged by the slow pace at which governments and institutions take effective measures to combat climate change. This frustration can lead to a sense of helplessness that amplifies anxiety. While some are deeply engaged in climate activism, the way they approach activism can sometimes intensify feelings of frustration and anxiety in the face of slow global policy changes.

This state of anxiety is not only the result of the lack of rapid progress but also of constant exposure to alarming information about the effects of climate change—from extreme weather events to biodiversity loss and rising sea levels.

As young people become increasingly aware of the impact of climate change on their future, they may feel the pressure to find solutions as well as uncertainty about society's ability to act effectively.

In this context, education and active involvement play a crucial role. When young people engage in concrete projects, community activities, and educational initiatives, they can transform this anxiety into a motivational force. Whether they participate in awareness campaigns, reforestation initiatives, or projects promoting sustainable solutions, they realize that they can actively contribute to change.

This sense of personal agency—the belief in one's ability to influence reality—is essential for reducing eco-anxiety and turning frustration into a positive drive for action.

Some young people are deeply engaged in climate activism, but the way they approach it can sometimes intensify frustration and anxiety when faced with the slow pace of global policy changes. **Generation Z needs leverages that ensure both their energy and concerns have a greater impact.**

The climate-neutral city theme is primarily about how much can already be done by applying tested principles and measures. A city that

2

Pihkala, P. (2020). Anxiety and the Ecological Crisis: an Analysis of Eco-anxiety and Climate Anxiety. Sustainability, 12(19), 7836. https://doi.org/10.3390/su12197836

3

58595-who-cop29-special-report_layout_9web.pdf - World Health Organization, 2024

plans through participatory processes and invests systematically in reducing its carbon footprint is a city where: nature plays a greater role, air quality is improved, heating and cooling bills are lower, daily travel distances are shorter and can be covered on foot or by bike, various institutions and organizations collaborate to implement projects that significantly improve living conditions. **However, these ideas are not yet sufficiently well-known.**

This is why organizing a workshop for young people is a valuable idea. The concept of climate neutrality can be introduced through concise explanations, but especially through a practical simulation that allows participants to understand that this transition happens step by step, project by project. By practicing the idea of local partnerships, where each person can define a role that aligns both with their personal resources and motivations and with the common interests of the community, young people gain confirmation of what specialized literature calls SELF-EFFICACY . This approach helps young people realize that change is not just a distant goal, but a concrete process in which anyone can actively contribute.

4

Self-efficacy refers to a person's confidence in their ability to complete specific tasks, face challenges, and influence outcomes through their own actions. The concept is closely linked to motivation, perseverance, and success in achieving goals.

C.2. Built Environment Education (BEE), Education for Sustainable Development (ESD) and Climate Neutrality

The first condition for these ideas to be implemented and replicated is for them to be understood, appreciated and disseminated, with schools and universities serving as the primary environments for acquiring knowledge, skills and attitudes.

Being created by people, the built environment reflects human principles and beliefs. This relationship between how we think and how the built environment is shaped works in both directions: people build according to the references and values they hold, and the built environment influences daily life, not only in terms of health, economic well-being, and cultural representation but also in shaping and reinforcing societal values and principles.

Built Environment Education (BEE) applies these principles and refers to the learning process that helps people understand, appreciate, and actively engage in the responsible development and use of the built environment. It is a highly effective method, both in formal and non-formal education, for connecting concepts and phenomena (studied in various subjects) with their practical application in the surrounding reality.

According to the **"Architecture & Children" Working Group of the International Union of Architects (UIA)[5] BEE** aims to develop sensitivity, awareness, and analytical skills regarding the built environment, enabling future citizens to understand the relationship between space, culture, functionality, and sustainability.

The UIA promotes built environment education as an integrated component of education for sustainable development, emphasizing that cities, buildings, and public spaces significantly influence people's lives and communities. Education in this field goes beyond architecture; it also encourages active participation in shaping cities, understanding the principles of sustainable urban planning, and developing critical thinking and creativity in relation to built spaces.

Through interactive methods such as urban space exploration, drawing, model-making, role-playing games, and participatory projects, BEE helps young people see how they can responsibly influence the built environment and understand that cities are constantly evolving—and they can play an active role in this transformation.

5

Work program of the International Union of Architects - https://www.uia-architectes.org/en/mag/built-environment-education-bee-and-childrens-cognitive-development/

Likewise, **Education for Sustainable Development (ESD)** already has numerous references in how it is defined and understood by UNESCO[6].

ESD aims to provide people with the knowledge, skills, values, and attitudes necessary to act responsibly toward the environment, economy, and society. It promotes an interdisciplinary approach, encouraging critical thinking, informed decision-making, and active community participation.

UNESCO emphasizes that this form of education must be transformative, integrating key themes such as climate change, biodiversity, sustainable consumption, social justice, and democratic participation.

Education for Sustainable Development is not just about acquiring information — it empowers students and citizens to become **agents of change**, capable of contributing to the creation of a fair and resilient society, in harmony with the planet.

Education for Sustainable Development (ESD) and Built Environment Education (BEE) share a common area focused on the efficient use of resources to reduce environmental impact, as well as on social and economic development — the three pillars of sustainable development. These aspects are reflected in the built and designed spaces that shape our surroundings.

Additionally, **the link between Built Environment Education and citizen participation in urban planning**[7] and space improvement is well-documented. Understanding the stages of spatial transformation processes, energy efficiency, space utilization, and environmental impact enables people to make more informed decisions and enhances communities' capacity for organization and resilience.

In a city, we can observe the tangible results of people assuming various roles, materialized in physical space:

— Decision-making roles that allocate financial resources
— Design roles that define technical solutions to challenges
— Priority-setting roles that establish project requirements
— Operational roles that facilitate activities in those spaces and ensure their ongoing adaptation to users' needs

The built environment serves as an excellent medium for explaining complex processes.

The Green Week Program should be particularly highlighted as it is already a dedicated time for Education for Sustainable Development (ESD). In recent years, the Romanian Ministry of Education has demonstrated a strong commitment to integrating ESD into the pre-university education system. ESD is addressed transversally within the formal curriculum, being integrated into various subjects and educational activities. Key themes include poverty reduction, human rights, gender equality, environmental protection, and civic responsibility. These topics are covered not only in classroom lessons but also through extra curricular and extracurricular activities, such as the national programs "Școala Altfel" (Different School Week) and "Școala Verde" (Green School Week).

Additionally, the Ministry of Education collaborates with public authorities, economic operators, and non-governmental organizations to promote ESD through various partnerships. These collaborations focus on topics such as children's rights, tolerance, rural and urban development, and natural resource management. Moreover, teacher training programs are organized, focusing on environmental education, experiential learning, and developing skills for a sustainable society.These efforts reflect the Ministry of Education's commitment to preparing young people for future challenges and promoting a culture of sustainability in Romania.

6

https://www.unesco.org/en/sustainable-development/education

7

Million, A. and Heinrich, A. J. (2014). Linking participation and built environment education in urban planning processes. Current Urban Studies, 02(04), 335-349. https://doi.org/10.4236/cus.2014.24032

8

https://www.edu.ro/educatie-pentru-dezvoltare-durabila

9

https://www.edu.ro/metodologie_Saptamana_Verde

10

https://saptamanaverde.edu.ro/ro/biblioteca-de-resurse

Figure C.2

correlations between Sustainable Development Education and Built Environment Education

Climate neutrality topics related to cities can be effectively introduced to Generation Z through built environment education within this strategic framework. Teachers and designated environmental coordinators in schools, following the methodology of the Green Week Program , are making efforts to attract partners from the non-profit sector. However, environmental organizations cannot multiply indefinitely to be present in all schools in a region or to host students for educational activities.

The need for support in organizing these programs in schools and high schools is significant. In response, non-governmental organizations with expertise in both non-formal education and environmental protection have already mobilized, providing resources to teachers and organizing training programs for educators. These efforts have been made possible with the support of funding from the non-profit sector, including grants, sponsorships, and individual contributions.

As previously explained, **Generation Z** is growing up and developing in a reality marked by the **climate crisis**, with today's youth becoming increasingly aware of the **impact of human actions on the environment**. Many of them experience **eco-anxiety**, a deep concern for the planet's future, coupled with a **strong desire to take action**.

However, for this **energy to be channeled effectively,** it is essential that they have **access to clear information, experiential learning methods, and real opportunities for engagement**. The **proposed educational scenario** provides a **structured framework** and the necessary resources to help students understand what climate neutrality means, how cities can be transformed, and what role they can play in this process.

At the same time, there are strongly favorable conditions for this scenario to be widely implemented. At the national level, Romania has set ambitious goals for integrating education for sustainable development, supported by the Ministry of Education, the Department for Sustainable Development, and other institutions and organizations promoting sustainability. At the European level, cities are encouraged to accelerate their green transition, and this scenario can be a **valuable tool for preparing young people and local communities for this transformation**.

The **provided resources**—explanations, definitions, best practice examples, and support materials for the role-playing exercise—**bridge education and action**, allowing not only **students** but also **teachers, NGOs, local administrations, and the private sector to use this guide as a starting point for real sustainable initiatives**. Thus, the **educational scenario** becomes **not just a learning method but also a platform for collaboration**, equipping the current generation with the **knowledge, skills, and motivation** needed to **shape the future in a more responsible and sustainable way.**

C.3. Local partnerships for the “Youh for Climate Neutrality” Workshop

Many times, no matter how good educational resources are (such as those provided in the first part of this material) and how detailed an educational scenario is (like the one offered in the second part), the energy and enthusiasm brought by guest speakers in the classroom are irreplaceable.

Teachers need this support not because they cannot independently use all the provided materials, but because invited guests add novelty, legitimacy, and attractiveness to the learning experience.

Additionally, high school students are often difficult to engage in extracurricular activities or programs such as Școala Altfel (Different School Week) / Săptămâna Verde (Green Week). As a result, valuable time is wasted. For example the students' time is sometimes spent on visits at the shopping mall or far away trips by rented buses that increase their carbon footprint instead of engaging in dynamic and meaningful learning experiences. Also the teachers' (paid) time could be used to find inspiration for teaching methods beyond SA/SV through interactions with organizations, institutions, and professionals, as well as relevant information for both students and educators.

Therefore, a structured mechanism for organizing workshops in schools could and should involve human resources from local branches of professional organizations and higher education institutions, supporting pre-university education.

High schools can continue to seek support from NGOs, not only environmental organizations but also those promoting youth civic engagement, local culture, circular economy, and more. However, it is unfair to expect free services and voluntary work beyond pilot projects initiated by these organizations. While piloting and developing new educational scenarios can be funded through grants, securing financial support for activities already established in previous projects is more challenging.

In the cities selected in the M100 project, applying this educational scenario yields multiple benefits for the development of the local support ecosystem for the participatory planning of the actions for reducing the carbon footprint.

Professional organizations, private companies offering products and services relevant to reducing the carbon footprint, and partners from local media should be invited as collaborators in this mechanism through which high schools become hosts for built environment education in the *NetZeroCityToBe* initiative.

Moreover, four of these cities — Bucharest, Timișoara, Iași, and Oradea — have specialized higher education programs for architecture, providing a favorable framework for collaboration with the academic environment. These university centers can play a crucial role in supporting education for sustainable development, involving **professionals, researchers, and students** in local projects.

Additionally, Cluj-Napoca, one of the 100 cities selected by the European Commission, has significant potential for such partnerships. Universities in the city can contribute not only through the expertise of specialists but also by mobilizing students. With adequate financial support, students could become facilitators of the educational scenario in high schools, organizing workshops to help students better understand the concept of climate neutrality and explore practical solutions for their cities. This approach would transform universities into active centers of resources and innovation, connecting young people with green transition initiatives in their communities.

This collaborative approach, in which all involved parties benefit, cannot be implemented without concrete examples where collaboration is initiated, demonstrated, and made visible. **To establish these partnerships, both experience, which translates into clear collaboration formats (partnership agreements), and financial resources allocated**

based on transparency and impact principles (such as a grant competition with a dedicated program) are essential.

Climate-neutral cities are not just a distant vision but an active process that begins right now, with each of our decisions and actions. Through strong partnerships and applied education, we can transform this shift from a global goal into a local reality. The proposed educational scenario is not just a learning tool but an opportunity for collaboration, a space where students, teachers, local authorities, and community organizations can unite their efforts to build more sustainable cities together. Whether it's about improving public spaces, reducing emissions, or using resources responsibly, every initiative, every workshop, and every implemented project contributes to a more balanced future.

Now is the time to act! The future of our cities is not solely in the hands of policymakers or major investors, but also in the hands of those who choose to engage, learn, and drive change. Students can become innovators and sustainability leaders, teachers can guide this transformation, and the community can provide resources and support. We have all the necessary ingredients to make this scenario more than just an educational exercise—we can turn it into a starting point for real projects, lasting collaborations, and cities that not only reduce their environmental impact but also become more livable and efficient for all residents. Every step matters, and the change starts now!

Credits and References

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The workshops in the four cities of the M100 Caravan were not organized in schools (due to the summer vacation period), but some of the facilitators (members of the De-a Arhitectura Association) are also teachers in pre-university education (architecture departments in art high schools) and/or in higher education (faculties of architecture and urban planning).

Therefore, the ideas presented in this material are not only conclusions drawn from the educational component of the M100 project but are also based on practical experience. This includes work related to Built Environment Education, which is already integrated into formal pre-university education through optional courses and workshops conducted in partnership with schools by the De-a Arhitectura Association, as well as within the vocational education system in specialized high schools and universities.

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Iceland Liechtenstein Norway grants
Norway grants

This material has been developed by the Romanian Order of Architects within the project „Towards Climate-Neutral and Smart Cities through Mutual Learning, Engagement and Capacity-Building”.

The project is implemented by UEFISCDI (programme operator), the Romanian Order of Architects, Urbanize Hub, Nordic Edge, NTNU and RANNÍS and is supported by EEA and Norwegian Grants through the Bilateral Relations Fund, enabling valuable international collaboration and knowledge exchange.

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ISBN 978-606-985-721-2

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