

# CASE STUDY

Bratislava (Slovakia) – Tokorozawa (Japan)

IURC – Asia & Australasia



NOVEMBER 7- 2023

**Thematic Network(s): Ecological Transition- Green Deal – A greener Europe**

**Thematic Cluster(s): NBS-Greening-Water Management**

**Cross-cutting challenge(s): Energy Transition -Climate Change**

**Topic keywords: Green Infrastructure, Climate Adaptation, Energy Efficiency**

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# Eco-City Development with Positive Energy and Green Infrastructure

Bratislava and Tokorozawa aim to be green and energy-efficient. Bratislava has learnt from Tokorozawa's greenery expansion measures and active use of renewable energy, especially solar power. In return, Tokorozawa has gained insights from Bratislava's longstanding approach to city greening and adaptation, and their efforts to initiate actions for energy efficiency and renewables



## EXECUTIVE SUMMARY

The two cities of Bratislava and Tokorozawa have a history of “greening” their cities. They started to cooperate on the theme of common interest which was climate change adaptation measures using green infrastructure such as forests and green spaces, later expanding the exchange towards the topic of renewable energy production, especially solar. Since the start of the IURC project, Bratislava has streamlined its policies and practical approach to climate adaptation both in renovation of public spaces and greenery maintenance as well as in urban planning and strategy. Several examples of recent measures are described in this case study.

Meanwhile, Tokorozawa City sought another solution to address their climate impacts. They decided to work diligently to introduce renewable energy. Tokorozawa City was quick to develop its own solar power plants. "Mega Solar Tokorozawa", with an output of approximately 1 MW and "Float Solar Tokorozawa", with an output of approximately 385 kW, have been operated on city-owned idle lands.



The immediate challenge for Bratislava is for it to take on a role as a municipality that takes responsibility for systematic reduction of greenhouse gas emissions. In 2023 Bratislava is preparing its new Sustainable Energy Action Plan (SECAP). In this respect, the lessons learned from Tokorozawa regarding the expansion of solar power use was timely and to their benefit.

**“My mission as the Deputy Mayor for Environment and Climate is now to kick start the city's efforts in reducing our greenhouse gas emissions and mainstreaming climate action in all policies of the city.”**

**Jakub Mrva, Vice Mayor (Bratislava)**

## MAIN CHALLENGE AND SOLUTION

The two cities are working in tandem to resolve their respective challenges which are:

**Bratislava** is located on the banks of the Danube River and has concerns about the impacts of climate change such as flash floods. With one fifth of the city territory being covered with forests, the city has sought to ensure the sustainable use of its forests to address the flash floods that occur frequently in the city. The city has also suffered from intense urban heat island effects in the summer time, which led to many studies on the topic. Since 2022 the issues of energy efficiency and energy independence from Russia have come more to the forefront, especially since Slovakia neighbours Ukraine.

**Tokorozawa**, a satellite city of Tokyo, is promoting a unique policy aimed at realizing a city-wide eco-town. The city's population has grown rapidly because of housing development, and the abundance of greenery in the city has continued to decline. A core of its policy is the conservation of forests and green spaces and promotion of the use of renewable energy such as solar power and the power generated from waste incineration.

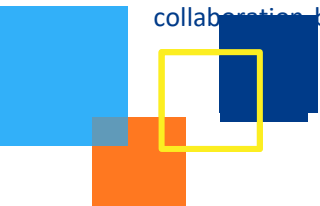
Here are some examples of policies and actions the cities chose to pursue:

### 1. Green infrastructure

In Bratislava, long-term underfunding has led to a considerable modernization debt of public infrastructure. Apart from basic renovation of streets and squares, systematic investments are needed to boost the agglomeration's resilience to the effects of climate change, which are already heavily manifesting across Bratislava's densely populated neighbourhoods in the form of recurring heat waves, declining rainfall or torrential rains and flooding. The challenge for Bratislava lied in systemizing its approach towards renovation of public spaces and regeneration of city greenery on all levels, including through introduction of clear principles and guidelines.

#### **Živé miesta programme (Bratislava)**

"Živé miesta" (Living Spaces) is a programme aimed at revitalizing public spaces with the goal of enhancing the well-being of residents, while also increasing their climate adaptation capacity. The living spaces are created through collaboration between the Metropolitan Institute of Bratislava, the Department of Urban Greenery, and the City



Forests in Bratislava, while their design follows the principles and standards outlined in the newly created Manual of Public Spaces to ensure a conceptual approach. The following environmental principles are considered:

- Nature-oriented green and blue measures, including new natural areas, creation of linear elements (rows of trees, avenues) and introduction of greenery on structures to ensure shade where tree planting is not possible,
- Use of surfaces and materials that do not excessively absorb solar energy (e.g. light-coloured materials with good solar reflectivity) and minimizing the use of paved surfaces to promote rainwater infiltration, thus cooling the environment through evaporation
- Preference for sustainable materials,
- Designing the location in consideration of potential impacts, such as extreme rainfall events, while putting emphasis on biodiversity.

Residents and communities can also participate in the creation of public spaces through the “Grant Programme for Community Revitalization of Public Spaces”, in collaboration with the Bratislava City Foundation. The programme currently includes over 40 completed, ongoing, and proposed projects, encompassing a total area of 243,563 square meters.



**Figure 1: Public space after Živé miesta**

### **Ecoindex (Bratislava)**

Bratislava is currently also planning changes of its urban plan introducing a more stringent and effective standard for green-blue infrastructure, called Ecoindex. The current standard, called Green Coefficient, does not consider the quality of greenery only the surface area that needs to be covered by vegetation. Additionally, it fails to account for the level of rainfall infiltration and water retention, and neither does it consider the urban-ecological function of vertical vegetation elements and green roofs. Going beyond the mere quantity, Ecoindex will define the quality of individual vegetated areas based on the ecosystem services that they bring to urban spaces (e.g. better microclimate, urban cooling, rainwater infiltration through soil, and biodiversity support) giving strong regulatory power to the city and a clear guidance to developers.

### **Green fund (Tokorozawa)**

In Tokorozawa, residents have an extremely strong awareness of the need to preserve greenery, and have donated to the 'Green Fund', which is used for conservation of green areas that are threatened by development. In addition, green trust activities by the Totoro no Furusato Foundation in the city are also active, with 43 green spaces in the city having been acquired to date. For a suburban city Tokorozawa boasts a high green coverage rate within a 30 km radius of the city centre because the local residents have high concern on greenery, and some have been donated to the “Green Fund” to preserve greenery.

## **2. Solar power**

### **Mega solar power plants (Tokorozawa)**

Tokorozawa aims to increase the use of renewable energy sources, especially solar power, to realise a carbon-neutral city. Tokorozawa is located on the outskirts of the metropolis of Tokyo. Although there is more idle land than in the Tokyo centre, it is not easy to find large tracts of land suitable for solar power generation. Tokorozawa has solved this problem by utilising a former waste landfill site, flood control retention ponds and farmland roofs.



**Figure 2: Mega Solar Tokorozawa**



**Figure 3: Float Solar Tokorozawa**

Mega Solar Tokorozawa began operation in March 2014 (Figure 2). It was built on a final waste disposal site in the city. The panels have a capacity of 1.053 MW. This was the first mega solar power plant in Saitama Prefecture with an output exceeding 1MW. The 20-year business plan projects a profit of about 300 million yen. Tokorozawa City sets aside the revenue from electricity sales in the "Machieco" City's Eco-town Promotion Fund and uses it for subsidies for solar power generation and eco-renovation for residential, community and business purposes.

The Float Solar Tokorozawa is a water-based solar power generation system that began generating electricity in March 2017 (Figure 3). Solar panels equivalent to 385.56 kW were placed on the surface of a flood-regulating pond in the city. The pond was constructed in conjunction with a large-scale residential development, and when full of water, has an area of approximately 11,616 m<sup>2</sup>, of which 1,224 panels were floated on approximately 4,296 m<sup>2</sup>.



**Figure 4: Farm based solar in Tokorozawa (1)**



**Figure 5: Farm based solar in Tokorozawa (2)**

In addition, the city has installed a total of approximately 1 MW of rooftop solar power generation on schools and other public facilities. However, the city has already seen the limits of available space for conventional solar development on city-owned property. Therefore, the city is supporting the installation of solar power generation at privately owned facilities. For example, subsidies have been disbursed for "farm-based solar (solar sharing: 989.04 kW capacity)". Solar panels are installed on 1.7 hectares farmland that planted with grapes and blueberries. The panels generate electricity, while it can block strong sunlight (Figure 4 and 5).

Lastly, Tokorozawa City established a local retail electric power company, Tokorozawa Future Electric Power(TFEP), with an engineering company, local bank, and the local chamber of commerce. Almost all of the city's facilities, including schools and community centres, signed a contract and use green energy with TFEP, as of 2021. This resulted in 85% GHGs emission reduction in FY2021 compared to the emission in FY2013.



# “Our mission is to create sustainable and nature-based “eco-town Tokorozawa” without relying on thermal and nuclear power.”

## Toshiaki Nakamura, CEO for Tokorozawa Future Electric Power

### PV Atlas for municipal rooftops (Bratislava)

Inspired by the solar power projects in Tokorozawa, Bratislava took a first step towards installing solar PV on its own rooftops by developing a solar power atlas. This atlas is a study of the solar power potential on municipality buildings, which should help the city identify available spaces for solar installations. The potential total installed capacity of all analysed municipality rooftops would amount to 12 MW. While this number is a very optimistic maximum that will take some time to achieve, Bratislava is already making plans to install solar PV on multiple roofs and start generating green energy based on findings from this atlas.

### 3. Participatory urban planning

#### Climathon (Bratislava)

Lastly, when Tokorozawa visited Bratislava in March 2023, they were intrigued by Climathon Bratislava – an event that brings solutions from citizens to the forefront of climate action. This hackathon is a significant innovative event where experts from practice, technical or business leaders, and enthusiasts from all over Slovakia meet to address climate change issues. For four years now, Bratislava and its residents have been creating solutions that help the city become more resilient.

In 2022, the participants had three challenges to choose from: how can the city optimize its services in case of extreme weather and climate events, how the city can be better prepared for expected long-term impacts of climate change, and how citizens can help the city combat climate change. 200 attendees took part in Climathon 2022, participants formed 29 teams in total (Figure 6). The teams worked for 48 hours and at the end of the weekend, 23 solutions were prepared, from which the expert jury awarded the best 3. Climathon participants had exclusive access to different data sets, which they could use to ensure greater relevance of their solutions. The winning team Acropolis came up with an idea how to optimize and improve the city’s response to extreme weather fluctuations such as heavy rains or flood



Figure 6: Climathon



# RESULTS AND IMPACT

The fact that solar power is being implemented in an urban city like Tokorozawa has been a great stimulus for Bratislava. The example of urban greening in Tokorozawa inspired the greening measures and creation of the Ecoindex in Bratislava. In both Bratislava and Tokorozawa, mapping information is being used to strengthen climate change resilience. The methods of public participation in Bratislava provided significant inspiration for Tokorozawa. Tokorozawa aims to adopt the Bratislava's method of Climathon to encourage citizen participation in the near future.

## KEY FIGURES

**85% ↓**

By 2021, GHG emissions from municipally owned buildings and facilities in Tokorozawa have dropped substantially compared to 2013.

**2600** households

the equivalent number of households that can be supplied by the Local Production of Green Electricity in Tokorozawa.

**243,563** m<sup>2</sup>


The size of public land that was revitalized under the Živé miesta program in Bratislava.

**23** solutions


were awarded at the Climathon of 2022 in Bratislava.



# LESSONS LEARNED

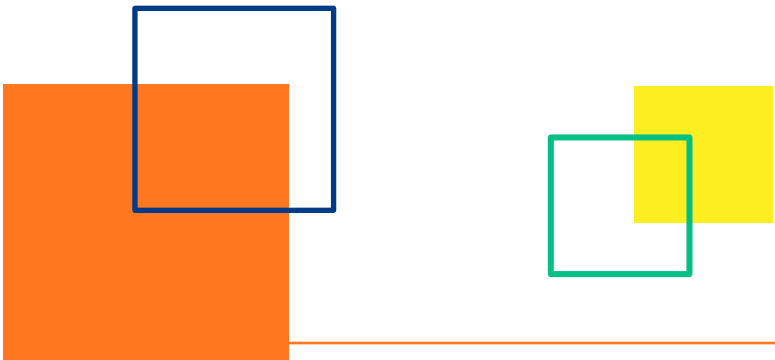


A barrier to the use of solar power in cities is the difficulty of securing land. Tokorozawa's experience has demonstrated how this is possible using idle lands, water surfaces and agricultural land.

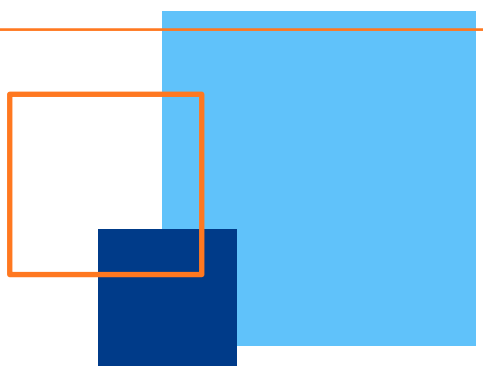


The Bratislava case showed how urban planning can revitalise public spaces with goals of people's well-being and climate resiliency.

Climathon Bratislava is an effective method of citizen participation that could be widely used in many cities in Japan and other countries.



Mapping information is useful for urban planning to incorporate climate change measures. All Japanese cities, including Tokorozawa, have produced flood hazard maps. Bratislava is assessing ecosystem services, including climate resiliency, with Ecoindex. It is also mapping the photovoltaic potential of building roofs.





# THE IURC PROGRAMME

The International Urban and Regional Cooperation (IURC) programme enables cities in different global regions to link up and share solutions to common problems. It is part of a long-term strategy by the European Union to foster sustainable urban development in cooperation with the public and private sectors, as well as representatives of research and innovation, community groups and citizens. Through engaging in IURC, cities will have the chance to share and exchange knowledge with their international counterparts, building a greener, more prosperous future.

The IURC programme is an opportunity for local governments to learn from each other, set ambitious targets, forge lasting partnerships, test new solutions, and boost their city's international profile. Its activities will support the achievement of policy objectives as well as major international agreements on urban development and climate change, such as the EU Urban Agenda, the UN Sustainable Development Goals, and the Paris Agreement.

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