

Global Urban Innovation Brief



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Introduction

Established in 2020, DiSTEP is the research institute that specializes in promoting emerging science-based industries and regional innovation, connecting Daedeok Innopolis and Daejeon City, while evaluating and analyzing science-based innovation projects funded by Daejeon City. To achieve its mission, DiSTEP identifies and plans international cooperation projects for Daejeon City that address global issues such as sustainable urban growth and climate change.

As part of this initiative, DiSTEP has collaborated with various experts from around the world to publish this brief to showcase cases of science-based urban innovation in different cities and provide implications for policy makers. Starting with this first brief, we hope to make this publication a yearbook to explore more opportunities to collaborate with other cities in science-based sustainable regional development.

This publication, the first Urban Innovation Brief, showcases the revitalization of regional economies through smart specialization strategies and collaborative nurturing of startup ecosystems. It also highlights examples of addressing urban challenges through 4th Industrial Revolution technologies, such as IoT.

We hope this brief will provide valuable information to those actively engaged in science and technology-based urban innovation, including stakeholders in Daejeon City.



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Sustainable Urban Development and the Six City Strategy



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(Territorial Development Unit, European Commission Joint Research Centre)

Analysis and promotion of the importance of place-based policy and territorial ecosystems in sustainable innovation policy lie at the core of the work of the Territorial Development Unit of the European Commission's Joint Research Centre (JRC). This work provides important support to European Union (EU) regional development policy, with increasing emphases on sustainable development and meeting the challenges of the twin green and digital transitions. In addition to providing stakeholder support to the development and implementation of Smart Specialisation Strategies for research and innovation (RIS3) at both national and regional levels, the unit has placed particular emphasis on urban development and engagement with city stakeholders.

As home to 72% of the EU population, cities play an increasingly important and complex role as agents for change in meeting many current and future policy EU and global challenges, such as: climate change, immigration, air quality, social inclusion, and ageing population.

To follow and support the engagement of cities in meeting these challenges, the JRC URBADEV project has sought to generate and share knowledge on the implementation of sustainable urban development (SUD) strategies, to elaborate guidance, and to develop capacity-building tools and facilitate peer learning.

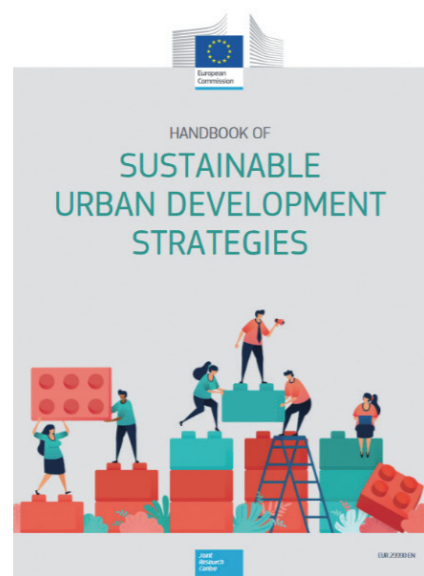


Figure 1: Handbook of Sustainable Urban Development strategies cover.

Source: JRC, 2020.



The JRC Handbook of Sustainable Urban Development Strategies provides valuable knowledge on how to implement integrated and place-based urban strategies as supported by EU funds for regional development. It aims to serve local authorities, managing authorities and all other relevant stakeholders.

Conceived as a policy learning tool, the Handbook responds to the needs and conditions of different territorial and administrative contexts. It does not aim to provide a 'quick fix', but rather, offers suggestions on how to tackle key challenges during the process of strategy design and implementation, by giving concrete examples and referring to existing studies and guidelines.

The Handbook addresses the EU's integrated approach to urban development by means of six key building blocks: strategic dimension, territorial focus, governance, cross-sectoral integration, funding and finance, and monitoring.

The Handbook is a joint initiative by the European Commission's Directorate General for Regional and Urban Policy (DG REGIO), and the JRC. It also benefits from the active engagement of policymakers, practitioners, and scholars. The Handbook relies on data available in STRAT-Board, a database and online tool developed by JRC, which provides an overview of SUD strategies implemented in 2014-2020.

The Six Cities Strategy

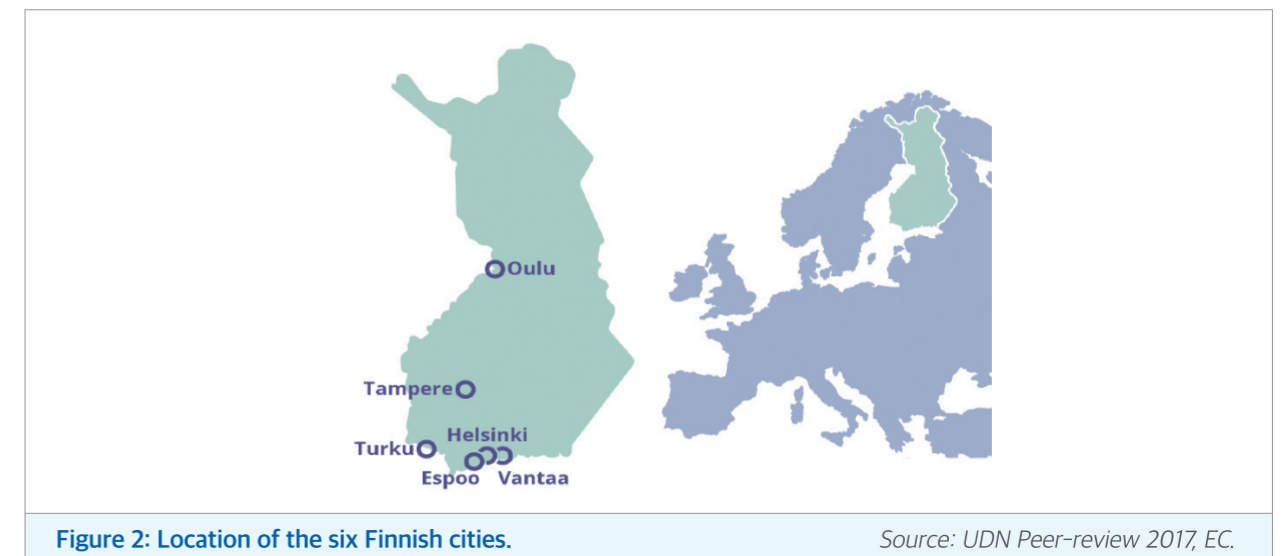


Figure 2: Location of the six Finnish cities.

Source: UDN Peer-review 2017, EC.

Among the cases documented in the Handbook is the 2014-2020 SUD Six City Strategy for Open and Smart Services (6 AIKA). Implemented across a network of Finland's six largest cities (Helsinki, Espoo, Vantaa, Tampere, Turku, and Oulu), this is a valuable example of the use of Smart Specialisation to implement innovation strategies at urban level, combining them with broader urban development objectives and improved national competitiveness.

Under the governance of the city authorities and local business and innovation agencies, the strategy has sought to foster innovative solutions to urban challenges from companies and R&D organisations. It has focused on three main areas of implementation:



- open innovation platforms, establishing innovation communities for stakeholders to test and develop new services and products;
- open data and interfaces, opening up and harmonising public data to help companies scale up their business; and
- open participation and consumer engagement, facilitating cooperation between users and providers to achieve more effective city services.

The 2014-2020 strategy had a total budget of approximately EUR 100 million with a contribution from EU funds of EUR 45 million, combining European Regional Development Funds (EUR 39 million) and European Social Funds (EUR 6 million). The main objective of the strategy was to strengthen the overall competitiveness of Finland through urban innovation, particularly in services, as well by enhancing competitive business and increasing employment. Furthermore, the strategy sought to foster greater cooperation between the cities, working together on concrete development projects and sharing the results.

The initiative has had positive outcomes, reinforcing cooperation among cities as well as between regions and cities. At local level, it has strengthened and broadened stakeholder engagement, promoting improved communication among them, with the exchange of good practices, as well as increasing stakeholder commitment to deliver Smart Specialisation at the city level.

Central to this strategy were collaboration and co-creation. The strategy was based on the joint ambition of the cities with regard to the challenges of urbanisation, climate change and ageing. The six cities have combined forces to find solutions to these challenges. The strategy had a solution oriented thematic approach, taking the network of the six cities as a single market place for the development of innovative solutions coming from companies, universities and other R&D organisations. The strategy focused on tackling significant urban issues at both the regional and city levels and was also aligned with national and European innovation and sustainable development.

Cities has been at the heart of this process. Although they are quite different in their respective urban visions and their approaches to tackling sustainable development, there are particular topics of mutual interest on which they worked together and learned from each other.

Under the strategy, almost sixty projects were launched across the three main implementation areas. These projects have sought to tackle a range of urban challenges, from smart mobility and clean technology to health and education. Project activities have centred on the development of experimentation platforms to enhance products and services, to create world-class reference sites, utilizing open data and interphases and a co-creation methodology engaging stakeholders from the quadruple helix of business, research, education and civil society.

As reported by Tuula Antola (Director of Economic and Urban Development, City of Espoo, Finland) during a 2021 UDN (Urban Development Network) seminar organized by JRC in collaboration with DG REGIO, the



issue of how to develop as well as what to develop was crucial. Sustainable urban development is largely about building innovation capacity across the whole community beyond the initial developers. The Six Cities co-creation model is a useful tool to align various aspects of the Sustainable Urban Development strategy with global agendas such as the Sustainable Development Goals. The projects through which the strategy has been implemented can be divided into a number of thematic areas: smart mobility, learning, circular economy and energy, training and employment, health and wellbeing. Through these projects, the strategy has generated new knowledge and developed competences for SMEs, using the tools of digitalization, open data and interfaces and bottom-up co-creation. The strategy has also been aligned with the 'Low Carbon Agenda.' Notably, Espoo has targeted the achievement of carbon neutrality by 2030.

Last Mile project – new sustainable mobility

Implemented in the Helsinki metropolitan area between 1 September 2017 and 31 March 2020, the Last Mile project brought together citizens, local authorities, universities, research institutions, as well as mobility and tourism companies. The goal? To improve the mobility of residents, employees, customers and international visitors in the Helsinki region and supplement the existing transport system. The aim of the project was to find quickly scalable solutions that could be expanded to new areas in the Helsinki region and to other cities in order to increase the attractiveness of public transport, find innovative ways of commuting, generate business from mobility solutions, reduce car use and promote a low-carbon economy.

The total investment for the project was EUR 1 858 238, with the EU's European Regional Development Fund contributing EUR 1 245 019 through the "Sustainable growth and jobs" Operational Programme for the 2014-2020 programming period. The investment fell under the priority "Producing and using the latest knowledge".

The project was coordinated by the Business Development Services of the City of Vantaa, with the other project partners being Espoo Marketing, Forum Virium Helsinki, Metropolia University of Applied Sciences, Aalto University and Demos Helsinki.

Before the strategy's implementation Helsinki public transport was already functioning well. However, certain recreation spots, tourist attractions as well as new work and residential areas were still hard to reach without a car. The negative impacts of such limitations in accessibility include, for example, hindering business expansion. Providing more extensive sustainable transport, including through use of intelligent transport systems, was identified as a key to unlock huge economic potential.

The Last Mile project implemented 20 pilot solutions to improve accessibility in and around the Finnish capital, including the cities of Espoo and Vantaa. These included city boat services, public land transport, hiking trips, collective rides for school students to sport practices, ridesharing services, traffic sense application, and a new bicycle rental concept.

Before the launch of the pilots, studies were conducted to highlight the needs of potential partner companies and transport users to ascertain the level of demand for various services. In addition, focus



areas and target groups were carefully defined, and challenges identified and discussed. 200 parties were involved in co-creating the services.

After the end of the project in 2020, Jätkäsaari Mobility Lab has continued the development of smart mobility solutions in Helsinki.



Figure 3: Smart mobility solutions.

Source: UDN Peer-review 2017, EC.

Next steps for Finnish cities: the InnoCities strategy

Based on the successful experience of the Six Cities Strategy, Finland has planned a new strategy for the 2021–2027 policy cycle called InnoCities - Innovative Cities and Communities with an increased budget of approximately EUR 140 million. The new strategy has a broader scope, now targeting 18 cities across the country through 16 “ecosystem agreements” signed between city stakeholders and with the Ministry of Economic Affairs and Employment. As a rule every city or town has its own agreement, but in a few cases a common agreement is shared between cities. This extends the activity beyond large cities to smaller cities and towns. Their common denominator is their current or potential innovativeness. Also, they all host Finnish universities or university centres. The new strategy has a stronger emphasis on research and innovation and, in particular, on the active involvement of young people for building a better society, with the final aim of meeting the challenges of the green and digital transition. The networking principle underpinning the Six Cities Strategy has also changed. With the previous strategy, implementation of all the sixty projects, collaboration between two or more cities was mandatory. While under InnoCities, INNOCITIES local projects are allowed. Despite the removal of the mandatory partnership principle, thanks to the previous experience a strong culture of collaboration has thrived, there is significant cooperation between municipalities at project level. While the Six Cities Strategy prioritised collaboration and scaling up per se, with InnoCities the overarching priorities are smart manufacturing, smart infrastructure (related to green and digital needs) and smart health, complemented by the specific priorities of each individual city or town.



In the words of Aleks Jäntti, Deputy Mayor of the City of Tampere¹⁾: “Innovation needs competition; competitiveness can be achieved though collaboration and collaboration benefits all”. In the specific case of Tampere, years of experimentation have underlined that the interaction between citizens, research institutes and companies is key, not just at cities, but also at state level.



Figure 4: Tampere's new tram

Source: Tiia Monto, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=107418336>

Tampere’s urban economic development programme, ‘Smart Tampere,’ has been renamed ‘Data driven cities for citizens’. Some of the projects under this city strategy programme will be implemented through the 2021–2027 InnoCities strategy. The focus is on improved use of data for business and services and the use of artificial intelligence. In relation to carbon neutrality the objective is to become 69% carbon neutral by 2030; an ambitious target also considering the weather conditions during winter (temperature can go down to -30 Celsius degrees). Therefore, overall on mobility, challenges are the strategies to foster change in citizens’ behaviours and the greater involvement of private sector. A recent investment of 100 million euro for a new tram system is going in this direction.

Conclusions

The EU, through its regional development policy, promotes sustainable urban development strategies to meet the global challenges of the twin green and digital transitions. Among the cases analysed by the JRC, Finland stands out for being a virtuous example of how to make the best of the EU funding opportunities to implement an innovation-led strategy at the local level.

¹⁾ Follow up interview conducted by JRC in March 2023.



The success of the Finnish case is reflected by the fact that the strategy implemented in 2014-2020 has been re-launched in the 2021-2027 programming period, with an increased budget and an extended number of cities involved.

The Finnish approach to sustainable urban development has been characterised by the use of cities as test-beds for innovation, with local innovation ecosystems playing a key role in driving economic growth. By leveraging the strengths of these ecosystems and testing new ideas in real-world settings, Finnish cities have been able to develop and implement innovative solutions that address global challenges while simultaneously enhancing economic competitiveness.

As a second key feature, Finnish strategies have emphasized the importance of collaboration between cities and co-creation with stakeholders, allowing for the development of joint solutions that are both effective and sustainable. Thanks to institutional learning, the culture of cooperation and creativity that underlies this collaborative approach has become an integral part of the Finnish approach to sustainable urban development.

Ultimately, the Finnish approach demonstrates that innovation and competitiveness work hand in hand with collaboration. By prioritising such a connection, it is possible to tackle global challenges with an approach responsive to the needs of both local communities and the broader economy.

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StartupCities, the new economic engines



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(Global StartupCities initiative)

Abstract

A range of new cases of international collaboration have been analyzed in terms of purpose of the project, local policies promoting public-private cooperation, driving entities, science tech clusters, partner organizations, project period, location, budget, and success stories fostering deep-tech startups, etc. This new cases are an emerging trend of local-global-local "Glocal" economic development known as the wide and open concept of "StartupCity". The StartupCity means new economic engine. The current state of the cases has been examined for five representative local economic sectors: agrifood, climate, health, games and mobility. The purpose of the brief paper was to seek synergetic interactions to boost regional innovation with science and technology-based urban growth engines. For the purpose of a comparative analysis, a real-world example has been included with the non-profit Global StartupCities initiative.

Keywords

StartupCity · Glocal economy · innovation · entrepreneurs · ecosystem

Introduction

The non-profit Global StartupCities initiative was launched in 2018 with the aim of interconnecting innovation ecosystems outside the big hubs for accelerating new economic opportunities through the matchmaking between startups, investors, and corporates in Europe.

StartupCity means new economic engine. The StartupCity concept is based on one ecosystem flagship per city and to interconnect their flagships in different strategic hubs (GSI 2018). So, the StartupCities are person-centered approach, based on entrepreneurs & innovators, as the key economic boosters. The ultimate goal of the initiative is to consolidate one big global economic hub based on each unique economic offer per StartupCity.

Since 2020, the initiative scaled-up for global level (Figure 1) with the bottom-up European innovation Area as the umbrella and connector for boosting these new European business opportunities for any European entrepreneur in any continent. The historic bottom-up European innovation Area was officially launched by the former Commissioner Mariya Gabriel for Innovation, Research, Culture, Education and Youth (EC 2019), and Honorary Global StartupCities Ambassador on November 25, 2020 at first Global StartupCities Summit (EC 2020).



Figure 1: Global Map of StartupCities 2023

Source: GSI, 2023.

Unique Summit

The Global StartupCities Summit is the annual main milestone of the Global StartupCities initiative, and it is known as Unique Summit (US 2023), with the aim of being held annually in a different continent since 2024 (after global pandemic). The Unique Summit's serial is an annual global matchmaking (Figure 2) for accelerating new economic opportunities between local economies from different continents within the Global innovation Area.

After brought together in 2021, at StartupCity Malaga, a total of 458 companies, investors and institutions from 20 European countries (a remarkable achievement in a pandemic context) to showcase their entrepreneurial ecosystems and to promote new business opportunities (X 2021). In 2022, at StartupCity Braga, above 800 people divided in more than: 40 ecosystems from all continents, 200 startups, 30 investors, and 125 corporations (BragaTV 2022). In 2023, at StartupCity Ostrava, the registration is open with currently participants from more than 25 countries and it will take place on November 22nd to 24th (MSIC 2023).



Figure 2: Unique Summit's Serial: Malaga, Braga, Ostrava

Source: GSI, 2023.



Global innovation Area

In 2022 during Unique Summit at StartupCity Braga, it was the official kick-off of the pioneer Global innovation Area which is divided into four continental bottom-up innovation Areas (Figure 3): America, Africa, Asia & Oceania, and Europe (the first pilot since 2020). Currently, the Global innovation Area has five Market iAreas (innovation Areas) as unique innovation spaces based on global startups calls, the local resources, and a pool of infrastructures between different StartupCities all over the world.

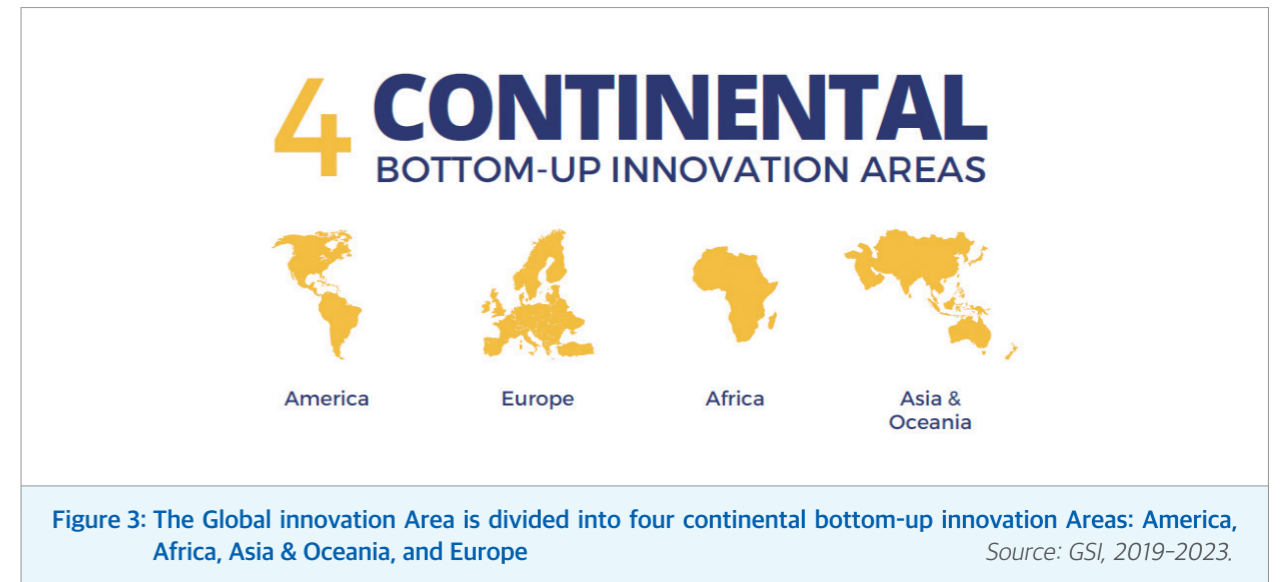


Figure 3: The Global innovation Area is divided into four continental bottom-up innovation Areas: America, Africa, Asia & Oceania, and Europe

Source: GSI, 2019-2023.

The pioneer Global innovation Area provides the backbone for interconnecting geographically local economies into five iAreas: agrifood, climate, health, games and mobility (Figure 4).



Figure 4: Five iAreas as economic accelerators within the Global innovation Area

Source: GSI, 2023.



Moreover, each iArea is nominating Top Entrepreneurs & Innovators based on a combination of public and neutral information such as startups competitions, startups reviews, and last news. Every year, the main benefits for the new cohort of founders (Top Entrepreneurs & Innovators) are mainly recognition and visibility at global level, and to accelerate new innovative solutions such as the following ones related to urban growth (Table 1):

Table 1: New innovative solutions related to urban growth *Source: GSI, 2020-2023.*

Founder	Key factors	Innovative solutions	Location
Andrés Martinez Vidal	Renovation Spaces: Smart City (local economy: small municipalities & businesses)	https://iurban.es/totems-and-displays/?lang=en	StartupCity Malaga
Beres Seelbach	Cargobike: "last mile" of delivery	https://onotion.com/en/our-solutions/	Berlin
Polina Mikhaylova	Micromobility: Universal docking station for scooter sharing	https://www.knotcity.com/en/products/	Strasbourg
Thomas Korn	Mobility: Hydrogen 12m city bus	https://www.keyou.de/solutions	Munich

A real-world example

As comparative analysis for boosting regional innovation, the non-profit Global StartupCities initiative is an uncommon success story of global cooperation based on "less is more" mindset, resilience mode, and slow cooking to scale globally.

In the first stage, the last five years, the sustainability of the initiative has been with the support of the initial local entities which are managing each StartupCity. These means lean mode with horizontal management where the initiative created a legal entity which is the secretariat with very simple bureaucracy process, no membership fees, and to join the initiative is only by invitation with the prerequisite of being proactive.

After the successful first stage, the second stage will starts in January 2024, it will have a sustainable business model with an annual symbolic fee and global sponsors in order to support the portfolio of iAreas activities with the Unique Summit as the final accelerator, and global impactful activity.

New cases of international collaboration

Table 2 presents a range of new cases of international collaboration in terms of purpose of the project, local policies promoting public-private cooperation, driving entities, science tech clusters, partner organizations, project period, location, budget, and success stories fostering deep-tech startups, etc. This new cases are an emerging trend of local-global-local "Glocal" economic development known as the wide and open concept of "StartupCity".



Table 2: Emerging trend of new "Glocal" collaboration *Source: GSI, 2019-2023.*

Main objective	Local Policies	Driving entities	Science Tech Clusters	Partner Organizations	Project Period	Location	Budget	Deep-tech Startups
Cross-bording	Yes	Local authorities	Yes	Key local players (academia-business)	2019-2020	Eastern Europe (zero zones: Cluj-Napoca, Varna)	< €20k	Blockchain IoT
Gaming industry	No	Local economic agencies	No	Corporates	2020-ongoing	Global (zero zones: Cologne, Malaga)	< €40k	AI
CleanTech	Yes	Local economic agency	Yes	Corporates	2021-ongoing	Global (zero zone: Ostrava, Valencia)	< €30k	AI Machine learning
Mobility	No	Local economic agency	No	Business clusters	2022-ongoing	Global (zero zone: Vantaa)	< €15k	Big data
Digital health	Yes	Local economic agency	No	University	2023	Global (zero zone: Braga)	< €15k	VR

The best example of "Glocal" collaboration is the project related to Gaming industry, for the first time ever we have managed that two medium & large innovation ecosystem share data base of founders to find business synergies to be scaled. Moreover, there is an on-going roadmap with local events as accelerators of these business synergies.



Conclusion

This paper has been conducted on the field of “Glocal” economic development link with the emerging and consolidated “Glocal” trend of the StartupCity concept since 2018. The current state of “Glocal” economic development state has been investigated for five representative economic sectors impacting the local-global-local level. Goals in all of those sectors are to be crucial economic accelerators based on entrepreneurs and innovators.

This paper outlines the potential of multiplier effect and economic synergies between innovation and entrepreneur ecosystems worldwide with this pioneer StartupCity concept.

The aim of the study has been to provide a practical view of new innovative solutions related to urban growth. As an application, some emerging and synergetic trends between innovation and entrepreneur ecosystems have been identified, mostly related to local economic agencies as driving entities.

“Glocal” development represents a permanent challenge that requires scientific innovation, tech oriented with the cross-ecosystems collaboration as potential problem-solver. In conclusion, there is a great opportunity with the on-going development of StartupCity Daejeon, could be leading a hypothetical Urban iArea as a real-world example of “Glocal” development, and economic accelerator with Daejeon’s peer cities within the Global innovation Area in 2024.

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Partnership Model to Catalyze Regional Economic Development

Greater Seattle Partners’ Public-Private Science & Technology Sectors Solving Global Problems



Josh Davis
(Greater Seattle Partners)

Seattle Region Overview

Half of all operational satellites currently orbiting Earth were created in Washington State, with the vast majority of these made in the greater Seattle area. Those already approved by the United States Federal Communications Commission (FCC) will push this number closer to 80% very soon. This is in addition to the infrastructure and technology required to launch, control and capture data from satellites, which are led by notable Seattle-based companies such as Aerojet Rocketdyne, Amazon, Boeing, and Microsoft. While quite amazing, this is just the tip of the iceberg in understanding the Seattle region.

Seattle’s first forays into technology have more down-to-earth origins beginning with the first peoples of the Puget Sound area. These people developed the tools to engage in fishing, manufacturing, and trade with networks extending throughout Canada and the Western United States. The first settlers used their own technologies to suppress and capitalize upon the Salish people, but today these indigenous tribes are honored and celebrated and an integral part of Seattle’s modern economy.

Before the days of artificial intelligence, quantum computing and semiconductors, Seattle’s economy in the 19th century was largely supported by mining, maritime, and logging. It was the forestry industry that largely led to the formation of The Boeing Company in 1916, proving to be the catalyst that would truly put Seattle on the global stage.

The speed at which science and technology took shape in Seattle was heralded by such companies as:

- Weyerhaeuser (1901)
- Starbucks (1971)
- T-Mobile (2001)
- Paccar (1905)
- Microsoft (1979)
- Salesforce (2019)
- Boeing (1916)
- Costco (1983)
- Alaska Airlines (1951)
- Amazon (1994)



Today, many of these companies are driving economic growth locally, in Korea, and throughout the world. It is this global reach that helps support a population of more than 4.1 million and a gross domestic product (GDP) surpassing \$410 billion. The Seattle region's economy is about the same size as that of Daejeon and Seoul combined, even though it has less than half the population.

Seattle has a very high location quotient (LQ) in key industries relevant to the global conversation. LQs are studied by economists and used by economic developers to both understand and drive decision-making models related to growth. According to the Bureau of Labor Statistics, LQs are calculated by first, dividing local industry employment by the all-industry, all-ownerships total of local employment. Second, national industry employment is divided by the all-industry, all-ownerships total for the nation. Finally, the local ratio is divided by the national ratio. An LQ of one (1.0) represents parity of the local and larger reference area. Expressed also as the following:

$$LQ = \frac{e_i/e}{E_i/E}$$

Where:

e_i = Local employment in industry i

e = Total local employment

E_i = Reference area employment in industry i

E = Total reference area employment

Figure 1

Source: https://en.wikipedia.org/wiki/Economic_base_analysis

When seen through this lens, Seattle has some stunning LQs as calculated using the metropolitan statistical area (MSA) versus the United States as a whole. This is how Seattle compared to the U.S. as a whole in 2022:

- Aircraft Manufacturing = 17.86
- Freight Transportation (Water/Seabourne) = 8.75
- Software Publishers = 8.61
- Seafood Product Preparation and Packaging = 5.07
- Wireless Telecommunication Carriers = 4.88
- Data Processing and Hosting = 3.53
- Port and Harbor Operations = 3.31
- Research and Development in Biotechnology = 2.72
- Environmental Consulting Services = 1.68

Source: Lightcast 2023 [1] <https://lightcast.io>



Science and Technology for Urban Innovation

The Seattle region has a very intentional policy and practical solution to catalyze innovation, encourage collaboration, and inspire problem solving measures through a “partnership” model implemented by both public and private industries through the establishment of “Greater Seattle Partners” (GSP). Formed in 2018 under the leadership of Challenge Seattle, an alliance of CEOs at that time from 17 of the region's largest employers, GSP is the culmination of efforts to support broad-based economic growth throughout the region and establish a bold vision for greater Seattle's future. Where Challenge Seattle is designed to address important regional issues from a policy perspective, GSP was charged with implementing economic development including attracting companies to the region globally. Companies were motivated by strong leadership making the case for unity and regionalism to project the region's brand globally.

These partners include but are not limited to: Amazon, Boeing, Deloitte, Microsoft, City of Seattle, University of Washington, Seattle University, Port of Seattle, and many other cutting-edge creators and users of science and technology who invest in and partner with GSP in order to solve regional problems. These include projecting the area as a global region, developing the economy, supporting the green transition, and solving some of the most pressing problems the globe is facing.

GSP is not a government entity (though it has many investors who are), and it is also not a for-profit private enterprise (though it also has many). Structurally, GSP is a non-profit designed to act as a connector and catalyst for one of the world's most innovative regions.

Some concrete examples of this private/public model include:

- Centers of Excellence

The development of innovation parks such as the Cascade Industrial Center (CIC) in Snohomish County, just north of Seattle. A long-term joint effort by GSP partners and local cities, counties, and economic development groups, the 4,000-acre property is now a center of science and technology excellence and home to domestic and global companies such as Blue Origin, Boeing, Eviation and Tesla. The CIC supports more than 2,000 jobs in high-tech manufacturing, packaging, and distribution with nearly 12,000 new jobs to be ready by 2040.

- International Relations

In the summer of 2023, the Asia Pacific Economic Cooperation (APEC) chose to host its Digital Month in Seattle under the banner of “Building a Digital Pacific for All.” Clearly, Seattle is recognized as one of the world's most vibrant tech hubs, pioneering new innovations to advance the digital economy and provide greater access to underserved individuals and small businesses.

GSP established and convened the Host Committee that welcomed senior government officials from 21 member economies over the course of almost four weeks. Its public and private partners hosted dozens of events, receptions, and meetings, and organized regional science and technology tours to educate attendees and showcase the innovation ecosystem.

In greater Seattle, total trade with APEC member nations surpassed \$1 trillion from 2012 to 2022, averaging over \$90 billion annually, or 76% of the region's total trade. Strong foreign direct investment from APEC member economies during this time created more than 8,000 direct jobs and \$3.5 billion in investment



in Washington state. These economic connections have contributed to a diverse foreign-born population, further enriching the social fabric of our communities.

- Leadership Missions

To further connect urban areas using a light rail network (figure 3) and the latest technology, GSP and the Seattle Metropolitan Chamber of Commerce engaged in the “High-Speed Rail” economic development conversation both regionally and abroad. In 2022, GSP led an “International Leadership Mission” to Japan in order to, among other science and technology driven themes (e.g., Urban Hydrogen), explore the Shinkansen and the Magnetic Levitation Train (Maglev), as well as JR Central’s operations with commercial partners (figure 2). In a similar way, GSP visited Daejeon in October 2023 and December 2023, and is planning to visit Daejeon in April 2024 to build more global-to-local science and technology partnerships.

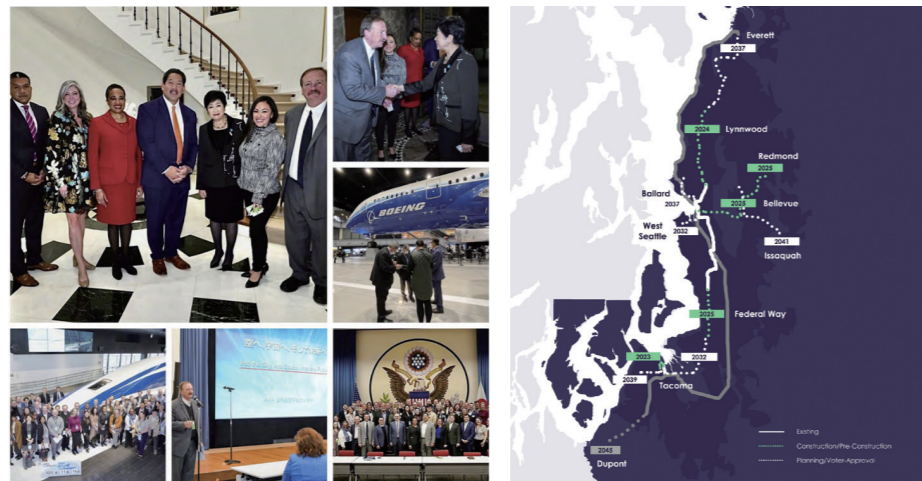


Figure 2: Mission to Japan & Figure 3 Seattle Region Light Rail Network
 Source: Photo Credit Alabastro Photography <https://www.alabastrophoto.com>

Global Business Attraction

In Spring of 2023, GSP hosted senior-level executives from nearly 30 companies based in Asia, Europe, and North America as part of SelectUSA, a federal program that promotes business investment. Titled the Seattle SelectUSA Spinoff, attendees toured several sites across the region including the Amazon Spheres and Boeing’s Everett factory where the 777x is made. In addition, they met with local leaders at Alaska Airlines, Microsoft, Port of Everett, Port of Tacoma, The Tulalip Tribes and more.

The results of the Spinoff led to several companies choosing to locate to the Seattle region including India-based climate tech company Earth Care Equipments, Chargepolo, a French company that makes fast-charging infrastructure for electric-vehicle fleets, and Jobley, a Japanese medtech company. GSP will host another Spinoff in spring of 2024 and Korean companies are invited to apply to attend.



Figure 4: Point Ruston with SelectUSA Participants
 Source: Greater Seattle Partners <https://greater-seattle.com>

These examples illustrate how a public/private partnership model can help advance science and technology through a culture of collaboration. Our region shares a rich history and connectivity with Korea, and we remain steadfast in our commitment to expanding and deepening economic ties and pursuing new advancements in science and technology, recognizing the significant benefits that such engagement brings to our workers, families, and businesses. By fostering strong public and private partnerships, we will ensure sustainable and inclusive economic growth for all.



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Facing Climate Change through Technology in the 4th Industrial Revolution: The Case of Los Diamantes, Costa Rica



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Abstract

This paper explores the use of technologies in the context of agriculture to address the pressing challenges of climate change in Costa Rica. The study begins by recognizing climate change as a significant global environmental concern, emphasizing its detrimental effects on agriculture and the vulnerabilities faced by Costa Rica in the Latin American and Caribbean region. The central objective is to demonstrate how technological advances, particularly those encapsulated within the 4th Industrial Revolution, can offer innovative solutions to mitigate the impact of climate change on Costa Rican agriculture. It highlights the ability of IoT to collect and analyze real-time data from smart devices deployed at crop sites. The paper explores a concrete application of these technologies through the implementation of climate-smart greenhouses. The project “Leveraging Technologies to Support the Government of Costa Rica in the Development of a Climate-Smart Greenhouse Strategy and Commercialization” is described. The collaboration involves key institutions such as the Central American Bank for Economic Integration (CABEI), the Korea-CABEI Single Donor Trust Fund and consortium members including Shinhan A-Tec, KAIST, Controlsoft and the University of Costa Rica.

Key Words

Climate Change, Agriculture, Technology, Internet of the Things (IoT), International Cooperation

Introduction

Climate change is one of the greatest environmental challenges facing humanity in the 21st century. The United Nations Framework Convention on Climate Change defines it as a significant change in the planet’s climate due to the direct and indirect influence of human activity. The effects of climate change are manifested through extreme weather events, increased temperatures, changes in rainfall patterns and a significant impact on agriculture (UN, 1992).



Agriculture is one of the activities most vulnerable to climate change, since it is highly dependent on climatic and environmental conditions. Latin America and the Caribbean, in particular, are facing extreme weather events that threaten the region’s food security. Costa Rica, a country known for its rich biodiversity and agricultural production, is not immune to these challenges (CABEI, 2022).

The purpose of this paper is to show how technology within the framework of the fourth industrial revolution can be used to address the challenges of climate change in Costa Rica’s agricultural sector. A project will be presented that demonstrates how the Internet of Things (IoT) for example can contribute to the adaptation and resilience of Costa Rican agriculture.

Climate Change in Costa Rica

Costa Rica has experienced a steady increase in the intensity of extreme weather events in recent decades. Between 1988 and 2014, the country suffered 42 extreme floods and droughts, resulting in estimated losses of US\$461 million (MINAE, 2020). In addition, temperature increases and abnormal weather patterns have been observed, affecting agricultural production.

The impact of climate change on Costa Rican agriculture is reflected in decreased crop yields, loss of biodiversity, and threats to food security. These challenges require innovative solutions to increase the resilience of the agricultural sector (CABEI, 2022).

4th Industrial Revolution and Agriculture

The Fourth Industrial Revolution represents an era of technological advances including automation, artificial intelligence, robotics and connectivity. These technologies have the potential to transform agriculture by providing advanced tools for crop management, decision making and resource optimization (Bersani et al., 2022). In the context of agriculture, the 4th Industrial Revolution translates into more efficient and sustainable farming practices; the application of advanced technologies in agriculture, known as Agriculture 4.0, is revolutionizing the way the food supply chain is grown, harvested and managed (Howard, 2021).

Internet of Things (IoT) in Agriculture

The Internet of Things (IoT) refers to a global network of interconnected smart devices that collect and share data in real time. In agriculture, IoT is used to monitor and control various variables, such as temperature, humidity, soil quality and crop growth (Bersani et al., 2022). IoT sensors installed in the agricultural field continuously collect data and send it to a central platform where it can be analyzed and used to make informed decisions. This allows for more accurate resource management and faster response to changing weather conditions.

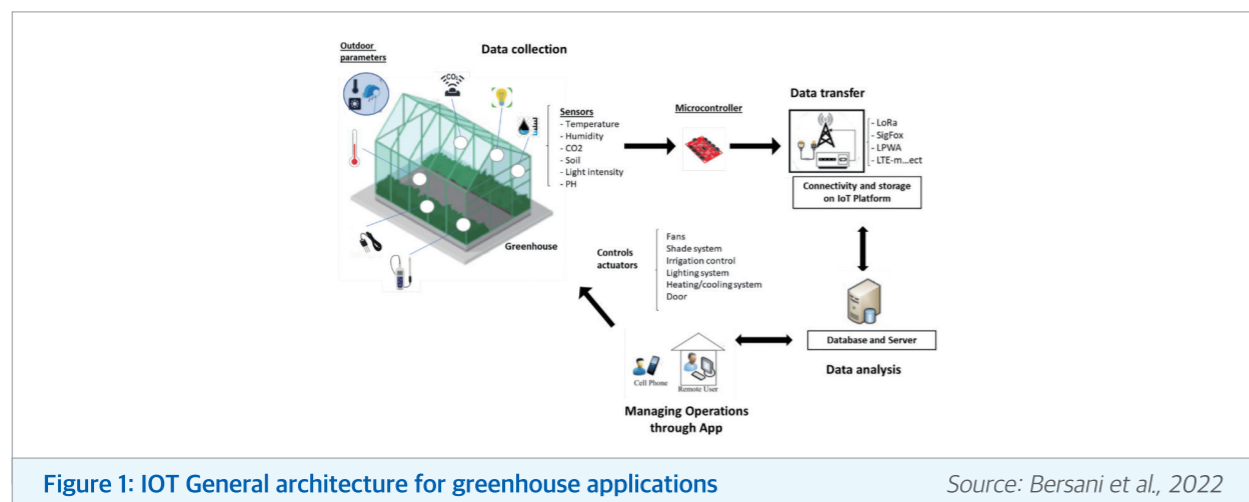


Figure 1: IOT General architecture for greenhouse applications

Source: Bersani et al., 2022

Climate-Smart Greenhouses Implementation Project

In the past, Costa Rica has witnessed the implementation of several projects related to climate-smart greenhouses, however, documented information is limited. In the agricultural sector, there has been some mistrust towards this technology due to previous disappointing experiences. Some Costa Rican farmers have expressed reservations, citing failures in past initiatives, including inaccurate production, sales and price projections, as well as insufficient attention to the producers' learning curve and price volatility, which have generated skepticism and highlight the need to carefully address these aspects in new projects.

In this context, and taking past situations as an opportunity for a resilient and successful project, under the name "Leveraging Technologies to Support the Government of Costa Rica in the Development of a Climate-Smart Greenhouse and Commercialization Strategy", this project is developed with the hope of implementing climate-smart greenhouses at the Los Diamantes Experimental Station, which is responsible for research, development and technology transfer.

The station is located in the province of Limón, which has a population of 469,797 inhabitants; the main Costa Rican ports for foreign trade in the Caribbean Sea are located in this area (INTA, 2022).

The entities participating in this project include the Central American Bank for Economic Integration (CABEI) in collaboration with the CABEI-Korea Single Donor Trust Fund. The main objective of this fund is to provide non-reimbursable resources for the benefit of the developing member countries of the CABEI in the Central American region; these resources are used to identify and prepare projects that incorporate Korean content, technologies and solutions in various sectors. In addition, they seek to leverage the experience and expertise of the Republic of Korea to promote the adoption and use of innovative technologies in activities implemented by the Bank, especially in sectors related to sustainability and regional development (CABEI, 2022).

The National Institute for Innovation and Technology Transfer in Agriculture, known in Spanish as INTA, is a public institution in Costa Rica in charge of technology transfer, research and development in the agricultural sector; in this project, it plays a crucial role as executing agency and recipient of the technology, contributing significantly to its implementation.



Shinhan A-Tec is the main partner of the consortium formed for the development of the project, a pioneer in the smart greenhouse industry in Korea; two additional members are participating: the Korea Advanced Institute of Science and Technology (KAIST), a high-level science and technology university, and Controlsoft, a technology company based in Costa Rica. Shinhan A-Tec and KAIST, focus on technology selection and deployment plans, the Costa Rican member of the consortium, Controlsoft, is dedicated to the adaptation and commercialization of the technology in the local context. The University of Costa Rica, in collaboration with KAIST, plays a crucial role in providing workshops for capacity building and technology transfer to stakeholders in Costa Rica's agricultural sector.

The project's objectives focus on increasing the adaptive capacity of Costa Rica's agricultural sector to climate change, as well as supporting small, medium and large agribusinesses to increase the productivity and market value of the area's agricultural products. Finally, to strengthen the agricultural supply chain and increase food supply to domestic and international markets; these objectives are expected to stimulate agricultural R&D and contribute to increasing the export value of products grown in climate-smart greenhouses.

The project was designed with three components:

- The first consists of conducting a feasibility study and market analysis to identify the opportunities and challenges of implementing climate-smart greenhouses in Costa Rica. This component is expected to select high-value crops that allow the development of sustainable business models, as well as the detailed design of the greenhouses, including technical specifications and cost analysis.
- The second component will develop the construction and deployment of the greenhouses in a strategic location, Los Diamantes Experimental Station (EELD), in Guapiles, Limon province.
- The third component consists of the transfer of knowledge and skills to key stakeholders in both the public and private sectors.



Figure 2: Project components

Source: Own elaboration based on CABEI Terms of Reference



Expected results and impact

The implementation of climate-smart greenhouses is expected to have a significant impact on Costa Rican agriculture, increasing crop productivity, improving the quality of agricultural products, reducing risks related to climate change, increasing efficiency in the use of resources such as water and energy, and contributing to the growth of the agricultural industry and the national economy using research and development as an engine of production.

Conclusion

The implementation of climate-smart greenhouses is expected to have a significant impact on Costa Rican agriculture; first, the sector will benefit from access to data sources based on the proof of concept built through the cultivation and use of the technology, which will allow testing and evaluating business opportunities for the construction of greenhouses in other areas of the country. This will open up the possibility of expanding this successful model to other areas, thus fostering growth in agriculture at the national level.

The skills developed through this project will enable stakeholders to implement cost-effective, scalable, data-driven business models to increase supply in the crop market. This approach will provide the opportunity to explore new ways of adding value to productive activities, thus fostering innovation and economic growth.

On the other hand, a more resilient and sustainable agricultural system will be fostered; the project will facilitate the creation of synergies between economic profitability and productivity in agricultural enterprises, integrating climate resilience measures. This will not only impact in terms of economic results, but will also have positive effects on social and political aspects, such as food stability, nutrition and the promotion of well-being in general.

This project will demonstrate an effective approach to climate adaptation and production enhancement, which will contribute to mitigating the adverse impacts of climate change on crops; this approach will not only generate immediate benefits, but will also highlight the continued need for technology development and transfer in Costa Rica's agricultural sector to address ongoing environmental challenges.

Climate change has left its mark on Costa Rican agriculture, with floods, droughts and changes in weather patterns affecting food production and food security. However, the implementation of climate-smart greenhouses, supported by collaboration between the Central American Bank for Economic Integration, the Korea-CABEI Single Donor Trust Fund, and key players such as the National Institute for Innovation and Transfer of Agricultural Technology (INTA), Shinhan A-Tec, KAIST, Controlsoft, and the University of Costa Rica, points a way towards resilience and sustainability.

The project, aimed at increasing the adaptive capacity of Costa Rican agriculture to climate change, has demonstrated the applicability of IoT in transforming agricultural practices; Agriculture 4.0, with its focus on efficiency and sustainability, manifests itself in accurate crop management, informed decision making, and resource optimization, thanks to the deployment of IoT sensors in greenhouses.



The relevance of South Korea in this process cannot be overlooked, as a technology leader, Korea has contributed expertise and innovative solutions through its representatives in the consortium, Shinhan A-Tec and KAIST. Technology transfer and collaboration between countries demonstrates the ability of the international community to join forces in the fight against global challenges.

In summary, the implementation of climate-smart greenhouses not only seeks to increase the productivity and resilience of the agricultural sector in Costa Rica, but also to contribute to economic growth and food security. The convergence of the Fourth Industrial Revolution and IoT and South Korea's experience in this project highlights the transformative potential of technology to address the challenges of climate change in agriculture. Costa Rica's story, woven with innovation and collaboration, becomes an inspiring example for the rest of the world in the search for sustainable and technological solutions to climate change.

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How Technology Became City Solution?

Case Study from Nakhon Si Thammarat City Municipality, Nakhon Si Thammarat Province, Thailand



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Abstract

This article aimed to deliver the experience-sharing for the success story of Nakhon Si Thammarat Municipality on how the city resolved the city's issues by using technology as a tool. According to the geographical characteristics of the city, the city has to bear with several severe floods which affect social and economic damage, the city has an innovative idea to transform the conventional monitoring system made by their employees to implement a monitoring system, consider technology like CCTV camera and Smart City Mobile Application as a powerful tool, and the project was successful through the collaboration among all stakeholders. Moreover, this project is also aligned with the UN Sustainable Development Goals in terms of SDG11 and SDG 13.

Keywords

Smart City, Flood Control, Collaborative Innovation, Sustainable Development Goals

Introduction

Thailand, the country is located in Southeast Asia. Thailand with number of populations 66.07 million people, GDP in 2022 is 495.3 billion USD. The IMD World Competitiveness Ranking 2023 is 30th for overall competitiveness, Technological Infrastructure rank is 25th and Scientific Infrastructure is 39th from 64th countries, the ranking came from Economic Performance, Government Efficiency, Business Efficiency, and Infrastructure.

Nakhon Si Thammarat Municipality, got Thailand Smart City Solutions Awards 2022 awarded by the Digital Economy Promotion Agency (DEPA) Thailand with various projects under smart city scope, focusing on the leverage of various technologies for the city's solutions. Nakhon Si Thammarat, a province in the southern part of Thailand, is a historic and economic city with the number of populations over 100,000 people. Due to the geographical characteristics of the city and heavy rainfall, Nakhon Si Thammarat City Municipality faces severe



floods. By developing Innovative Flood Control with a Smart City Mobile Application, the municipality has completely transformed flood control. Before this invention, city employees had to physically go to locations prone to flooding, the tops of mountains, and the five main city canals in order to keep an eye on the levels and flows of water. This manual approach frequently produced inaccurate results and caused the information to be disseminated slowly, which caused flooding incidents to be responded to too late and maybe made the situation worse.

With the use of a network of carefully positioned CCTV cameras, the invention is able to monitor places that are vulnerable to flooding, the summits of mountains, and the five main city canals. The constant monitoring of water levels and flows by these cameras removes the city employees' demand for direct, on-the-ground monitoring. Changes from manual to all parties are guaranteed timely and correct information delivery through automatic monitoring participants in the management of floods.

Path to Innovation

Start with the city problem

The city faced recurring issues from severe flooding events caused by heavy rainfall and the unique geological location of the city influenced by the inflow of water from the hills through five city canals as well as inadequate water management. Previously the monitoring system relied on manual observation, resulting in inaccuracies and delayed responses to flooding events affected to social and economic loss.

The Nakhon Si Thammarat City Municipality realized that they were delayed in notifying of the water situation so the time to mitigate the level of the problem was limited they came out with the idea of how to get notified earlier so they would have more time to mitigate the level of the issue. The idea was to replace the manual monitoring system with human observation which was not efficient enough and delayed by developing a system monitoring the status of the problem with technologies. The system provides real-time information for city management. The monitoring system is comprised of the smart city mobile application and hardware system which are CCTV cameras and a communication network.

Approach

Considering the tool and management that would solve the issue, the city transformed in 2 approaches as follows

- **Technological Transformation:** Onsite observation to real-time observation by CCTV Network Implementation, leverages CCTV cameras network system strategically by setting up CCTV cameras at key locations, including mountain tops, city canals, and flood-prone areas. CCTV Cameras continuously monitor water flows and levels, eliminating the need for physical on-site observation. Real-time Information Dissemination: Prompt and accurate information is delivered through a user-friendly Smart City Mobile Application to stakeholders involved in flood management. Besides that the Smart City Mobile Application actively involves various stakeholders, fostering community collaboration in various aspects of city development.



- **Management:** People-centric: from only the person in charge to make citizens participate regularly



Figure 1: Mobile Application

Source: Nakhon Si Thammarat City Municipality

Stakeholders

“The key stakeholders are the municipality and their citizens”

One of the key successes of the implementation technology under the domain is to consider stakeholders' needs and how to make them participate in the system, the city chooses a People-Centric approach.

The system management relies on a people-centric approach, The innovation has brought community engagement with around 60% of the population, or over 60,000 residents and 2,000 student volunteers participating in the monitoring system, through the Smart City Mobile Application which provides them with the channel to communicate with the municipality for instance case of flood situation or other municipality service such as garbage collecting.

The key feature is residents are capable of accessing CCTV cameras to monitor water flows and levels in real-time, this feature enhances the engagement of the citizens with their city by allowing them to identify and report the incident in real time.



Key Resources

Besides mobile applications, the city requires hardware and communication systems as follows.

- CCTV Cameras: Strategic placement at key locations.
- Cable Infrastructure to prepare reliable communication infrastructure.

As well as considering the Electricity System for a stable power supply.

In terms of Human Resources, to maintain the system to provide the city's staff with technical expertise for the system maintenance. The key important is the active involvement of stakeholders in this project which are residents, city workers, and executives for their collaboration.

Strategy

“People are the key and technology is a tool in a good management system”

People-Centric

People-centric approach, [4] “the definition of this term is a problem-solving technique that puts real people at the center of the development process” [5] It is about understanding human needs and designing solutions, systems, or initiatives with a primary focus on the needs, preferences, and well-being of individuals or communities. The approach places people as a significant concern for decision-making processes, concerns, inclusivity, and active participation.

- **Empowering:** In the context of this project, the people-centric approach involves with resident active participation and empowering the city residents to take part in related flood prevention incident reports for example water blockage, and waste accumulation as well as accessibility to all necessary information for example, the application delivers real-time data to city executives, workers, disaster prevention units, hospitals, schools, and residents. The results lead to a powerful synergy between city authorities and residents.
- **User-Friendly Platform:** The convenient Smart City Mobile Application allows users easy access to this essential delivery of information to city officials, employees, hospitals, schools, preventative units, and every resident. Being reachable gives power to the decision-making process for all parties involved, resulting in a quicker, more informed to flood and other city issue incidents. Thus, the remarkable consequences of considerable mitigation of floods occur.

Furthermore, this innovation actively prevents flooding by encouraging previously unheard-of levels of citizen engagement and empowerment, going beyond simple flood control. Nowadays, locals actively participate in attempts to prevent flooding.



Project timeline

From 2020 until the present.

How to manage the system

The system is currently operated and monitored by Nakhon Si Thammarat Municipality for their city management and system maintenance which their citizen are actively taking part in issue reports.

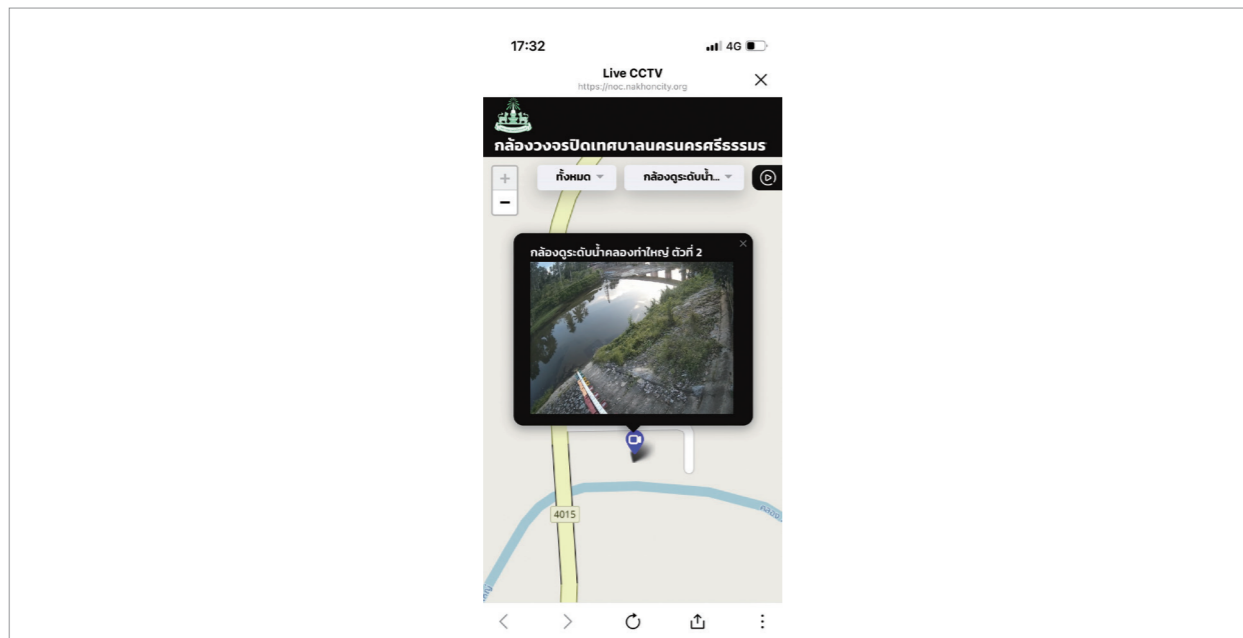


Figure 2: Live CCTV which can be accessed through the municipality website

Source: Nakhon Si Thammarat City Municipality



Figure 3: example picture from the city's CCTV camera with the indicator of water level in the city canal

Source: Nakhon Si Thammarat City Municipality



Impact

The Innovative Flood Control solution demonstrates substantial positive outcomes in terms of cost savings and community resilience, the summary of the impact made in 2 aspects, the economic impact and the social impact.

- Economic Impact

Federal Funds Reduction: Over 7 million USD was saved annually in federal government funds for flood relief payments and the municipality has reported annual savings of around 0.5 million USD in flood relief kits in the year of 2019 and 2020.

- Social Impact

Engagement for the collaboration for city development: Smart city is not only an issue for the government sector but also for citizens, this project was very successful in terms of getting a large portion of their citizens to participate actively in this project, 60% of the population participating through mobile application.

Challenges

Technical Challenges such as the condition of CCTV cameras, cable wires, and the electricity system occurred occasionally and the city provided a contingency plan for those issues parallel with the service level.

Sustainability

The Innovative Flood Control solution aligns with international policies, particularly the United Nations Sustainable Development Goals (SDGs).

- **SDG 11 (Sustainable Cities and Communities):** Safeguarding lives and property through sustainable flood control. The expected result of the project is to mitigate the level of the problem which lead to less social and economic loss from flood as well as community engagement for environmental responsibility by resident involvement in flood prevention reduces waste entering city canals.
- **SDG 13 (Climate Action):** Proactive measures to address climate-related challenges. The innovation actively contributes to ecological responsibility by reducing the municipality's carbon footprint. From the Fuel Consumption Reductio, with the system impact to less physical travel by city workers, this leads to minimized fuel consumption.

Concept and Approach for Future Implementation

Nakhon Si Thammarat City Municipality expresses a willingness to collaborate with the City of Kaohsiung, emphasizing technology exchange for urban flooding management.



Collaborative Approach

- **Technology Exchange:** Sharing expertise on urban flooding management.
- **Smart City Mobile Application:** A user-friendly, low-cost, robust, and resilient solution for prompt issue resolution and community benefits.

Conclusion

The Innovative Flood Control using a Smart City Mobile Application not only serves as a successful case study but also provides a replicable model for communities facing similar challenges. Through technology integration, community engagement, and ecological responsibility, the project exemplifies the transformative power of collaborative innovation in addressing critical environmental issues.

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INSPIRER Project: Participation in Urban Planning Processes in Virtual and Real Spaces in Germany



Jan Stepczynski, Prof. Dr. Heike Wiesner
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The German Federal Ministry of Education and Research (BMBF) launched a project line (VAR2) in 2020 to promote innovative research and development projects in human-technology interaction that complement mixed reality (MR) technologies, such as virtual reality (VR) and augmented reality (AR), with physical interaction possibilities. This project line is the predecessor of a previous similar project line (VAR1).

The project line aims to enable a new level of interpersonal communication and skill acquisition over distances. The proposed solutions aim to lead to interactive systems that provide improved immersion and support multi-user applications, especially when compared to current approaches in these fields.

The INSPIRER project

INSPIRER as part of the above mentioned project line stands for participation in urban planning processes in virtual and real spaces. Researchers in the INSPIRER project are developing an AR- and VR-application that allows multiple users to collaborate on urban planning projects. Virtual planning states can be experienced in an immersive way. The interaction is based on intuitive, virtual control elements. The system enables broad sections of the population to participate in democratic decision-making processes in urban planning. The development process will be accompanied by a participatory evaluation. The aim is to find out which technologies are particularly suitable for integrating different user groups and how improved immersion can lead to successful implementation of urban planning processes. Ethical, legal and social aspects are also important factors to be taken into account in the development process.

Participation in urban planning describes the involvement and co-determination of citizens in planning processes. This collaborative approach is becoming more important in urban planning and aims to guarantee that urban development aligns with the needs and desires of the community. In complex building projects, understanding the development of goals and plan contents is often challenging for those affected. Information events alone are insufficient to solve this problem. Additionally, even in participatory research projects, participation experts and process designers often overshadow the perspective of citizens. Several digital tools have been developed to improve participation opportunities by enhancing the flexibility and accessibility of participation offerings. Particularly, virtual reality (VR) and augmented reality (AR) possess the potential to expand participation in urban planning processes through immersing citizens in virtual environments and overlaying digital information onto the physical world.



Scenario: The city of Fellbach as a real laboratory for INSPIRER

To enable the analysis of the INSPIRER programs in practical situations, the city of Fellbach has been integrated into the INSPIRER project as a project partner, offering an ideal case study for the programs in the context of urban planning.

With a population of 46,070 (June 2023), Fellbach is situated in close proximity to the city of Stuttgart, which has over 600,000 inhabitants, making it a popular location for commuters and predominantly medium-sized businesses. Fellbach lies within the Rems-Murr district, which accounted for a GRDP of 15,317 million Euros in 2019, equating to roughly 2.9% of Baden-Württemberg federal state's total.

The demonstrator's development will undergo a formative and participatory evaluation in a real application scenario in Fellbach and potentially other locations. The associated partners and various citizen groups will continuously partake to analyze the participation level and the acceptance of digital technologies implemented in urban planning processes.

The aim is to involve citizens in the development process of the applications as early as possible to be able to gain valuable insights as well as integrate the perspective into the development cycles. The real scenario chosen for the project is an intersection in Fellbach, which is planned to be converted into a roundabout.

In figure 1 the roundabout is shown in form of a virtual scan of the area together with pointcloud scans both superimposed on the actual area of the current intersection.

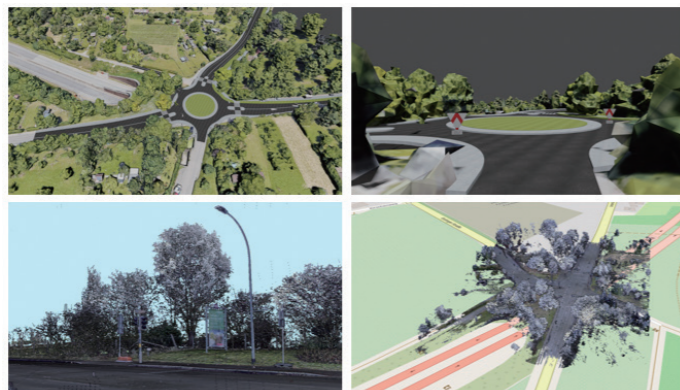


Figure 1: Views of a virtual 3D scan and point clouds of the intersection in Fellbach; with superimposed 3D model of the planned roundabout

Source: Projekt INSPIRER

INSPIRER Applications

The proposed applications include an AR and a VR application that provides urban planning projects' visualization during the early planning stages. The applications enable project overview and citizen interaction. The objective is to promote valuable citizen feedback and enhance democratic inclusion in urban planning.



Figure 2 depicts an augmented reality scene featuring an AR app prototype with a simulated edifice and user-generated feedback in the form of comments appended to the placed object. The user can availed a 360-degree view of the object and obtain a perspective of the proposed edifice in the proximate surroundings. Moreover, adding comments enables interaction with planning authorities, offering new prospects for engagement in the currently stagnant urban planning landscape in Germany, where participation processes are rigorously regulated by law, and the scope and time available for interaction with citizens are limited.

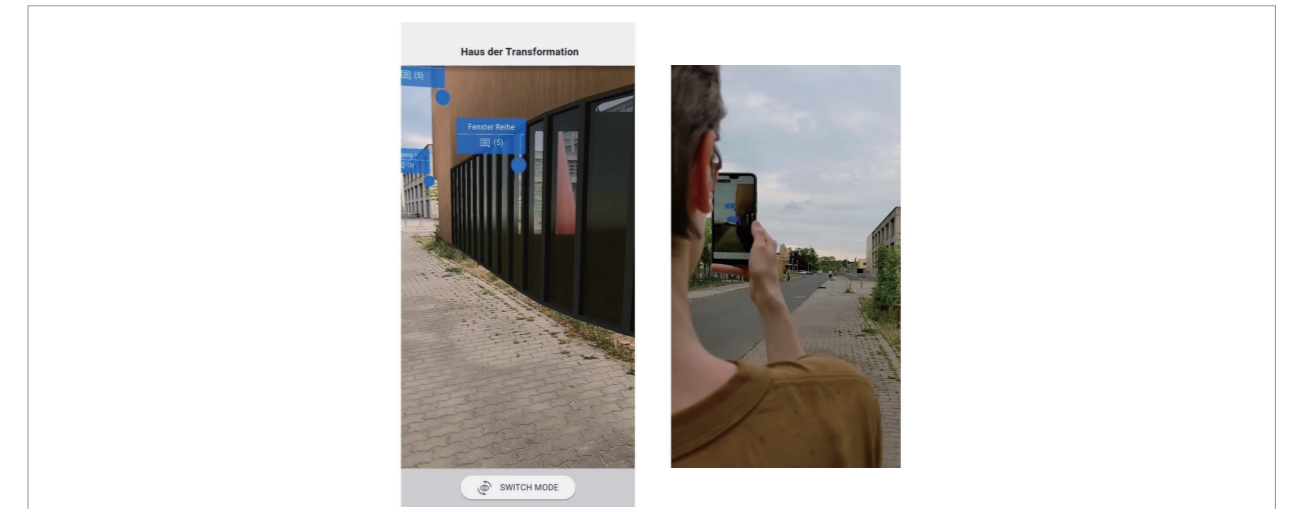


Figure 2: View of an AR scene with virtual building superimposed (left) and user with smartphone showing the same view (right)

Source: Projekt INSPIRER

Figure 3 depicts a scene from the VR prototype, where users can provide additional feedback by placing objects. This functionality is also present in the AR application. For instance, a waste bin is placed in the example, indicating to planning authorities that more waste disposal options are necessary.

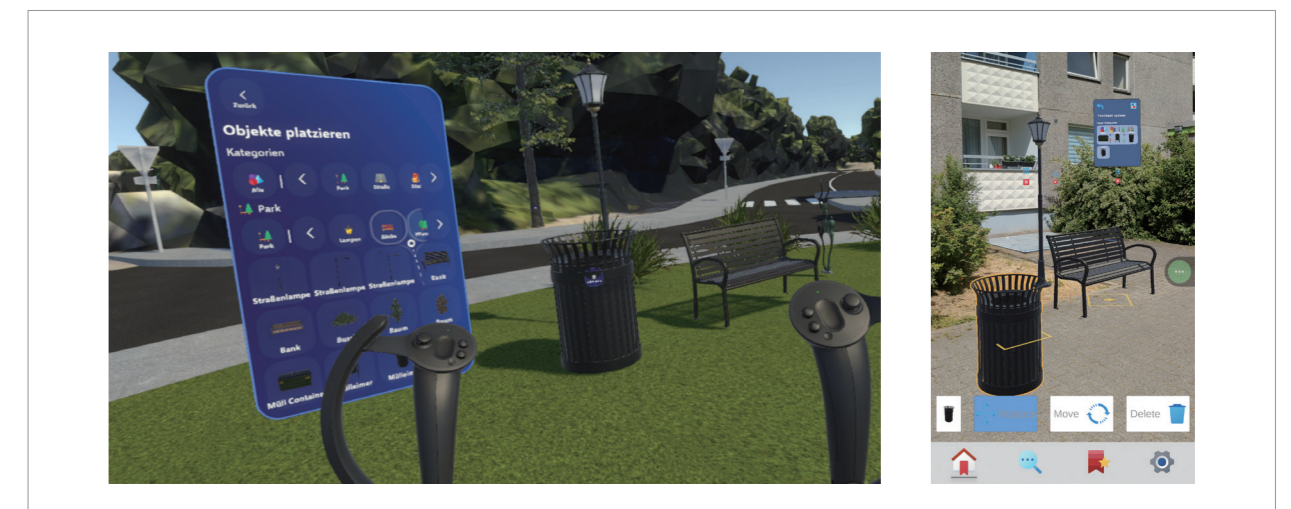


Figure 3: Views of the placement of objects in VR on the intersection in Fellbach and the surrounding area

Source: Projekt INSPIRER



Figure 4 presents another interactive functionality implemented in both the AR and VR applications. Users may provide feedback by drawing onto the augmented or virtual reality environments. The tool is designed to enable citizens to incorporate desired objects which are not available in the application's libraries, thereby fostering more creative forms of interaction.

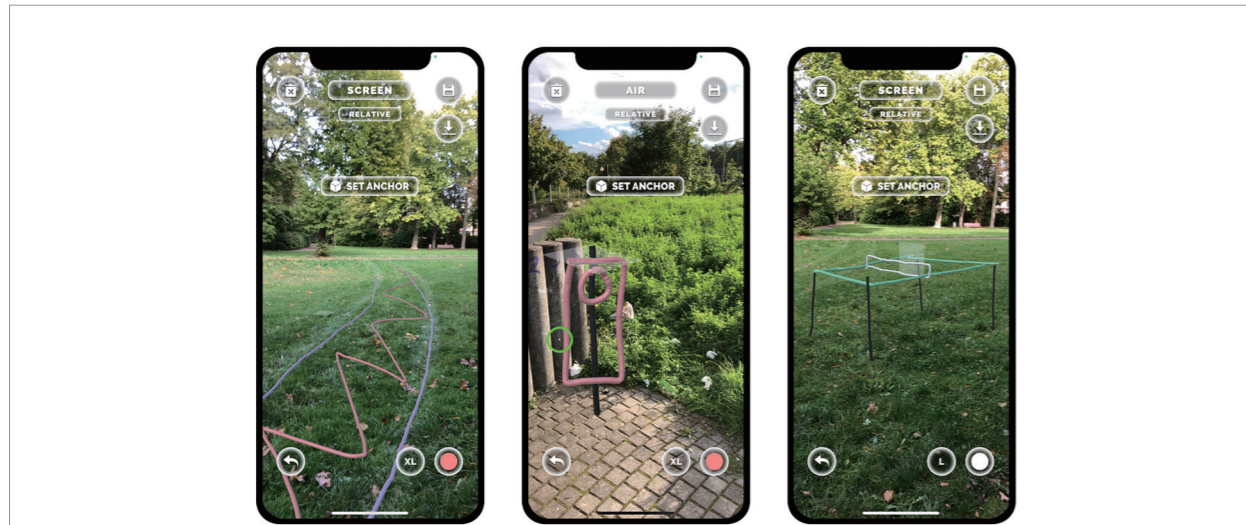


Figure 4: Views of a 3D drawing app for virtual sketching with a smartphone

Source: Projekt INSPIRER

Evaluation concept of the INSPIRER project

The assessment employs a mixed-methods strategy to collect diverse viewpoints on user needs and to verify the outcomes both qualitatively and quantitatively. Continuous feedback is amassed during the app's development stages, cultivating active correspondence and productive partnership within the INSPIRER initiative. Simultaneously, the assessment is carried out by the Berlin School of Economics and Law, the project partners involved in the development phase. It guarantees that the gathered requirements conform to the general system and are included in the development process via consistent feedback and coordination with technical partners. The study concentrates on apt technologies to assimilate distinct user groups and enhance engagement in city planning procedures. The initial step of the evaluation procedure was executing a necessities evaluation and a requisites survey with stakeholders involved in the urban planning process, utilizing qualitative interviews. The survey findings were classified and utilised in the participatory creation of initial exemplars in a workshop format for AR and VR systems, geared towards enhancing engagement in urban planning procedures. These findings were also utilised as the foundation for assessing the first digital prototype of the AR-App. The second workshop format developed the methods by involving citizens and urban planners in addition to the existing qualitative methods. The AR and VR prototypes were tested, and two questionnaires were administered afterwards. The first questionnaire was the standardized AttrakDiff, used for subjective evaluation of interactive products. The second questionnaire was more general and included open questions to receive feedback on the usability and functionality of the applications. The results of those workshops are currently being analysed.



The major steps of the evaluation process always include three elements:

- An informative element, in which the project partner provide an introduction to the INSPIRER project and a focus presentation of different topics to be analysed
- An interactive element, in which the participatory testing of the digital demonstrator of the AR-/VR-application or both are conducted with direct supervision by the technical partners of the project to provide assistance and explanation for different functionalities
- A reflective element in the form of quantitative questionnaires (standardized AttrakDiff and a more open questionnaire for providing feedback) together with qualitative semi-structured group or individual interviews, in which citizens are able to give more broad feedback on the workshop and the state of development of the demonstrator in a separate area.

Conclusion

In conclusion, the INSPIRER project, initiated by the German Federal Ministry of Education and Research, represents an increasing effort to leverage augmented reality (AR) and virtual reality (VR) technologies for enhancing citizen participation in urban planning processes. Building on the foundation laid by its predecessor, VAR1, the VAR2 project line aims to push the boundaries of human-technology interaction, providing immersive and intuitive tools for collaborative urban planning.

The focus of INSPIRER on participation in urban planning processes, particularly in the city of Fellbach, serves as a real-world laboratory for the evaluation and development of AR and VR applications. Fellbach, with its proximity to Stuttgart and its diverse population, provides an ideal case study for testing the viability and acceptance of digital technologies in shaping urban landscapes.

The proposed applications within INSPIRER, as illustrated through AR and VR prototypes, showcase innovative features such as user-generated feedback, object placement, and 3D drawing functionalities. These tools not only facilitate citizen engagement but also bridge the gap between communities and planning authorities, fostering a more inclusive and dynamic urban planning environment.

The evaluation concept employed by the INSPIRER project is comprehensive, utilizing a mixed-methods strategy to collect diverse viewpoints and ensure the continuous improvement of the applications. The active involvement of citizens, urban planners, and project partners in workshops, surveys, and testing phases underscores the commitment to creating user-centric, effective tools for urban planning.

As the project moves forward, with ongoing analysis of workshop results and feedback, INSPIRER stands as a testament to the potential of AR and VR technologies in transforming traditional urban planning processes. By addressing not only technical aspects but also ethical, legal, and social considerations, INSPIRER is poised to contribute significantly to the advancement of democratic decision-making in urban development.



The collaborative efforts of all stakeholders involved, coupled with the real-world testing in Fellbach, position INSPIRER as a model for future initiatives seeking to harness technology for the benefit of communities and sustainable urban development.

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