The Urban Lab of Europe!

JOURNAL

PROJECT

SPIRE - Smart Post-Industrial Regenerative Ecosystem

Baia Mare, Romania

TOPIC

Sustainable use of land and nature based solutions

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SPIRE Journal 2: The project moves forward

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This is the second journal of the Smart Post-Industrial Regenerative Ecosystem (SPIRE) project since its creation on 1st September 2019. The impact of the current COVID-19 pandemic has shown how visionary the SPIRE project is. The reclaiming and enhancing of Baia Mare's green infrastructure, which is clearly linked to health and wellbeing, is now particularly relevant in times of climate and health crises

Baia Mare was historically a metallurgical area, but the city is currently transitioning from its past as Romania's mining capital towards a social, economic, and environmental development model that is sustainable. The city and its citizens are ready to move into a new socio-economic era, but the persistence of Heavy Metal (HM) pollution in the urban area is still significant and exceeds acceptable limits by five times. Solutions need to be found for the 627 hectares of contaminated land that negatively affects the local ecosystems and residents' health.

SPIRE's challenge is to test an integrated and innovative strategy capable of:

- Recovering contaminated land and starting long-term phytoremediation and land revalorization process (with a Remediation Toolkit and Adaptive Site Management Application)

- Co-creating new bio-based solutions for pressing urban issues, like developing new ecofriendly building materials or reducing carbon emissions, adopting a replicable approach to supporting local circular business models.

- Finding alternatives to fossil fuel to foster sustainable energy transition for potential capitalization at functional urban area level.

- Supporting participation and a behavioral shift, thanks to the immaterial Local Environmental Utility (iLEU), a novel digital solution to reward environmentally friendly actions.

Partnership:

- City of Baia Mare

- Urbasofia SRL
- Indeco Soft
- Transilvania Branch of the Romanian Association for Electronic Industry and Software (ARIES Transilvania)
- Baia Mare Metropolitan Area
- University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca (USAMV)
- Green Energy Association (GEA)

Executive summary

This is the second journal of the Smart Post-Industrial Regenerative Ecosystem (SPIRE) project since its creation on 1st September 2019. The impact of the current COVID-19 pandemic has shown how visionary the SPIRE project is. The reclaiming and enhancing of Baia Mare's green infrastructure, which is clearly linked to health and wellbeing, is now particularly relevant in times of climate and health crises.

During the second year of the project's implementation, the city has continued its transition from its past as Romania's mining capital towards a new sustainable development model applying Nature-Based Solutions. Romplumb, Ferneziu, Colonia Topitorilor, Urbis, and Craica are the five pilot sites being reclaimed in the city under the SPIRE project to become strategic green infrastructure. They will be integrated into the future network of healthy natural and semi-natural areas within the BM 2050 Master Plan sustainable use of land strategy.

Despite the fact that contamination from heavy metals constitutes a genuine global health concern, in Baia Mare citizens' recognition of environmental issues is limited. The municipality is working towards raising awareness among the population of the dangers of pollution and the urgency to decontaminate the sites. The ecological transformation of the city's pilot sites has incorporated intense community work, with awareness and communications campaigns, citizen engagement activities, and co-design participatory workshops, among others.

To support and enhance this participatory approach, the City of Baia Mare has become a facilitator of the iLEU reward system (a digital token) to sponsor environmental-friendly actions and initiatives, both public and private. Additionally, a Circular Economic Startup, Accelerator, and Mentoring Programme has been initiated. Three finalists will develop their ideas built upon bio-based solutions to foster the sustainable transition of energy and materials.

On the one hand The SPIRE project reaps the benefits of European, national, and local policies for some of the matters it addresses, whereas it also deals with the lack of comprehensive policies at a national level on other issues. These experiences provide insights which allow the project to evaluate and enable new and alternative urban governance models for the future.

This journal presents a detailed analysis of the UIA challenges in the SPIRE project, measuring their risk from low to high. The participative approach and cross-department working, present a low risk in implementation. Medium risk is identified for leadership, monitoring and evaluation and communication. Finally, high risk is present for public procurement challenges and upscaling.

1. Project implementation process

The second year of the SPIRE project has been severely impacted by the emerging situation of COVID-19. This global pandemic has profoundly influenced the project implementation, mainly due to the limitations of events, meetings, and the organization of the workshops (including the outdoor plantathlon initiatives). It is important not to lose sight of the fact that the participatory community activities were at the core of the project, as well as the need to share experiences with other cities in the country, in Europe, and globally.

The core activities developed by the SPIRE project, even though delayed due to the pandemic, are namely: soil preparation and first cultivation in the pilot sites, engagement and co-creation dynamics and workshops, the launch of the SPIRE Hub and Makerspace, the launch of the iLEU platform and wallet, and the Circular Economic Startup Programme first steps.

1.1 Soil preparation and first cultivation in the pilot sites, including Plantathlon activities

Within the SPIRE project, NBS phytoremediation techniques use plants to clean up contaminated land and remove Heavy Metals from the soil. Since spring 2020, specific preparation processes for abandoned, degraded areas have been performed on the soils of the five pilot sites. Plowing and tillage actions have been implemented to level the

surface of the soil and prepare suitable germination beds for the future plantation species.

Energy willows and other selected species have been planted following the criteria of the remediation Toolkit guided by the Conceptual Adaptive Site Management Application (CASMA), providing a specialist catalogue based on soil HMC, remediation capacity per planting cycle, biomass harvest cycle, the cost-effectiveness of soil preparation and plantation, primary and secondary potential applications, and cascading uses, as well as a set of design options (please, refer to table 1).

Plant category	**Species**
Broadleaf trees	*Acer platanoides*
	Robinia pseudoacacia
	Salix alba
	Salixbabylonica
	Betulapendula
	Fraxinusexcelsior
	Catalpa bignonioides globosa
	Sorbusaucuparia
Needleleaf trees (conifers)	*Pinusnigra*
	Thujasp.
	Juniperussp.
Energy willow cuttings	*Salixviminalis*
Climbing plants	*Parthenocissusquinquefolia*
Ornamental grass	*Miscanthusgiganteus*
Perennials- shrubs/floriferous plants	*Prunuslaurocerasus*
	Berberis thunbergii
	Hibiscussyriacus
	Lavandula angustifolia
Geophytes	*Iris sp.*
Lawn	*Lawn turf grass seed blends*

Table 1. Species selected to be planted in pilot sites. Source: SPIRE Technical Report D.6.2.11-Safety and health plan for the sustainable community use of the SPIRE productive landscapes

Biodiversity plays an important role in the landscaping plan. Plants are carefully selected to reduce the risk of monoculture and the needs of the local fauna such as urban birds, bees and butterflies are taken into consideration. Also, the inclusion of preexisting plant species on the sites is ideal because of their optimal adaption to the local conditions.

Fig 2. Visit to the pilot sites to assess plantations (October 2021). Source: UIA Expert

Some Plantathlons activities carried out in the city during spring 2021 created a collaborative ecosystem supporting citizen led actions and enhancing the community's involvement in the preparation, seeding, and planting for each of the pilot sites (Romplumb, Ferneziu, Colonia Topitorilor, Urbis, and Craica).

1.2 Engagement and co-creation dynamics and workshops, including public furniture designs

Since November 2019 questionnaires and digital surveys related to health and environmental issues have been carried out. Data collection revealed the environment to be of significant concern for the population. A willingness to adopt nature-based solutions and enact behavioural change geared towards improving the local environmental situation was indicated. Despite some initial skepticism towards co-creation and participatory activities, a window of opportunity for a transition towards a new green deal has been identified in Baia Mare.

From October 2020, consultation and collaborative workshops have been undertaken through 3 different Co-creation Stages:

Co-creation Stage 1: Assessment of the transformation potential including three general objectives:

-To raise awareness of the ecological and environmental challenges that Baia Mare is facing.

-To determine community needs and necessities concerning green infrastructure, public space, and facilities/opportunities for locals to spend time in nature.

-Brainstorm on initial transformation ideas and potential facilities and functions for the pilot sites.

Co-creation Stage 2: Co-designing the zoning and planting plans for SPIRE pilot sites, including three general objectives:

-To involve communities in the decision-making process for the pilot site ecological transformation.

-To gather input for site planting requirements: access, zones, ambiance, character (through a second questionnaire)

-To co-elaborate a preliminary design sketch for the pilot sites.

Co-creation Stage 3: Co-designing micro-interventions to be co-implemented, including two general objectives:

-To assess each pilot site's sensorial and spatial perspectives.

-To co-produce micro-interventions solutions.

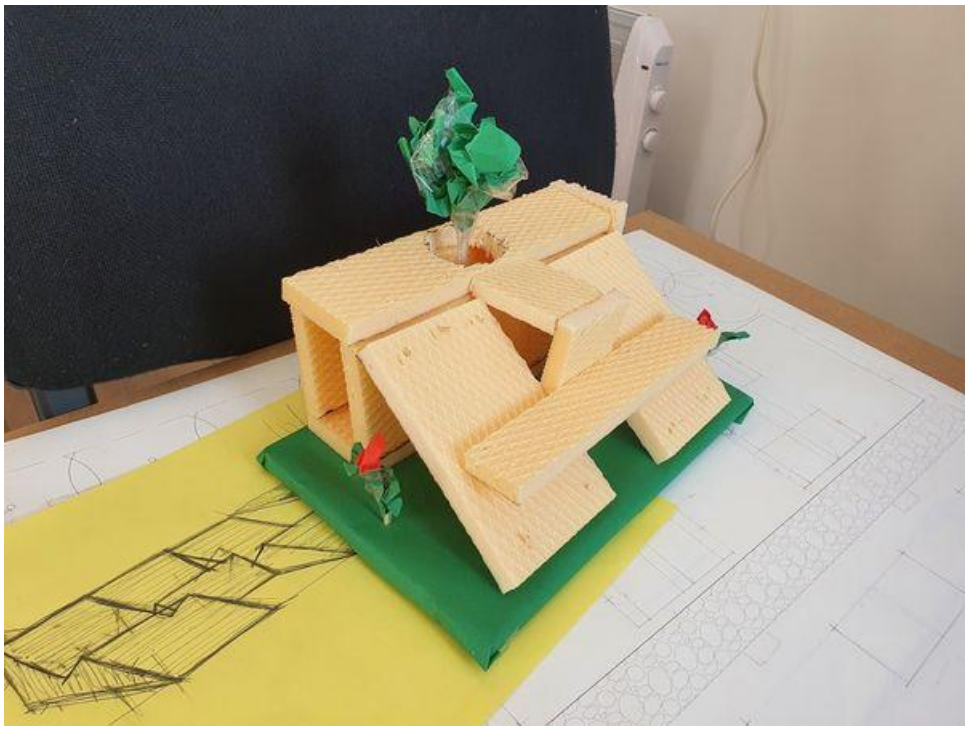

Fig 3. Furniture / sculpture proposed as a milestone in the future public reclaimed space. Source: Baia Mare municipality.

1.3 Launch of the SPIRE Hub and Makerspace, including first workshop on iLEU platform and wallet

On 28th October, the launch of the SPIRE HUB took place, with the participation of the entire SPIRE consortium. The building has already been partially renovated, and it is ready to be used as SPIRE Hub and Makerspace. A further extension has been granted to renovate the attic and the remaining ground floor room to support the iLEU activities.

Fig. 4. SPIRE Hub in casa Schreiber. Source: Baia Mare municipality

Various activities were performed in the building over a two-day period including several internal meetings

related to the SPIRE project, maker space demonstrations for 3D printers and laser cutting machines, and the first workshop on the iLEU platform and wallet.

Fig 5. Maker space demonstration in the renovated casa Schreiber. Source: UIA expert

Fig 6. First workshop on iLEU platform and wallet. Source: Baia Mare municipality.

The SPIRE Hub, with the Makerspace and the ILEU platform and wallet operations in place, is essential for the city to be connected with the citizens. They are crucial elements of the project interlinked with co-creation and participatory processes for the future master plan and circular biomass further research and work. The SPIRE Hub should ensure the project's future sustainability and positive cascade effects.

1.4 First steps of the Circular Economic Startup Programme, including proposals selection

The SPIRE STARTUPS is a free mentoring programme for individuals and teams with innovative and revolutionary business ideas to help transform the biomass resulting from the decontamination of the five heavy metal polluted lands in the SPIRE project into new, usable, and valuable products for society.

Different ideas around the biomass value-chain were assessed and validated during various workshops, thematic webinars, and individual mentoring sessions held during the first stage of the programme performance by a team of specialists. The six preliminary selected participants were given the chance to present their ideas during the SPIRE Start-ups DEMO DAY event. Three of them were chosen to continue to the second stage of the mentoring process: the first stage focused on improving the Business Model; the second stage will focus on scaling-up potentialities. The 3 best startups, chosen by a jury and the local community, will be able to use the facilities of SPIRE HUB & MAKERSPACE.

Fig 7. SPIRE Start-ups DEMO DAY event. Source: SPIRE project.

The new bio-based solutions pursued by the SPIRE project should potentially be derived from the material harvested from the pilot sites to support local circular business models. Nevertheless, there is still intense work ahead to find alternatives to fossil fuel products to foster sustainable biomaterials and bio-energy transition for capitalization at the functional urban area level.

2. Implementation challenges

The UIA Permanent Secretary has proposed seven implementation challenges, outlined below, to assess the project's progress and potential limitations. It is vital that these challenges include a focus on meaning, intensity, likelihood, and temporality. Following a traffic-light rating system, a legend is presented where red indicates that the challenge is particularly relevant for the project; yellow indicates that the challenge is somewhat applicable to the project; green indicates that the challenge is only partially suitable for the project.

Implementation Challenge	Level

1. Leadership	Medium
2. Public procurement	High
3. Participative approach	Low
4.Cross-department working	Low
5.Monitoring& evaluation	Medium
6. Communication	Medium
7. Upscaling	High

Table 2. Second mapping SPIRE against implementation challenges

2.1 Leadership (Risk level: Medium)

SPIRE is a comprehensive and ambitious project covering an essential set of subjects from different angles. It provides a systemic and interlinked approach: brownfield phytoremediation and future Master Plans, community engagement and participation, new business models, bio-mass material development for energy and bio construction, and cryptocurrencies, being developed simultaneously over a three-year timeline. Such a holistic project will reach innovative achievements despite the multi-faceted barriers of the project.

Given the uncertainty of the present COVID context where SPIRE is being developed, the leadership of the project by Baia Mare municipality remains crucial. Baia Mare municipality's leadership is built upon SPIRE consortium's committed partnership, which remains strong. The consortium is actively involved in the SPIRE's research, tests, counterchecking, and development (including continuous re-design of some activities due to Covid-19). In addition to this, there is a permanent search for synergies with other close innovation initiatives such as the UIA project Cluj Future of Work!

The COVID situation has presented many challenges and limitations to overcome. Administrative procedures have been paralyzed affecting the work on pilot sites (plantation and harvesting) and the fact that the physical presence of youth and citizens is restricted.

- The SPIRE Local Action Network, the SPIRE Hub and maker space, and the initial iLEU platform have been implemented, remodeling some of the activities, when possible, to online workshops and meetings.

2.2 Public procurement (Risk level: High)

The definition of the best services and equipment is a crucial aspect of an initiative such as the SPIRE project. Due to the pandemic and legal barriers, some processes have been delayed, such as:

(1) A delay in the approval of iLEU regulations because the present fiscal legislation didn't allow the Local Authorities to use the public budget for such an innovative mechanism. It creates a cascade effect (local iLEU ecosystem and value system, as well as the iLEU backed citizen campaign).

- A complete re-design and adaptation of the work plan and related activities are already in place to minimize negative impacts.

(2) A delay in legal procedures to acquire the agro-mechanic equipment for soil preparation and cultivation in the pilot sites. Also, the lengthy pandemic problems have seriously affected the agro-mechanical works, soil remediation/amendment, landscaping, and implementation of small urban interventions.

- The first Plantathlon was developed in Spring 2021.

(3) Obtention of permits and refurbishment work affected the renovation of Casa Schreiber (Spire HUB) since it is

a Cultural Heritage Monument. It also affected the Urban Innovation and Planning Hub.

- Casa Schreiber partial renovation and SPIRE Hub and Makerspace equipment were implemented despite the delays and were officially launched at the end of October 2021.

2.3 Participative approach (Risk level: Low)

The SPIRE social lens has consolidated a solid Stakeholder network thanks to three effective actions: (1) Citizen engagement, (2) co-creation processes, and (3) active participation of the local community in the re-naturalization of the pilot sites through Plantathlons activities and the use of the innovative iLEU digital reward system. In all cases, the COVID situation brought up challenges for the work plan.

(1) Regarding citizen engagement, a data collection process was carried out through questionnaires and digital surveys to raise awareness about health and environmental issues and consolidate the SPIRE Local Action Network (between November 2019 and July 2020).

(2) Regarding co-creation processes, and through 3 different Co-creation Stages, consultation and collaborative workshops with the diverse communities were developed (between October 2020 and October 2021). Also, a Mentoring Programme was launched, even though it has yet to result in solutions focused on new bio-based materials, an aspect that has to be revised.

- Final technical designs of the pilot sites and urban furniture exercises were done during the last stage of the different workshops.

(3) Regarding the active participation of the local community, several Plantathlons activities have been carried out in the city from spring 2021. The iLEU digital reward system to sponsor environmentally friendly actions and initiatives has been initiated.

- The official launch of the SPIRE Hub in Casa Schreiber took place at the end of October 2021, with a specific workshop focused on using the iLEU token.

2.4 Cross-department and integrated management and implementation (Risk level: Low)

The setup of effective coordination mechanisms is functioning in Baia Mare Municipality. The project's design included an intranet platform and a risk management analysis shared with the various project partners involved.

The ongoing communication between the municipal departments (personnel, urban planning, investment, financial, and others) is agile. During this challenging implementation period, the consortium partners have maintained their roles, showing strong cohesion and fluid communication.

- Even if a Quality and Risk Management Plan is in place, Covid-19 contingencies remain uncertain. Part of the rationale is being periodically redefined (some delays are due to public procurement procedures or national legislation, but others are a direct consequence of the pandemic situation affecting almost all of the project activities).

2.5 Monitoring and evaluation (Risk level: Medium)

Due to the project's complexity and different angles, a unitary evaluation framework has been developed, allowing the project to measure its results against an appropriate baseline. This baseline is valid for the local scale while also usable at the European Level.

The SPIRE Standards, Key Performance Indicators (KPI), and auxiliary tools - the GIS Dynamic Atlas platform, the Conceptual Adaptive Site Management Application (CASMA), and the remediation TOOLKIT - were comprehensively developed during the first implementation year of the project.

However, the work plan delays - mainly on plantation and harvesting activities and everything related to the iLEU and SPIRE Hub schemes -, make it difficult to evaluate and monitor expected results, yet generate a medium risk level for this component.

- Soil remediation indicators and related measurements, even if partial, are recommended to be collected to provide information and avoid potential additional risks. The GIS platform could be enhanced with more data to ensure the success of the future Integrated Metropolitan bio-based strategy and Masterplan 2050 and its sustainability possibilities.

2.6 Communication with local partners and beneficiaries (Risk level: Medium)

The Activation of Local Stakeholders has been vital to this project since community engagement and participation are crucial elements to ensure the project's consistency and future positive cascade effects.

Efforts in multi-channel communication have been made at various levels: traditional media (newspapers, radio) and social media (project website and Facebook, Linkedin, and Twitter channels). Scientific papers showing the

research that was undertaken and further findings have also been published.

However, one of the targeted groups remains unaddressed due to difficulties with activities that required attendance in person: children, students, and their families. Part of the project's potential and the needed shift related to health and environmental awareness and behaviour will only be possible if young people act as climate and environmental champions. Some communication actions and activities are needed in this respect. The challenge to overcome the pandemic constraints and involve young people is essential to ensure the project's success.

- SPIRE's visual communication materials are now intensively disseminated digitally. SPIRE team has been swift in finding adaptive and mitigative solutions to the social distance constraints.

2.7 Upscaling (Risk level: High)

The metropolitan scaling-up possibilities and strategies have already been considered in the project regarding the Integrated Metropolitan bio-based strategy and Masterplan 2050.

For SPIRE finally to become a reference regarding cost-effective phytoremediation strategies for heavy metal polluted sites, more intense global communication and dissemination activities work should be designed and developed by the SPIRE consortium.

- A closer relationship between the Local Government and other municipalities suffering similar problems of brownfield remediation and circular biomass solutions in the global arena is recommended.

3. Lessons learnt and next steps

SPIRE has focused this year on ensuring the implementation of core activities such as the soil preparation and cultivation in the pilot sites, including participatory plantathlons; the co-creation dynamics and activities, including the technical design of the pilot sites; the launch of the SPIRE Hub and maker space, including the initial iLEU workshops and platform; and the development of Circular Economic Startup Programme, including three finalist projects to be elaborated further. The partners have shown remarkable resilience and adaptability with reference to the Covid-19 situation.

- The impact of the current COVID-19 pandemic has shown how visionary the SPIRE project is, reclaiming and enhancing Baia Mare's green infrastructure, now particularly relevant due to the climatic and health crises. Urban green infrastructure and well-being are two interconnected dimensions of feedback. On the one hand, an individual's well-being is enhanced through healthy interaction with green infrastructure; on the other hand, the more we use and enjoy parks and green streets, the more we become aware of the need to protect and improve them.
- Nature-based phytoremediation solutions are linked to adaptation and climate resilience. With phytoremediation methods applied in the city, adaptation and climate resilience work hand in hand with risk reduction strategies. They improve the urban environment and revitalize the urban land while strengthening the risk governance, enhancing preparedness, and enabling an effective response to recover and "build back better."
- Pollution is one of the most significant environmental challenges worldwide; according to the European Environmental Agency, the management of polluted land costs about 6.5 billion€ a year in Europe alone. The phytoremediation techniques tested in Baia Mare have great potential for scalability and marketability.
- SPIRE schemes could be broadly applicable in emerging countries with significant population density and scarce funds available for environmental restoration. The lack of short-term results prevents some cities from investing in these proposed measures. However, the real impact and long-term positive consequences will become evident over time, with the SPIRE project as a global reference.
- Further importance should be placed on the fact that the iLEU reward system has encountered several legal barriers in its implementation due to its innovative systemic nature. It highlights the need for culture-shifting towards RESILIENCE, not only in citizens' environmental behaviour but also in legal frameworks and procedures. These groundbreaking initiatives will be able to occur only by allowing ourselves and our procedures to be adaptable, reflexive, and transformative.

Figure 8. iLEUS figures produced by 3D machine in the maker space. Source: Baia Mare municipality.

4. Acknowledgements

This second journal has been written based on the inputs provided by email exchanges, online conferences with the SPIRE team partners, and a field visit to the city in October 2021.

I would like to thank all the partners for proactively debating the project's constraints and potentialities. And especially for their commitment to overcoming the barriers that Covid-19 has brought about during the project.

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