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The Urban Lab of Europe !

The APPLAUSE project Journal N° 1

Project led by the city of Ljubljana



**CIRCULAR
ECONOMY**



The APPLAUSE project

ApPLAuSE (Alien PLAnt SpEcies) - from harmful to useful with citizens' led activities will experiment a completely new approach to IAPS (Invasive Alien Plant Species) treatment. IAPS will be considered as a resource and starting point of a new business model. A big effort is dedicated to new green technologies in all aspects of IAPS treatment (e.g. pilot enzymatic processing of IAPS fibres instead of chemical) as well as circular economy principles in development of new products (re-use). Through a large-scale educational and awareness raising campaigns, citizens are encouraged to participate in IAPS harvesting and re-use. ICT technology will be used to address target groups and to produce open data, new knowledge and develop new services like IAPS monitoring. Collected IAPS biomass will feed three main ways of further transformation: at home (e.g. food, dyes), at tutored workshops (e.g. to produce wood or paper articles) and in craftsman laboratories (e.g. to manufacture innovative products with market potential in social enterprises and employing vulnerable groups).

Partnership:

- **City of Ljubljana**

- Snaga Ljubljana, d.o.o.- public waste management company
- University of Ljubljana – higher education and research institute
- Jozef Stefan Institute – higher education and research institute
- National Institute of Chemistry – higher education and research institute
- Pulp and Paper Institute – higher education and research institute
- TISA, d.o.o.- company for arboriculture and forestry- local business
- GDi, d.o.o.- local business
- Centre of Excellence for Space Sciences and Technologies (SPACE-SI) – research organisation
- TRAJNA- Association for the development of sustainable design- NGO
- Studio tipoRenesansa- NGO

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1. Executive summary

Around 20% of land in the City of Ljubljana is protected with natural environment status (Natura 2000 accounts for 13%). Nevertheless, in the last field analysis undertaken in 2015, approximately 150 Invasive Alien Plant Species (IAPS) were identified in the city area, causing harmful impacts in terms of biodiversity loss, health problems or damages to properties and infrastructures. At the same time, existing IAPS management (where plants are removed and sent to incineration) is having a negative impact on the city's efforts to reduce waste. Even if Ljubljana has achieved a 67% separate waste collection rate, the highest among European capitals, it strives to become a "Zero Waste City". A separate collection of biological waste was introduced in 2006, collecting 25.977 tons, a year later.

APPLAUSE pilot project introduces a new approach to IAPS. They are considered a resource and a starting point of a new business model. Through educational and awareness raising campaign, citizens are encouraged to participate in IAPS harvesting and use. The main change is to shift from linear treatment of IAPS to a circular one that leads to the development of new valuable products and an effective and transferable response to IAPS management in urban environments.

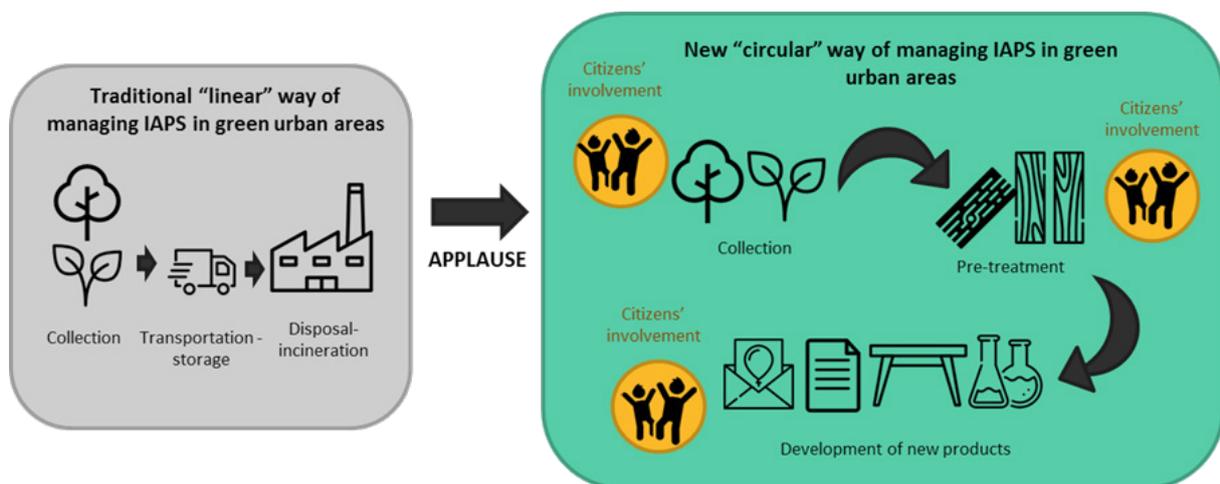


Figure 1. APPLAUSE circular approach compared to the traditional circular model

APPLAUSE has gone through its first year of implementation, reaching a **number of achievements**:

- Setting up a streamlined coordination structure that is clear and practical for all partners (→ researchers, NGOs, businesses and public authorities learning to work together).
- Delivering a first campaign of IAPS harvesting and pre-processing (→ recovering IAPS and transforming it into resource).
- Implementing the first tests for multiple uses for IAPS (→ using IAPS as raw material for furniture, paper products, biochemical compounds...)

Early **lessons learned** are:

- IAPS are a serious environmental, economic and social problem for cities, even if this is an issue often overlooked by public authorities at local, national and European level.
- Circular models require planning and coordination, especially if the recovered material needs to be transferred from one organisation to another.
- Even the last bit of waste can be revalorised in a circular model. The challenge is how to find new uses for this recovered waste that are viable from a practical and economic perspective.

2. Policy context

2.1 European level

Invasive Alien Plant Species (IAPS) are plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences. They affect native biodiversity, displacing local vegetation, destroying agricultural land and making natural habitats more vulnerable. IAPS can also affect human health, infrastructure and recreation areas costing millions to the EU each year. According to the Institute for European Environmental Policy, IAS (both plants and animals) cost to the EU at least €12.5 billion a year¹.



Photo 1. Japanese knotweed (*Fallopia japonica*), native to East Asia, is one of the many IAPS found in Ljubljana as well as in many other European cities. Photo: Jorgina Cuixart.

To address this issue, the **EU Regulation 1143/2014 on invasive alien species (IAS Regulation)** entered into force in January 2015, fulfilling Action 16 of Target 5 of the EU 2020 Biodiversity Strategy. It provides for a set of

measures to be taken across the EU in relation to invasive alien species included on a [list of IAS of Union concern](#)². Three distinct types of measures are envisaged, in order to combat IAS:

- **Prevention:** measures aimed at preventing IAS of Union concern from entering the EU, either intentionally or unintentionally.
- **Early detection and rapid eradication:** surveillance systems to detect the presence of IAS of Union concern as early as possible and take rapid eradication measures.
- **Management:** concerted management action for those IAS that are already well-established in certain Member States to minimize the harm they cause.

Bearing in mind these three typologies of measures, **APPLAUSE provides a solution to the management of IAPS in green urban areas**. By turning a harmful material into a resource, it not only contributes to the aims and objectives of the IAS regulation, **it also supports the implementation of the EU 2018 Circular Economy package and the Waste Framework Directive** (Directive 2008/98/EC). Specifically, it reduces the amount of waste generated in green areas management. Due to the harmful nature of these species, only some IAPS can be composted, others are incinerated or sent to landfill. APPLAUSE is capable of recovering such waste and turn it into a resource that can be used in secondary products, contributing to a reduction

¹ Kettunen, M., et al. (2008). "Technical support to EU strategy on invasive alien species (IAS). Assessment of the impacts of IAS in Europe and the EU." Institute for European Environmental Policy, Brussels.

² Regulation (EU) 1143/2014 on invasive alien species: http://ec.europa.eu/environment/nature/invasivealien/index_en.htm

in CO2 emissions. Such circular approach is not only applicable to the management of IAPS in European cities, in fact, it can also be transferable to rural or forest areas affected by IAPS.

TAKE AWAY POINT

→ IAPS impact on cities, an aspect often overlooked

Even if existing regulation does not make any reference to the problems caused by IAPS in cities, their spread is problematic. Major impacts of IAPS in cities include: Disruption of the ecosystem services provided by green areas (preservation of biodiversity, flood protection, fire prevention, climate change mitigation and adaptation); contribution to the spread of diseases and pests; toxicity and allergic reactions; and damages to properties.

Source: M. Gaertner et Al (2017). "Non-native species in urban environments: patterns, processes, impacts and challenges" Biological Invasions

2.2 National level

Slovenia is among the European regions with above-average biodiversity with an estimated total of 45 000-120 000 species³. Its Nature Conservation Act provides the basis for the overall conservation of biodiversity and protection of valuable natural features as part of Slovenia's natural heritage. However, the country is yet to have a national strategy on IAPS management. In this sense, **the City of Ljubljana, through the APPLAUSE project, is leading the way in proposing innovative circular solutions to the management of IAPS that can later be adopted at national level.**

As for the circular economy policy agenda, the project aligns with the **Roadmap towards a Circular economy in Slovenia** published in April 2018.⁴ The roadmap recognises the uniquely

influential role of cities such as Ljubljana in expediting the shift towards a circular economy. Cities are considered suitable environments for testing pilot circular practices that can then be applied to other local communities. As part of this roadmap, an action plan is due to be developed in 2019. In this sense, APPLAUSE can become a shining example of a pilot circular practice led by city governments.

Also, APPLAUSE's varied activities contribute to different national policies aimed at waste reduction (by having an alternative to IAPS' landfilling/incineration), the promotion of sustainable design and consumption (through the development of greener products) and green job creation (in IAPS collection, harvesting and processing as well as in handcraft production). The most relevant national policies are:

- The national sustainable development goals stated in a Vision for Slovenia in 2050;
- The Slovenia's Development Strategy 2030;

³ Slovenian Environment Agency: <http://www.arso.gov.si/en/soer/biodiversity.html>

⁴ Roadmap towards a Circular economy in Slovenia: <http://www.circularchange.com/events/roadmap-towards-the-circular-economy-in-slovenia/>

- The National Environment Protection Action Programme 2030; and
- The framework programme for transition to a green economy and the action plan for 2015–2016.

2.3 Local

Ljubljana's unique approach towards IAPS management is based on the interconnection of two policy areas: nature conservation and circular economy.

In 2014, the city already adopted its **Environmental Action Programme 2014-2020**. The programme includes the Protection of the natural environment as a strategic objective. As a result, a set of measures have already been implemented, including IAPS data collection, public awareness campaigns and collection of Japanese knotweed from households in collection centres. APPLAUSE builds on and upgrades these measures.

At the same time, APPLAUSE is in line with the priorities of **Ljubljana's Sustainable Urban Development Strategy 2014-2020 and its action plan**, where the implementation of activities on disposal, collection and recovery of

IAPS in Ljubljana territory is outlined as one of its priorities.

Finally, the project also contributes to two longer term ambitions for the future of the city:

- **The vision of Ljubljana 2025:** One of the key aspects of this vision is for Ljubljana to remain an environmentally friendly city, interconnected with the landscape with renovated parks, green and recreational areas that provide habitat protection.
- **Its commitment to "Zero Waste City":** Even if Ljubljana is already the European capital with the highest separate waste collection rate (67%), it wishes to go one step further. In 2015, it committed to eliminate waste in its area by joining the Zero Waste Europe initiative⁵. Collecting the IAPS biomass and turn it into new and sustainable products, is part of this commitment.

⁵ <https://zerowasteurope.eu>

TAKE AWAY POINT

→ Previous supporting work on circular IAPS management in Ljubljana

Action towards a better management of IAPS is not new to Ljubljana. The city is co-financing the LIFE-funded project **ARTEMIS** (2016-2020) which aims to raise awareness among the general public and the forest owners on the harmful impact of IAPS. This project is also putting in place an early warning and rapid response (EWRR) system to manage their impacts on forests.



Photo 2. First paper produced from invasive plants.
Photo: City of Ljubljana

Also, as part of **Ljubljana's Green Capital** activities (in 2016), the city coordinated the first paper making trials made from Japanese knotweed, one of the IAPS found in the city. Such pioneering paper production from IAPS was also showcased at the **EUROCITIES annual conference in 2017**, which took place in Ljubljana and focused in circular cities.

These first production trials were undertaken by some of the partners that are now part of the APPLAUSE consortium.

3. Account on the progress made by the project since starting the implementation

During this first year of the project many activities have started in parallel. The progress made can be divided into three bundles: coordination activities aimed at setting up the structures for partnership working; activities aimed at

identifying, collecting and pre-processing the raw material (IAPS) for APPLAUSE circular model; and finally, the initial development of IAPS-based innovative circular products.

3.1 Putting all the activities in motion

APPLAUSE started in November 2017. As in any other collaborative project, the initial months of implementation are spent setting up the structures, strategies and workflows between partners.

APPLAUSE work plan is intense with lots of activities interlinked with each other. **A streamlined coordination structure** has helped to put the project in operation:

- Operational decisions are taken by the **project management group** (City of Ljubljana + representatives of all partners) who meets on a monthly basis
- The project is monitored by the **project steering committee**. Led by the City of Ljubljana's Vice-Mayor, this group includes senior representatives from all partners not involved in the project on a daily basis. The committee meets every three months.
- Finally, there is a **policy guidance group** that meets twice a year. This is a high-level consultative body composed of external advisors who are experts in relevant topics for

the project, representatives of the civil society and decision-makers.

Apart from transversal project activities such as management, communication or evaluation, APPLAUSE can be divided into 2 main activity streams: 1) IAPS tracking and harvesting and 2) development of innovative products using IAPS as raw material. Citizens' involvement is a crucial element of both activity streams.

These two activity streams combine multiple disciplines from arts & design, to botanic studies or geo-information systems. This combination gives to APPLAUSE a truly **multidisciplinary approach**.

One of the main achievements of this first year has been to put this multidisciplinary approach in practice, with activities running in parallel and partners of different fields learning to work together. **Good leadership** and regular meetings to get to know each other have been crucial in resolving coordination issues and fostering a **common understanding** of the project objectives and priorities.



Photo 3. APPLAUSE team at the kick-off meeting. Photo: Simona Strgulc Krajšek.

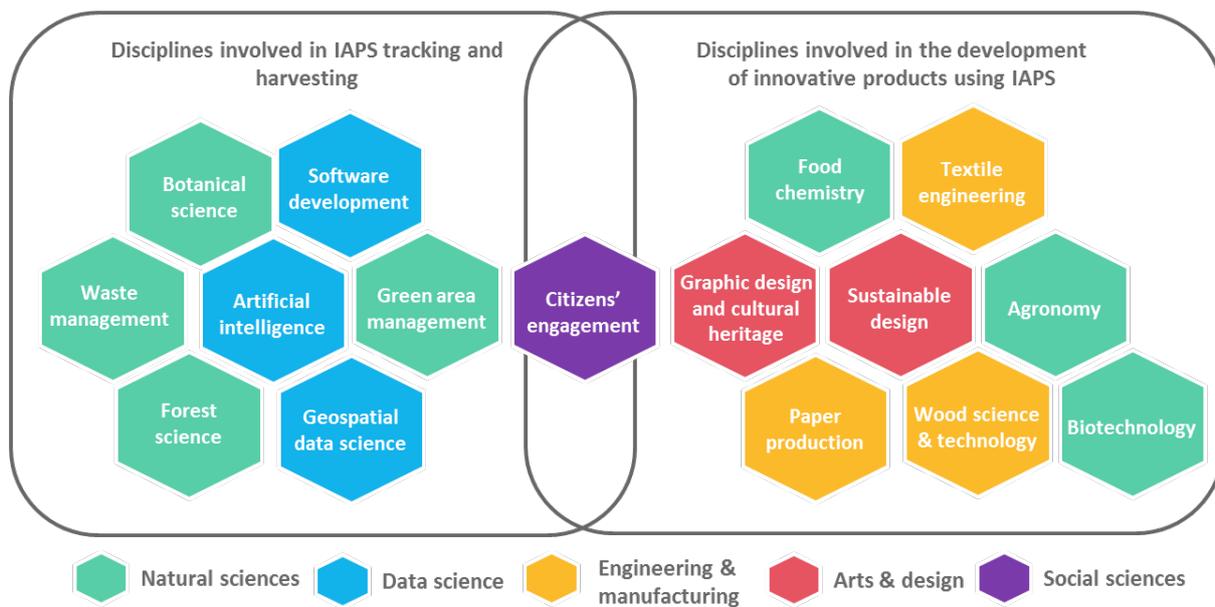


Figure 2. APPLAUSE multidisciplinary approach.

TAKE AWAY POINT

→ A multidisciplinary partnership, both a challenge and an opportunity

APPLAUSE is composed of 11 partners (16 if we take into account that University of Ljubljana cooperates with 3 different faculties and within faculties with different departments). It effectively combines different fields of study (natural sciences, data science, engineering and manufacturing, arts & design and social sciences). At the same time, it involves a mix of working methods, from scientific research, to artistic creativity or urban practice. Such **multidisciplinary** has been a **challenge**, resulting in some misunderstandings or differing opinions on how the project should be done. However, after a year, all partners agree that **such diversity is also an opportunity that sparks creative thinking**, helping to implement better and more innovative urban actions.

3.2 Kick-start of the IAPS tracking and harvesting

SNAGA, Ljubljana's public waste management company, is responsible for the management of the 2,4 km² of public green areas in the city. Consequently, they are also in charge of the identification, collection, treatment and disposal of IAPS on public green areas. Managing the

public green areas costs approximately 3 mio € each year. APPLAUSE implements a **completely new approach to how cities deal with IAPS**: from a harmful substance that needs to be dealt with to a useful one that is considered a resource for innovative products. Also, instead of doing it by



Photo 4. Harvesting with high school students. Photo: Branka Trcak.

themselves (as any other public works), it counts with the participation of citizens in both the identification and harvesting of IAPS.

Approximately 150 IAPS have been identified in the area of Ljubljana. Within the project, the focus is on 25 species, chosen due to their widespread presence and/or potential for second use (flowers, stems, wood, rhizomes or leaves as raw materials for new products).

The APPLAUSE team has already undertaken the first campaign of IAPS tracking and harvesting. Three main aspects are necessary in order to set up a good system:

- **Know your IAPS and where they are:** It is important to locate and track the presence of IAPS in the city so that when it's time to harvest, you know where to go to find them.

How is it done in APPLAUSE? Through the combination of **field work** (undertaken by botanical experts from University of Ljubljana and the City of Ljubljana) and **data from aerial photos and satellites** (processed by the Slovenian Centre of Excellence for Space Sciences and Technologies) a **new digital platform for the identification and life-long monitoring of IAPS will be developed** (by the private company GDi d.o.o.). Thanks to this tool, many tasks that are currently done manually will be digitalized in order to make it easier to be managed by the City of Ljubljana.

- **Choose the best time to harvest:** It can be winter, summer, after it has rained or dry conditions... The time to harvest may vary depending on each species or the part of the plant that needs to be recovered (wood, leaves, stems, flowers...). For paper production, it is better to plan the IAPS collection in the winter, when the plants have no leaves or flowers.

How is it done in APPLAUSE? Experts from the department of Biology and Forestry of the University of Ljubljana advise SNAGA and TISA on IAPS management and harvesting techniques.

- **Arrange logistics and pre-treatment of the material:** So when the IAPS are collected they can be pre-processed and delivered to those producing secondary products.

How is it done in APPLAUSE? Both SNAGA and TISA have made new arrangements in order to pre-treat the different IAPS materials (wood-cutting, fresh leaves collection) and store it until they are needed. Optimal storage conditions are crucial in order to avoid problems with wood fungi, illnesses or moist.

Getting to know each and every characteristic of the different species and the requirements for future material use has been a trial and error learning process. One of the key successes of this first year has been the development of a **protocol for IAPS identification, harvesting, pre-processing and delivery**. Coordination between partners has been crucial. This protocol will be tested next year at the start of the harvesting season.



Photo 5. Storage of pre-processed wood at SNAGA facilities. Photo: Jorgina Cuixart.

Protocol for herbaceous IAPS harvesting and preprocessing

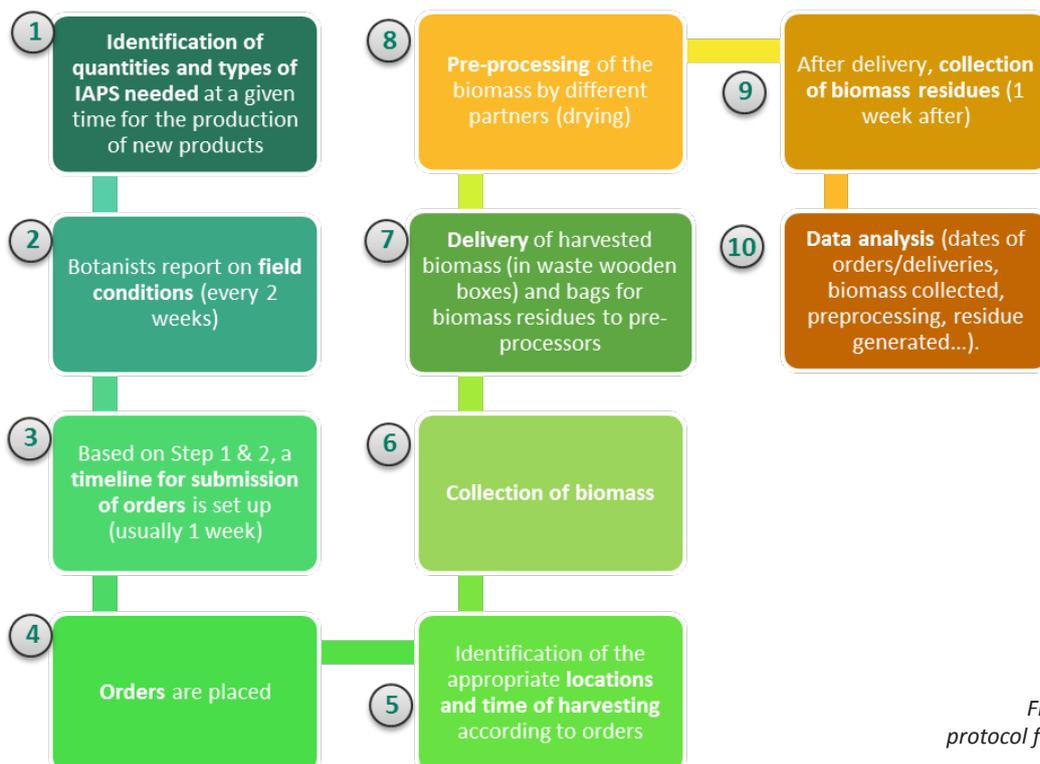


Figure 3. APPLAUSE protocol for IAPS harvesting and preprocessing

3.3 Testing the future innovative products made of IAPS

With the yields of their first IAPS' harvesting campaign, partners responsible for developing innovative products have been busy studying the potential of different materials and components. Thanks to the ample expertise from APPLAUSE partners, the project has been able to identify **multiple uses for IAPS' raw material**:

- **Paper and wood products** (led by TRAJNA, association for the development of sustainable design in cooperation with the University of Ljubljana, Biotechnical Faculty, Department of Wood Science and Technology and the Pulp and Paper Institute): Craft paper sheets, postcards, packaging as well as small carpentry items (tables, frames, etc.).
- **Heritage typography** (led by the Institute and letterpress studio tipoRenesansa): wood types for traditional printing on paper sources, as an alternative to metal types.
- **Dyes and formulations for printing** (led by the National Institute of Chemistry and the University of Ljubljana, Department of Textiles, Graphic arts and Design): extracted from IAPS and prepared for its use in paper and/or textile substrates.
- **Organic pesticides** (led by University of Ljubljana, Department of Agronomy): Substances for preventing, eliminating or controlling pests as an alternative to synthetic pesticides
- **Biochemical compounds** (led by University of Ljubljana, Faculty of Chemistry and Chemical Technology): adding properties (colour, hydrophobic characteristics, durability...) to coatings, adhesives, foams to make them more eco-friendly.



Photo 6. Sample discs of shrubs of *Ailanthus altissima*.
Photo: Dr. Viljem Vek.

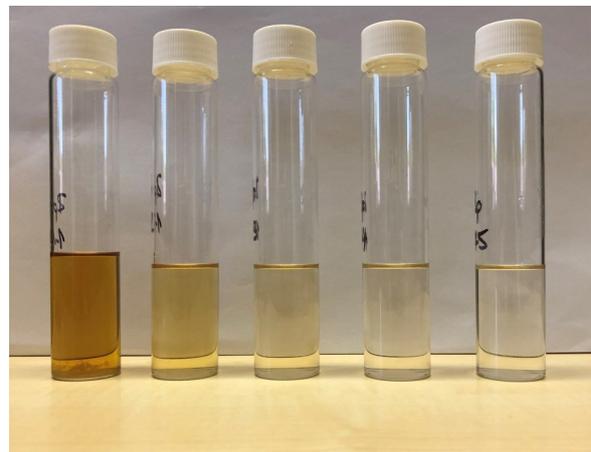


Photo 7. Wood extracts from IAPS.
Photo: Dr. Viljem Vek.

- **Biodegradable plastics** (led by Jozef Stefan Institute): Use of IAPS residues to produce bio-based composites (fibres, particles and/or resin).

While the viability of these new products is still being explored, the progress made so far shows promising results. **A crucial aspect for next year will be to demonstrate the practical scalability of some of these products.** For the craft paper/ wood products or the wood types, this is not a key aspect for success, since their production is artisanal, non-commercial and intends to remain small-scale. For the other products, there could

be some potential for industrialisation. This will depend on the amount of biomass available and the optimisation of the production processes. In the meantime, research partners are ensuring this new knowledge gets disseminated through publications and presentations at international symposiums. This is an important step before any research results can be transferred to market.

TAKE AWAY POINT

→ Striving to close the loop by revalorising the last bit of waste generated

APPLAUSE uses IAPS (until now considered a waste) to develop new innovative products (paper, wood, dyes, biochemical compounds...). But even the process of developing these products generates “some waste”. In its effort to close the loop, one partner of APPLAUSE (Jozef Stefan Institute) has the specific task to find new uses for the residual waste generated during the process of producing the new products. For example, they have been experimenting with the use of microorganisms to extract the lignin generated during the paper pulp production. Instead of going to waste, this lignin (a complex organic polymer) is being used as substrate for the cultivation of bacteria for enzyme production.

4. Summary on implementation challenges

Implementing an innovation in a complex environment such as a city often brings along some challenges. In APPLAUSE, the main ones relate to the need for better coordination of the harvesting of IAPS or the difficulties of multidisciplinary teams (city practitioners, researchers, NGOs, designers...) in working together. Things not always happen as planned and sometimes, it is necessary to improvise. During this first year of implementation, the City of Ljubljana and their partners have learned to remain flexible in order to come up with solutions to some implementation challenges.

The Urban Innovative Action initiative has defined **seven implementation challenges** that are common in many projects. An assessment of how these challenges are impacting the APPLAUSE project is provided below (**red**: high importance, **yellow**: medium importance and **green**: low importance):

Table 1: Mapping urban infra revolution against the established uia challenges

Challenge	Level	Observations
1. Leadership for implementation	High	This has been an issue of great importance for the first year of implementation, especially since APPLAUSE involves partners from many disciplines (scientific, design, practitioners) who have had to learn to work together. As project leader, the team in the City of Ljubljana have had to put in place good leadership skills: providing direction and vision, focusing on the project needs while supporting the partners' interest, setting clear goals and communication channels, inspiring and stimulating work. This will remain a key priority in APPLAUSE.
2. Public procurement	Medium	Procurement processes within APPLAUSE focus on the purchasing of equipment (for example, machinery for the wood workshops). The process is going smoothly. The partners have introduced some criteria in the tender specifications to ensure that the equipment is more environmentally-friendly. While green procurement is becoming a standard in Ljubljana, smart procurement (leaving freedom of innovation in the mode of delivery) is sometimes perceived as too risky. Within APPLAUSE, the nature of the public procurement (very much focused on specific equipment) does not leave too much room for smart procurement.
3. Integrated cross-departmental working	Low	This challenge seems to be quite well resolved in APPLAUSE. This is because cross-departmental working is part of the working culture of the City of Ljubljana . It happens at many levels: weekly meetings of the heads of department, team building activities for all employees once a year, etc. Such collaboration also expands to the "big family" of the city of Ljubljana (public organisation delivering public services in the city) whose representatives also meet with city officials on a regular basis. Also, the core team in the city delivering APPLAUSE is cross-departmental (European affairs, Environment department and IT) which makes the organisational arrangements within the urban authority much easier.
4. Adopting a participative approach	Medium	The coordination structures put in place in APPLAUSE (monthly consortium meetings, steering group and policy guidance group meetings) support the active participation and co-implementation of both project partners as well as other stakeholders outside the consortium. Also, public events such as the IAPS festival, which counts with the participation all project partners, are a good occasion for fostering such participative culture. For the upcoming months, the challenge will be to involve local residents and NGOs who are not yet familiar with the project.

Challenge	Level	Observations
5. Monitoring and evaluation	Low	<p>At the start of the project, APPLAUSE developed a monitoring plan with a set of indicators for each activity. Thanks to this initial plan as well as specific evaluation activities foreseen in the work-packages, this challenge is perceived as low risk.</p> <p>However, towards the end of the project APPLAUSE will deliver the overall circular model for IAPS management. Demonstrating its viability from a practical and economical perspective will be a good indicator of the real added value of the project. This measurement will be complex given the multitude of interconnected processes that take place in the model (harvesting of each IAPS, different pre-processing techniques, wide range of innovative products...). Therefore, it is likely that this challenge raises in importance as the project develops.</p>
6. Communicating with target beneficiaries	High	<p>The entire approach of APPLAUSE is based on a strong citizens' involvement. Through large-scale educational and awareness raising campaigns, citizens are encouraged to participate in IAPS harvesting and its use in innovative products. Establishing good communication with citizens is one of the main priorities of the City of Ljubljana as project leader. To be as effective as possible, the city uses established channels (for example the city's own social media accounts which already have many followers or existing events such as the annual cleaning day). Also, the citizen engagement activities focus on the 5 districts that are nearest the IAPS collection points in order to facilitate involvement.</p>
7. Upscaling	Medium	<p>One of the main goals of APPLAUSE is to deliver a circular model for IAPS management that is self-sufficient. Partners are confident that this self-sufficiency will sustain the long term impact of the project. Even if some aspects of the model (for example one specific secondary product) are not viable, the overall model will be sustained by SNAGA, Ljubljana's public waste management company. This is because IAPS management is an additional responsibility for SNAGA and APPLAUSE offers a better alternative to their existing practices. For up-scaling, the main challenge will be to get more citizens to participate and also to extend the number of IAPS treated once the financial resources secured through APPLAUSE end.</p>

5. Conclusion

After speaking to partners during my site visit in October 2018, one reaches the conclusion that APPLAUSE's first year has been intense. At the same time, it is been a rewarding learning experience for all partners. For some of them, this has been the first time working in an urban setting where implementing "new things" tends to be quite complex.

This first year the main effort has been on "inward activities": establishing good coordination structures within the consortium, organising the first campaign of IAPS harvesting and testing the new innovative products. **The second year is likely to focus on consolidating such activities and kick-starting the project's**

"onward activities" aimed at engaging citizens.

Readers of the next journal will expect to learn about:

- The progress made in mapping of IAPS.
- The experience in using the IAPS protocol during the next seasons' campaign.
- The performance of the digital software tool for automatically recognising IAPS on the field.
- The definition of the final products to be developed as part of the project
- And the take-up of the awareness raising and educational campaigns.

So keep an eye on APPLAUSE!

Urban Innovative Actions (UIA) is an Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges. Based on article 8 of ERDF, the Initiative has a total ERDF budget of EUR 372 million for 2014-2020.

UIA projects will produce a wealth of knowledge stemming from the implementation of the innovative solutions for sustainable urban development that are of interest for city practitioners and stakeholders across the EU. This journal is a paper written by a UIA Expert that captures and disseminates the lessons learnt from the project implementation and the good practices identified. The journals will be structured around the main challenges of implementation identified and faced at local level by UIA projects. They will be published on a regular basis on the UIA website.



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