

## ***Lessons learned – 2nd reporting period (1. 11. 2018 – 31. 10. 2019)***

<b>Communication</b>	<p>The decision to use the existing communication channels of the City of Ljubljana (Website, Instagram, FB account and YouTube) was a very good one. The decision behind it is that the mentioned channels have already established and broad range of interested public in urban development and different processes and policies, especially environmental. We are also using additional digital channels free of charge like digital displays in public buses, FB accounts of several city districts and digital newsletter of the City of Ljubljana. The main goal of the APPLAUSE project is to include and motivate as many stakeholders as possible and by using already existing channels we can achieve a goal of mobilising and raising awareness of all target groups better than by creating a separate digital communication channels.</p>
	<p>Due to great deal of interest among people, it would be good to consider expanding the Festival of (re)use of invasive alien plants from a one day event to several days.</p>
	<p>During the presentation of the project in the centre of Ljubljana (Festival), we have experienced how different is the understanding of the presented laboratory activities for different age groups. We also conclude that taking the scientific topics straight from the laboratory down to "the streets" can be problematic. Simplification of scientific explanations is needed, but this can quickly lead to over simplification and misunderstanding of the problems, because the general public is unfortunately not equipped with even the basic knowledge to understand many scientific topics.</p>
	<p>The issue of invasive species cannot be framed without transdisciplinary collaboration. The field needs to invite social sciences into conversation to frame the discourse in an inclusive and politically correct/unbiased way. Transdisciplinary could be improved by partners presenting their needs, dynamics, processes and methods in their working practice. A document of collaborative working ethics could be designed.</p>
	<p>We had several presentations in 2019 and while presenting IT and database platform, we found that we would need some printed materials/brochures dedicated to the Applause IT system only.</p>

	<p>Education of public is very important for everyday work of arborists in the city. When we cut trees lots of people stop and comment. Sometimes aggressively and unpleasant. Mostly they want to protect trees and stop cutting. Usually that is good, so each tree removal should have a good reason. After we inform the public about the reasons for cutting the trees (invasive trees, rotten, dangerous), most of the people understand it and agree with it.</p>
<p><b>Awareness raising</b></p>	<p>Within the project, we are raising awareness of invasive plants with three age groups. School children proved to be the most appropriate age group in terms of organization, performance and knowledge acceptance.</p> <p>In our work with volunteers, we face several challenges: motivating the participants to devote their free time to work activities, providing a large enough group of volunteers, finding a suitable area with invasive plants and finding days with appropriate weather.</p> <p>Some elderly citizens with physical disabilities have proved to be less motivated to gain knowledge on how to remove invasive plants.</p> <p>Of all the groups, working with primary school pupils, who received information well and enjoyed attending workshops, proved to be the most effective and meaningful. Additionally, organization of school events is straightforward, as schools are happy to accept provision of new and exciting content, especially if they are not required to pay for.</p> <p>Free culinary workshops were a very successful way to raise awareness. At six workshops, more than 100 participants prepared different dishes from cold and hot entrees, main courses, side dishes and desserts. It would be worth considering carrying on with similar type of actions due to the popular demand.</p>
<p><b>Result indicators</b></p>	<p>Within the Applause Activity "Impact assessment" a logical roadmap of results that illustrates the implementation and the impact of all project activities based on measurable result indicators, had to be provided. To track the progress of the project toward the set objectives and to guide the local partner as well as their stakeholders' decision, the evaluation as a systematic process of collecting and analysing the information will be performed. Due to unaccounted results and result indicators this activity was all about to tackle the project outputs onto a higher level to show main results and the impact made by this action in a way, the officers of the Urban Innovative Actions Initiative - Permanent Secretariat may easily understand and assess.</p>

	<p>Unfortunately within the strategic framework of the Applause project a clear definition of results was missing. From our standpoint this task should have been set at the very beginning within the Applause Application form. At this stage of the project implementation, the project coordination team as well as the officer's team were highly occupied with time-consuming efforts to set the missing link.</p>
<p><b>Selection, harvesting, biomass collection, pre-preparation, primary wood processing</b></p>	<p>The actual quantities of IAPS that citizens bring to the collection centre are significantly lower than expected. There is less than planned engagement of individuals to self-dispose of IAPS.</p>
	<p>During the project we learned that the difference between the weight of collected plants and weight of biomass suitable for use (for cooking stems of Japanese knotweed at ICP as preparation for papermaking) could be enormously bigger than expected. After milling the stems of plants, water flows away from plants and quantity of biomass suitable for further use can be 2 times smaller than collected biomass, depending on the humidity of the plants.</p>
	<p>It is important, how you dry fresh material. If it is too crowded, it becomes mouldy.</p>
	<p>Harvesting of tree bark is much easier on fresh logs right after cutting in spring, compared to older and already dry logs.</p>
	<p>Botanical field work can begin at the end of May and continue until the first significant drop in temperature (October, November).</p>
	<p>Field botanist must be able to recognize IAPS at different development phases and consider the intraspecific variability.</p>
	<p>Field work is affected by weather: it affects the development of plants and length of field work season, also working in rain or high summer heat is difficult or impossible.</p>
	<p>Thermal modification of wood has to be optimised for each wood species. Thermal modification of some of the invasive species was very challenging. Predominately wood of <i>Robinia pseudaccacia</i> was challenging to modify. During the respective study, it was clearly shown that special attention has to be given to the drying phase and the modification temperature has to be elevated steadily to prevent honeycomb cracks in the thicker elements. We have to repeat modification procedure for several times, to produce material of sufficient quality.</p>
<p><b>Research</b></p>	<p>If plants were sprayed in hot, dry wheatear; extracts can cause phytotoxicity, only on lettuce. To neglect this factory, spraying of lettuce should be performed as early in the morning (7 am), when there is no strong sun.</p>

Efficacy of water extracts differs between invasive alien plants and also differences were detected between groups of different harmful organisms. For example, water extract from false indigo has insecticidal properties against onion thrips, *Phyllotreta* spp, *Eurydema* spp., but not against colorado potato beetle.

Printing on brown paper, produced from IAPS, can be performed on the same printing quality as it is on the paper, produced from bleached chemical pulp, when using the digital ink-jet printing technique with high dye coverage.

Dyeing textiles or printing paper with higher concentration of dye obtained from Japanese knotweed rhizomes yields durable colours of textiles and on papers. However, rhizomes should not be picked in winter time, due to the too small amount of dye that can be extracted.

Using a lignin – waste biomass from paper industry, is quite different as using pure chemicals in the laboratory. Analysis is difficult as different types and parts of the plant – roots or stems, different harvesting time yield different structures. Extraction also induce some changes in its structure and every sample is different and complicates further research.

When trying to use natural dyes extracted from plants to produce solar cells, we found that changing one part, requires us to optimize all other parts as well. Furthermore, we cannot extrapolate the type and intensity of the colour to the efficiency of the solar cell.

According to our hypothesis, we succeeded in isolating lignin degrading bacterial strains, which turned out to be phylogenetically very similar.  
We did plan to screen large collections of isolates, which has helped us obtain the strains, but we conclude that these strains are not as numerous in a natural bacterial population and that their isolation is problematic due to the very high number of other bacteria that cannot degrade lignin.

Wood analyses - During the process of machines selection and their arrangement in a workshop, it is very important to know the products that will be produced in the workshop. However, these can only be predicted successfully, if we know the available raw material and its dimensions, which means that tree species identification as the first step of the project is very important.

	<p>In determining the machining properties of wood, the variability of the density of each tree species is very important. In particular, this proved to be very important with <i>Ailanthus altissima</i>, which had extremely high density variability at different samples. This variability resulted in very different machining quality, which means that the samples with higher density machined very well while the samples with lower density machined very poorly.</p>
<p><b>Wood products prototype and production</b></p>	<p>Doing wood products prototypes requires following lots of different processes (technological, practical, communication between designers...).</p>
	<p>Involved partners (design and production of wood prototypes) have different working dynamics, so it is good to plane meetings once in 2 weeks.</p>
	<p>Pre-preparation is very important in a process of design. Some brainstorming including students are welcome. We already have a list of planed simple and more complex wood products but we need to be open for some new ideas especially supported by young generation.</p>
	<p>We need to plane seasonal products in advance - Christmas gift- for example hanging tree ornaments .</p>
<p><b>IT, digital platform, database</b></p>	<p>When planning to develop software IT system, one should take into account, that the deployment IT infrastructure can be changed while project is in progress. One must plan additional effort to adapt SW IT system to the infrastructural changes occurring regularly in IT, such as database and GIS system upgrades, Javascript libraries updates, GIS data transformation etc. Also, a completely separated test system shall be planned.</p>
	<p>Both of the developed methods for automatic detection of invasive plant species on satellite data that we have developed in the scope of the APPLAUSE project rely heavily on a good quality ground truth data. The stands in order to be detected on satellite data need to be dense and compact and not mixed with other vegetation or grow under it. Due to these reasons most of the ground truth data we got from the experts in the project and web portal “Invazivke” were useless for our methodological approach. We had to collect our own ground truths to use as a training samples.</p>

	<p>Only invasive plant species that are of certain size can be detected on the Sentinel-2 satellite images. A single image element - or a pixel- may not necessarily carry enough important information if and where exactly invasive plant species are located. For a relevant analysis we therefore have to observe a sufficiently large areas of invasive plant species, but most types of invasive species are present individually or on smaller land plots and can therefore not be detectable on satellite images.</p>
<p><b>Circular business model</b></p>	<p>Preparing a business model is a process - plan enough time and include the whole value chain. In order to have a solid partnership each partner should invest something in order to get something back.</p>
	<p>The price of APPLAUSE's finished products due to biomass removal and pre-processing cost will most probably be higher than similar products made of regular paper or wood. It will be necessary to assess more precisely how many buyers on the market are willing to pay for such products and adjust the production volume accordingly.</p>