APPLAUSE

– FROM HARMFUL TO USEFUL WITH CITIZENS LED ACTIVITIES

PROJECT PLAYBOOK

RECOGNIZE, REUSE OR HAND OVER.

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WHY PROCESS INVASIVE ALIEN PLANTS?

INVASIVE ALIEN PLANT SPECIES (IAPS) HAVE BEEN RECOGNIZED FOR SEVERAL DECADES AS ONE OF THE MOST IMPORTANT REASONS FOR THE DECLINE OF BIODIVERSITY. THEY CAN ALSO CAUSE ECONOMIC AND ENVIRONMENTAL DAMAGE. SOME ARE EVEN HARMFUL TO HUMAN HEALTH, CAUSING ALLERGIES, SKIN REACTIONS AND INFLAMMATION.

In Slovenia, about 150 IAPS can be found in nature, of which at least a third are invasive or potentially invasive. IAPS have been present in Slovenia for several decades. Some occur in smaller populations that can still be permanently eradicated, some, unfortunately, no longer. In most countries, the IAPS biomass is still composted or incinerated. In Ljubljana, we started researching and testing the possibilities of processing IAPS biomass into useful purposes in 2016, when we were, together with four partners, among the first in the world to produce paper from Japanese knotweed at the semi-industrial level. The results were so promising that in 2017 we started to form an interdisciplinary consortium and the result of that work is the APPLAUSE project. The project connects 11 different partners and has created lots of new knowledge in the field of IAPS processing.

We want to share this knowledge with you because the problem of IAPS cannot be solved at the level of an individual or an individual city - it is necessary to involve as many different stakeholders as possible.

So, where to start?

Species introduced by humans into an environment in which they did not thrive before are called alien species. They come to our places in different ways, and many have been settled by man deliberately to bring benefit, e.g., edible plants (such as potatoes, tomatoes and maize), fodder and honey plants, ornamentals, shrubs and trees. These contribute to the well-being of people, and we can hardly imagine our lives without them. But among these, some plants have been introduced into an environment unintentionally. Most alien species do not survive in the new environment because they cannot adapt to it, and only a few are able to settle, successfully reproduce, spread and, with time, cause damage to the conquered area. We call them invasive alien species.

INVENTORY/STATE OF THE ART

The key to solving the problem of IAPS is a good early detection warning system and active management of existing populations. Eradication of IAPS requires years of work, precision and perseverance. It is very important that national and local institutions set an example for their residents, including the eradication of IAPS on land owned by them.

IAPS are here, and some will stay here forever. Only based on biomass quantity data will you be able to correctly estimate the costs of eradication and the potential for processing. Normally, the city does not have sufficient funds to eradicate all the IAPS present, nor is eradication mandatory for all of them. We suggest that you define the priorities for eradication based on applicable legislation (which species must be eradicated), the potential for damaging human health and the protective status of the area.

Also, when collecting data on the distribution of the IAPS , get acquainted with stakeholders who are already active in this field. This will facilitate the further assembly of your value chain.

TO-DO LIST:

Step 1: Review the legislation,

Step 2: Establish collaboration with biologists - botanists,

Step 3: Prepare a list of existing data on the distribution of the IAPS,

Step 4: Prepare a list of already active stakeholders.

METHOD OF WORK: office work.

EQUIPMENT NEEDED: computer.

EXAMPLE OF THE APPLAUSE PROJECT

The analysis of existing IAPS databases in Ljubljana before the APPLAUSE project identified some important guidelines for creating new databases. 1. The habitats of the species must be so precisely defined so that the utility companies can easily find them (best option are polygons on digital orthophotos in 1:500 scale). 2. The database should separate data collection from the IAPS eradication measures carried out. 3. Descriptive parameters about plants need to be carefully selected in order to predict better and analyze the potential source of material for different products.

CONTACT

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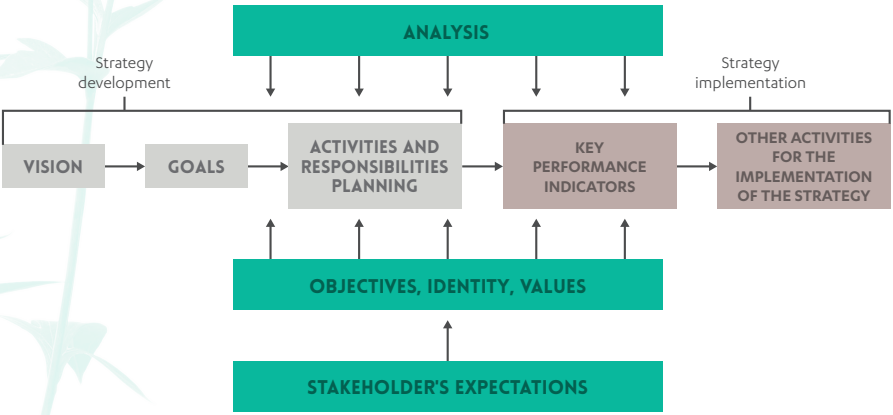
GOALS, OBJECTIVES AND PERFORMANCE INDICATORS

Diversity is an opportunity to stimulate creative thinking and helps implement better and more innovative solutions faster. This is especially important in the field of the circular economy, where we assemble value chains. Only with interdisciplinary working groups can we achieve the most optimal result, so we should not be afraid to introduce them into our everyday work. However, it should be noted that the results of IAPS eradication are rarely immediate, but should be seen as a long-distance run.

Forming partnerships is a process that requires sufficient time. There are several forms of partnerships, from very formal ones (signing a contract) to completely informal (even more flexible). When working together, it is of utmost importance that the partners agree on the goals and objectives of the work.



Source: Development of strategy and evaluation of business model within the APPLAUSE paper and wood workshop, T. Čater.

The key performance indicators or success factors must be determined based on three areas: the economic, social and environmental. One of the performance indicators should also be the newly acquired knowledge and the number of stakeholders involved. In the field of environmental impact, for example, an effective indicator would be the percentage of biomass harvested that is not incinerated but is instead put to good use in such a way that the biomass maintains a higher added value. From the point of view of the social impact of the project, you can evaluate quite accurately how many participants were involved in various guided activities, such as workshops, harvesting campaigns, festivals of (re)use, or how many people were acquainted with online contents (manuals, instructions, videos) on IAPS. The economic impact can be evaluated in the context of connecting stakeholders into a new business model based on a sustainable and circular economy and promotion of local development or cooperation.

TO-DO LIST:

Step 1: Establish an interdisciplinary working group or project consortium,

Step 2: Carry out a workshop to present the existing system of IAPS management and gather ideas for upgrading,

Step 3: Carry out economic, social and environmental evaluation of the implementation of the ideas,

Step 4: Carry out a working group meeting or workshop to determine the set of activities to be carried out and the associated performance indicators.

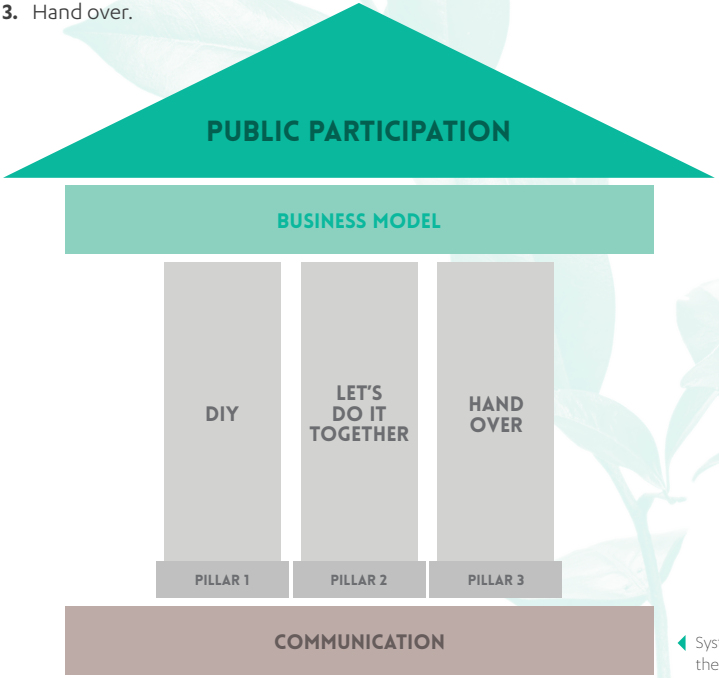
METHODS OF WORK: office work, workshops. Optional: external expertise for workshops.

EQUIPMENT NEEDED: computer, write-erase board.

EXAMPLE OF THE APPLAUSE PROJECT

The system of managing IAPS is based on education and cooperation with the citizens of Ljubljana and three principles of operation:

1. Do it yourself (DIY videos and plans),
2. Let's do it together (visit different workshops),
3. Hand over.



System of managing IAPS in the City of Ljubljana.

Key performance indicators for APPLAUSE project:

1. Citizen's awareness on the IAPS identification, collection and processing (we measure the number of workshop participants, the number of views of YouTube videos, etc.).
2. IAPS eradication system improvement (we measure time savings).
3. Improved preservation and promotion of cultural heritage (we measure the number of workshops and shops with old knowledge and machines).
4. IAPS as a source for the production of wooden and paper products (we measure the number of new products).
5. New processes for the production of input materials for industry (e. g., vanillin) and the substitution of oil-based industrial processes (we measure the number of new processes, etc.).
6. Pilot paper production from IAPS using enzymes (we measure lignin consumption in pre-tre ated pulp production material).

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ROLES AND RESPONSIBILITIES

The members of your value chain will, in most cases, come from different fields of work and use different methods of work to carry out their tasks. The role and responsibility map is, therefore, a necessity with which we later avoid misunderstandings and excuses. A professional moderator who is not involved in the partnership can also help solve major stagnations.

TO-DO LIST:

Step 1: Prepare a list of planned activities,

Step 2: Prepare a list of references of the involved stakeholders,

Step 3: Draw a scheme of roles and responsibilities.

METHOD OF WORK: office work. Optional: external expertise to assist in the distribution of roles.

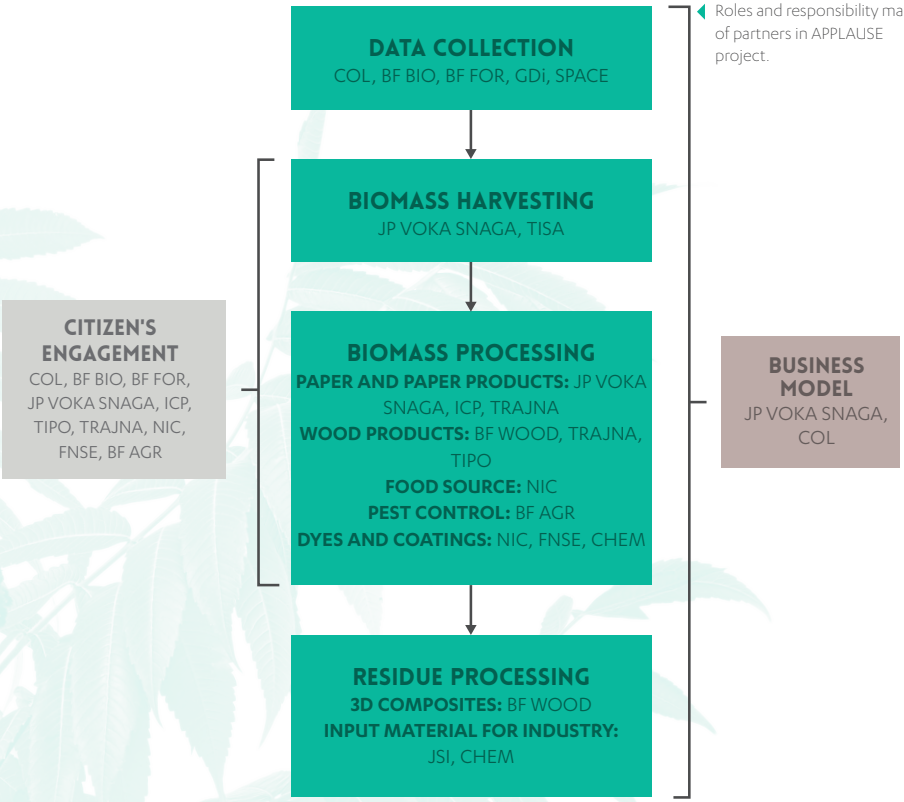
EQUIPMENT NEEDED: computer.

EXAMPLE OF THE APPLAUSE PROJECT

Number of all project participants: 16 organizations, a total of 185 people

Number of researchers involved: 92

Number of undergraduate and postgraduate students involved: 375



COL – City of Ljubljana, **JP VOKA SNAGA** – public company JP VOKA SNAGA, **BF BIO** – University of Ljubljana, Biotechnical Faculty, Department of biology, **BF FOR** – University of Ljubljana, Biotechnical Faculty, Department of Forestry, **BF AGR** - University of Ljubljana, Biotechnical Faculty, Department of Agronomy, **BF WOOD** - University of Ljubljana, Biotechnical Faculty, Department of Wood, **FNSE** - University of Ljubljana, Faculty for Natural Sciences and Engineering, **CHEM** – University of Ljubljana, Faculty of Chemistry and Chemical Technology, **JSI** - Jožef Stefan Institute, **NIC** - National Institute of Chemistry, **ICP** - Pulp and Paper Institute, **TISA** - TISA, Company for arboriculture and forestry, **GDi** - GDi d.o.o. Ljubljana, **TRAJNA** - TRAJNA, an association for the development of sustainable design, **TIPO** - studio tipoRenesansa, **SPACE** - Slovenian Centre of Excellence for Space Sciences and Technologies

CONTACT:

- The City of Ljubljana, Office for Development Projects and Investments, Section for Development Projects, Adamič-Lundrovo nabrežje 2, 1000 Ljubljana

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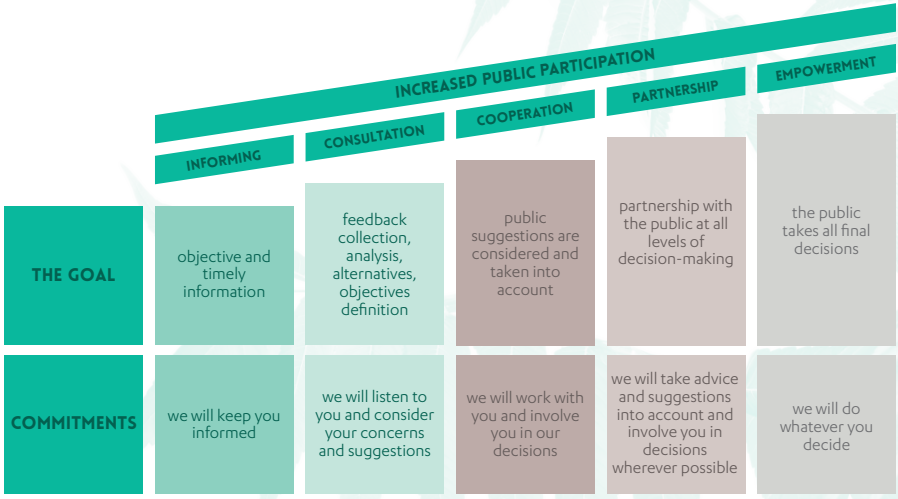
PUBLIC PARTICIPATION

In Slovenia, most land is privately owned. Therefore, the issue of IAPS cannot be solved without public participation.

The method of achieving the full participation of citizens in decision-making and activities is called the participatory model. This approach represents a vision of democratic, community-oriented participation of all individuals. For successful cooperation with citizens, the first and key step is to establish a relationship. From the point of view of cooperation, we can distinguish three milestones: the decision to participate, the initial participation and permanent participation. The three main factors that usually influence the decision to participate are: users need to be aware of the opportunity, users need to recognize the appropriateness of the opportunity, and users need to be motivated.



Public participation model example.

Citizens' education is a process as well, with the results not being visible immediately, but showing in the long run. Identifying and eradicating IAPS must become a habit, and a variety of activities are required to carry them out. In most cases, those activities that are easy and fun for the participants are more successful. Experience shows that the use of short films, e.g., on YouTube, interactive 3D models, culinary workshops and phone apps, are the most popular.

Information provided must be unambiguous and professionally verified. It is recommended to use different communication channels for young (social networks) and older population (publications). Festivals of reuse, where various products are on display and the public has the opportunity to ask questions directly, work very well too. However, school children proved to be the most appropriate age group in terms of activities organization, performance and acceptance of knowledge.

How to involve children? The workshop for children is carried out in two parts. The first part is intended to present the issue of IAPS. If no IAPS grow nearby, use photographs, 3D plant models or short films. The first part of the workshop should last up to 45 minutes. The second part of the workshop is experiential. Children get to know the process of making paper (machine or hand-made) and wood products; they can also learn the traditional technique of high letterpress printing. The second part of the workshop should last a maximum of 1.5 hours. At the end of each workshop, the children fill in a short questionnaire (up to 5 questions), out of which new knowledge and satisfaction with the workshop can be seen.

TO-DO LIST:

Step 1: Analysis of the landowners' age structure,

Step 2: Analysis of the IAPS inclusion in the education system,

Step 3: Prepare a communication plan.

METHOD OF WORK: office work. Optional: cooperation of marketing external expertise.

EQUIPMENT NEEDED: computer.

EXAMPLE OF THE APPLAUSE PROJECT

JP VOKA SNAGA carries out educational and creative workshops on paper and wood processing at Povšetova ulica 6 with the aim of spreading basic knowledge about paper, wood and the 'do it yourself' culture. The workshops offer a sustainable solution to how we can handle IAPS in the future. They include programs for groups or individuals (science and technology days for children from the age of six, rental of a hand-made paper workshop with a master), tailored to the participants.

On the premises of the Pulp and Paper Institute at Bogišićeva 8, you can join educational workshops with a tour of the pilot paper machine. The purpose of the workshops is to demonstrate the basics of paper-making for groups or individuals. A creative day for children up to the age of six, a technical day for primary and secondary school students, and a workshop on the topic of using paper in everyday life is offered. The workshops according to the wishes of the participants can be prepared.

At Breg 22, the tipoRenesansa studio carries out workshops for making posters with wooden letters for letterpress printing. The purpose of the workshops is to learn the old printing technique and make a poster through a creative game with letters.

At Bežigrad's Krater, a creative laboratory in a construction pit (at the intersection of Peričeva ulica, Topniška ulica and Dunajska cesta in Ljubljana), TRAJNA, an association for the development of sustainable design, is implementing socially and environmentally responsive education, which will invite various artists and other curious citizens to design products from wood and paper made of IAPS. The workshop is suitable for designers, school groups, development of project or business ideas, or tailored to the participants' wishes.

Number of educational events (excluding workshops): 29

Number of educational videos (YouTube): 44

Number of prepared publications: 12

Number of exhibitions: 2

CONTACT

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  Kristjan Jarni, Ph.D., kristjan.jarni@bf.uni-lj.si

- Educational workshops in the hand-made paper artesian workshop: VOKA SNAGA, water and waste management public company, Vodovodna cesta 90, 1000 Ljubljana

  Meta Vidovič, meta.vidovic@vokasnaga.si

- Educational workshops with a tour of the pilot paper machine: Pulp and Paper Institute, Bogišićeva 8, 1000 Ljubljana

  Tea Kapun, Ph.D., tea.kapun@icp-lj.si

- Workshops for making posters with wooden letters for letterpress printing: Institute and letterpress studio tipoRenesansa, Breg 22, 1000 Ljubljana

  Marko Drpić, marko.drpic@tiporenesansa.com

- Educational wood and paper workshops at Bežigrad's Krater: TRAJNA, an association for the development of sustainable design, Dunajska cesta 56, 1000 Ljubljana

  Gaja Mežnarić Osole, info@trajna.si

  Andrej Koruza, info@trajna.si

APPLAUSE IDEAS

THE MOTIVE FOR COOPERATION:
- users participate in voluntary actions
  - **values, environment-protection**
- engaged owners of private IAPS surfaces
  - **legislation**
  - **land value / potential damage**

THINK ABOUT POSSIBLE BARRIERS TO PARTICIPATION AND HOW TO OVERCOME THEM
- unconsciousness, disinterest

DEVELOP A PLAN FOR MONITORING AND CONTROLLING ACTIVITIES
- records (collection center, attendance sheets)

RECORDS ALREADY IN PLACE

PROVIDE AN OPTION FOR CUSTOM SERVICE OF IAPS DISPOSAL AND BIOMASS TAKEOVER

Participatory model of the APPLAUSE project.

OPPORTUNITY AWARENESS AND THE DECISION TO PARTICIPATE

CREATE AWARENESS OF THE OPPORTUNITY OF THE APPLAUSE PROJECT
- PR communication/information on how the user can participate

DIFFERENT AUDIENCES AND COMMUNICATION
- all (active, elderly, young): Invitation to IAPS voluntary actions, visit educational workshop
- owners: provide information for identification and efficient disposal, invitation to submit IAPS biomass to the Collection center

CLEARLY PRESENT THE PURPOSE OF THE PROJECT, WHAT ARE THE TASKS OR OPPORTUNITIES FOR PUBLIC PARTICIPATION AND WHERE THEY CAN GET MORE INFORMATION OR PRACTICAL GUIDANCE

WEB PAGE - information and practical guidance

COOPERATION WITH TRŠH, ARTEMIS, NATURA 2000, WITH ECOLOGICALLY CONSCIOUS ASSOCIATIONS, GARDENING CENTERS - attracting engaged users for cooperation

COLLECTION CENTER INSTRUCTIONS FOR USERS

FIRST PARTICIPATION

TO ENSURE THAT THE EXPECTATIONS AND TASKS OF PARTICIPATING USERS ARE UNAMBIGUOUS AND CONSISTENT

TO DETERMINE REWARDS FOR FIRST ATTENDANCE

IDENTIFY THE REASONS WHY THE PARTICIPANT IS ATTRACTED TO PARTICIPATION (PERSONAL VALUES, NEW KNOWLEDGE)

INSTRUCTIONS FOR USERS WHO REMOVE IAPS (Announcement / higher volumes / possible material for products)

PERSONAL ADMISSION OF USERS TO COLLECTION CENTER AND BIOMASS TAKEOVER

INSTRUCTIONS FOR PARTICIPANTS IN VOLUNTARY REMOVAL CAMPAIGNS

CONTINUOUS COOPERATION

TO ENSURE THAT THE PROJECT IS WELL ORGANIZED AND THAT COMMUNICATION WITH USERS IS REGULAR

GIVE USERS FEEDBACK THAT THEIR PRESENCE AND TIME SPENT ARE VALUABLE

EXPLORE HOW ENGAGED USERS CAN BE REWARDED

DEFINE THE TYPE OF REWARDS

COLLECT USER DATA WITH CONSENT (first and last name, email) FOR THE PURPOSE TO BUILD A COMMUNITY

INFORMING AND GIVING FEEDBACK

FREE PARTICIPATION IN WORKSHOPS

DISCOUNT WHEN BUYING PRODUCTS FROM IAPS

ADDITIONAL BENEFITS (promo materials, participation in sweepstakes - e.g. for tickets, etc.)

AFTER THE PARTICIPATION

ESTABLISH TOOLS SO THAT PARTICIPANTS CAN PROVIDE FEEDBACK

QUESTIONNAIRES IN PHYSICAL FORM

"SUGGESTIONS, COMMENTS" AS A SECTION OF THE WEBSITE AND THE POSSIBILITY OF COMMUNICATION THROUGH THE EMAIL APPLAUSE@LJUBLJANA.SI

IAPS - Invasive alien plant species

- activities that could be implemented

- activities already implemented

IAPS DATA COLLECTION AND MANAGEMENT

In order to make the right decisions, we need to know the distribution of the IAPS. The classic way of obtaining data is a field inventory, which is a time-consuming and financially costly task, but sometimes the only option. Rough estimates of the distribution of the IAPS can also be obtained from the analysis of aerial and satellite images. Unfortunately, the two methods are not without drawbacks, as the final result depends mainly on the properties of the original images (appropriate time series of field data), the density of the plant species and the size of the location. In urban areas, we often have smaller degraded areas where invasive alien species grow mixed, and it is impossible to identify an individual plant species from satellite images. It is also important that field data are obtained for the whole research area and not just for a part of it. The spatial distribution of the terrain data leads to greater homogeneity of the sample data and leads to better detection results throughout the investigation area.

LEGENDA:

- City of Ljubljana
- Japanese knotweed

Locations of invasive alien knotweed, detected by the analysis of an aerial (orthophoto) image.

In plant identification, we can also use applications based on the deep learning approach – today, the most well-known and widely used is the artificial intelligence (AI) approach. It is necessary to consider whether to use existing applications to identify plants or their modifications, or decide to develop our own application. In the latter case, experts who already use such applications should be consulted.

Data are the capital of the future. More and more of them are being published in open form. The choice of an appropriate data management platform is thus a very important decision, as it affects maintenance costs, the quantity and quality of the analyses and the possibilities for data exchange.

TO-DO LIST:

Step 1: Analysis of the existing IT and GIS system,

Step 2: Prepare a list of IAPS and appropriate eradication measures,

Step 3: Establishment of a platform for data collection and management (mandatory participaton of a biologist - botanist),

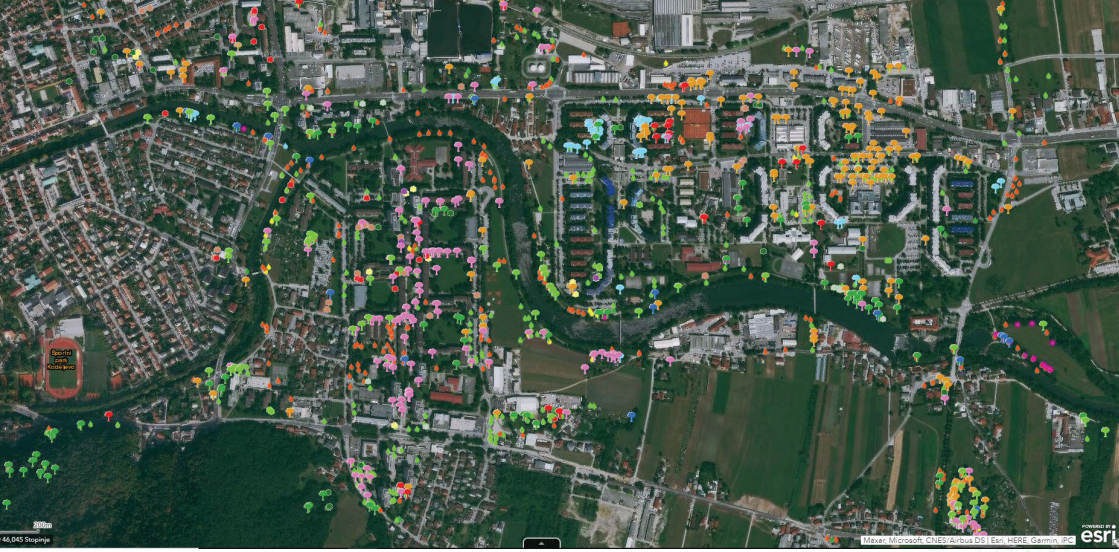
Step 4: Prepare a platform maintenance plan.

METHODS OF WORK: office work and fieldwork. Mandatory participation of a biologist - botanist.

EQUIPMENT NEEDED: computer, tablet with GPS.

EXAMPLE OF THE APPLAUSE PROJECT

The platform for the management of IAPS in Ljubljana consists of several building blocks. The field experts are using a mobile app on tablets to map IAPS, including habitat descriptions and plant specimen properties. The citizens can enter their own observations through the WebPortal Service for Citizens' Initiatives, which are checked and included in the system if approved by the employees of the City of Ljubljana. The employees of the City of Ljubljana are using an application to create digital working orders for IAPS eradication. The working order contains a map and descriptions of locations, based on which it is possible to estimate the cost of removal. The contractors get access to a mobile app on which they record the work done. They can also add an image of the location before and after removal, and enter features after the procedure. Thus, the database is regularly updated and the activities performed recorded. The employees of the City of Ljubljana have an on-going insight into the situation and can take appropriate action immediately.



Display of filed inventory results with an application for the inventory of invasive alien plants.

The number of newly obtained pieces of IAPS data – more than 26,000 data for 120 plant species at more than 20,000 localities (growth sites). The area of the growing sites covers over 2.3 km².

Saved time using a new IAPS management platform – Example of common ragweed eradication (350 locations). We estimated that it took 25 hours to manually prepare a list of locations and eradication maps before setting up the platform; now we need 12 hours to do the same work.

CONTACT

- The analysis of orthophotos and satellite images: Slovenian Centre of Excellence for Space Sciences and Technologies Space-SI, Aškerčeva cesta 12, 1000 Ljubljana

  Urša Kanjir, ursa.kanjir@space.si

- Data management platforms: GDi, d. o. o., Ljubljana, Šmartinska cesta 106, 1000 Ljubljana

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- Field inventory: The City of Ljubljana, Department for Environmental Protection, Zarnikova 3, 1000 Ljubljana

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- Field inventory: University of Ljubljana, Biotechnical Faculty, Department of Biology, Večna pot 111, 1000 Ljubljana

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BIOMASS PROCESSING

The possibility of processing begins with the exploration of the material. Initially, as many different plant materials as possible should be tested to obtain as much information as possible about their potential applicability and availability. In the following steps, we reduce the selection of species and carry out a more targeted analysis.

TO-DO LIST:

Step 1: Analysis of already existing data on processing and potentials,

Step 2: Analysis of available biomass quantities,

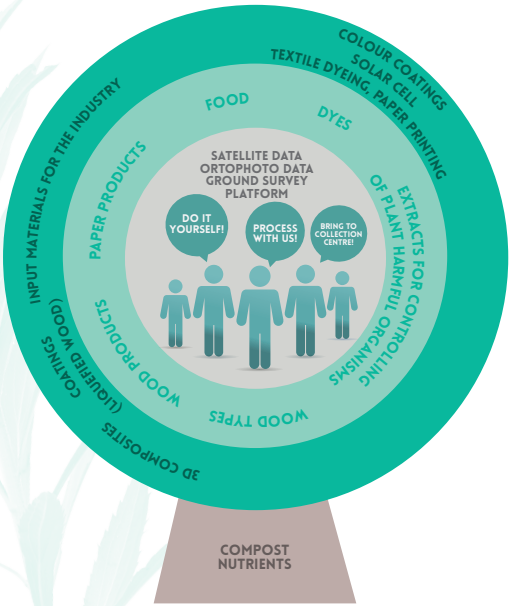
Step 3: List of processing methods,

Step 4: List of staff, equipment and financial resources needed.

METHOD OF WORK: office work.

EQUIPMENT NEEDED: computer.

EXAMPLE OF THE APPLAUSE PROJECT



LEGENDA:

- awareness raising
- paper and wood products, food, dyes and pest control
- secondary products/ materials

Circular diagram of the APPLAUSE project.

DO IT YOURSELF

We have already mentioned that in Slovenia, most land is privately owned. Do it yourself (DIY) is a way of making, changing or repairing things without direct assistance from experts. Approaches arise from a variety of motivations that allow people to achieve greater self-sufficiency and autonomy in a market-oriented economy. Such communities typically create open source principles that allow free access to production plans, exchange of skills and knowledge, and continuous product improvement. It is also necessary to create an environment where recipes/instructions can be circulated and upgraded. Do-it-yourself culture is becoming increasingly popular in Slovenia as well.

DIY WOOD AND PAPER PRODUCTS

When preparing the instructions, you must specify precisely the parts of the plants needed, the quantity, the period of harvesting and the necessary tools. It is also useful to indicate the approximate production time (minutes or hours), the level of complexity (with warnings regarding the use of hazardous substances) and the handling of waste material. From a sustainability and circularity point of view, guidance on the recommended way of using the product and handling the product after its life is also welcomed. Instructions can also be provided in the form of shorter YouTube films.

TO-DO LIST:

Step 1: Establish cooperation with the product designer,

Step 2: Prepare a list of products suitable for DIY manufacturing method,

Step 3: Prepare production plans,

Step 4: Make YouTube movies and publish a DIY catalogue,

METHODS OF WORK: office work. Necessary collaboration with external contractors: product designers and video makers.

EQUIPMENT NEEDED: computer and space with equipment for product making. Recording equipment is provided by external contractors.

DIY IAPS DISHES

Some IAPS can be used as a raw material for food. The choice of plants as a food source is limited by the Regulation on novel foods in the European Union (EC No 258/97, EU 2015/2283). You can use cherry plum fruits, Jerusalem artichoke tubers or black locust flowers to prepare delicious dishes.

REQUIRED TASKS:

Step 1: Establish cooperation with a master chef,

Step 2: Prepare a list of plants suitable for cooking,

Step 3: Prepare the recipes,

Step 4: Make YouTube movies and publish a cookbook.

METHODS OF WORK: office work. Necessary collaboration with external contractors: recipe preparation and video makers.

EQUIPMENT NEEDED: computer and kitchen. Recording equipment is provided by external contractors.

DIY PEST CONTROL

The efficacy of plant powders and water extracts against plant harmful organisms is connected to insect species. The water extract from false indigo proved to be the most effective against phytophagous mites; slight efficacy of water extracts from false indigo and tree of heaven was detected against onion thrips on onion and cabbage flea beetles on cabbage.

TO-DO LIST:

Step 1: Establish cooperation with an agronomist,

Step 2: Prepare a list of plants suitable for extracts,

Step 3: Conduct field experiments,

Step 4: Prepare the recipes,

Step 5: Make YouTube videos and publish a DIY catalogue.

METHODS OF WORK: office work, laboratory work and fieldwork. Necessary collaboration with external contractors: videomakers.

EQUIPMENT NEEDED: computer, farmland and equipment for making extracts. Recording equipment is provided by external contractors.

DIY DYES

Dyes extracted from Japanese knotweed rhizome and leaves showed excellent fastness on textile or paper when they were applied in higher concentrations. The colour of the extracted dye from rhizomes is yellow but can be changed into red when alkali is added (i.e., soda ash) or into greenish-yellow when acid is added (i.e., vinegar). The pretreatment of textiles with iron sulphate gives greyish colorations, while the pretreatment with soya milk, copper sulphate or chitosan (substance extracted from shrimp shells) gives brownish colorations. Polyester has a chemical and physical structure that prevents dyeing with natural dyes; however, dyeing was very successful when the Japanese knotweed dye was used.

TO-DO LIST:

Step 1: Establish cooperation with a textile engineer,

Step 2: Prepare a list of plants suitable for making dyes,

Step 3: Experiment on different textiles,

Step 4: Prepare the recipes,

Step 5: Make YouTube videos and publish a DIY catalogue.

METHODS OF WORK: office and laboratory work. Necessary collaboration with external contractors: video makers.

EQUIPMENT NEEDED: computer and laboratory. Recording equipment is provided by external contractors.

EXAMPLE OF THE APPLAUSE PROJECT

We have prepared a catalogue (in Slovene only) with recipes for home production of paper and wood products, dyes, pest repellent and cooking recipes.

The catalogue can be ordered free of charge at e-mail address applause@ljubljana.si or can be downloaded from the website of the City of Ljubljana.

Number of DIY plans and recipes: 26

Number of DIY films: 8 videos about the product (maximum number of views: nesting box – 17,000 views) and 7 cooking recipes (maximum number of views: Smoothie made of cherry plum – 40,000 views).

CONTACT

- Design of DIY wood and paper products: TRAJNA, an association for the development of sustainable design, Dunajska cesta 56, 1000 Ljubljana

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PAPER AND PAPER PRODUCTS

The chemical, morphological and mechanical analysis at the laboratory level showed that the most suitable IAPS for paper production are Japanese and Bohemian knotweed, Canadian and giant goldenrod or black locust. Their biomass can be used for boutique and machine production of paper of various grammage. The paper is suitable for printing educational publications, promotional materials as well as for the design and development of commercially interesting products, such as memory games, floral letters, New Year's decorations, etc.

TO-DO LIST:

Step 1: Analysis of the biomass sample in order to prepare the optimal recipe for paper production,

Step 2: Harvesting and grinding of biomass,

Step 3: Cooking and delignification of biomass,

Step 4: Temporary storage of biomass,

Step 5: Paper production,

Step 6: Product design and prototyping,

Step 7: Product production,

Step 8: Use or sell products.

METHODS OF WORK: office work, laboratory work and field work.

EQUIPMENT NEEDED: computer. If you collect biomass through voluntary collection campaigns, the participants must also be provided with work equipment and refreshments; transport is optional. The biomass should be grounded to a maximum of 3–5 mm big particles.

EXAMPLE OF THE APPLAUSE PROJECT

Number of people trained to make hand-made paper: 2

Quantity of paper produced: 7,200 kg

Paper products designed and produced: paper brick, Collection of Travelling Plants, Forager's Calendar, flower envelope, pots for planting plants, paper decorations, memory game, puzzle with the motif of Old Ljubljana and DIY basket

(from top to bottom)
Flower letter
Seed paper (left)
Paper plant pot (right)

EXAMPLE OF THE APPLAUSE PROJECT

Canvas business model for handcraft paper-making workshop and handmade paper/products.

KEY PARTNERS

City of Ljubljana

Institute of Cellulose & Paper

Collaboration with newly established public institute ROG as Ljubljana creative intersection

Field experts & artisans

Educational institutions

Relevant resellers of sustainable and local products (Ljubljana Tourist Board)

KEY ACTIVITIES

Paper workshop program

Handmade production of paper, paper products

Business strategy, marketing, promotion and trade of products. Offer of other services (rent, workshops, etc.)

KEY RESOURCES

Knowledge, staff and equipment for work

Workshop facilities

Sufficient material (biomass and others)

VALUE PROPOSITION

(1) Production of innovative, sustainable, attractive and functional craft-made products

(2) Preserve the tradition of paper industry in Slovenia

(3) Guided activities for children that combine awareness raising on IAPS and promotion of traditional handcraft

(4) Access to machinery, affordable space for rent for artisans

CUSTOMER RELATIONSHIP

Contracts with COL (supply of paper products)

Contract with resellers of paper products

Partnership with educational institutions (for workshops and educational events)

CHANNELS

Direct sale through Sales person/representative (COL, producers, resellers)

Company web page and online sales

CUSTOMER SEGMENTS

Paper workshop participants: kinder gartens, youth organisations, elderly, tourists, interested locals

COL as a promoter/payer of workshop activities

Other users of the workshop facilities like artisans

Business buyers (resellers of paper products)

COST STRUCTURE

Equipment & workshop facilitation costs

Staff cost (workshop master, sales person, overhead costs)

Biomass and material costs for paper & products

PR & Marketing costs

REVENUE STREAMS

Asset sale from (online & offline) products (price range from 5 to 5 euro) and services (events, rent the place, etc.)

Guided educational workshops for various groups (schools, elderly, tourists, locals)

EU, national and municipal funds for workshop program development, inclusion of vulnerable social groups

Canvas business model for machine-made paper and paper products.

KEY PARTNERS

Botanists (for identification of biomass)

Utility companies that have proper equipment (cutting)

Subcontractors (for lamination of several paper sheets)

Land owners

KEY ACTIVITIES

Pretreatment of biomass (cutting, delignification)

Paper production

KEY RESOURCES

Knowledge about delignification process

Pilot paper machine

Experienced employees

VALUE PROPOSITION

(1) A unique paper product that is:

Circular

Made of IAPS

Protects local biodiversity

Good quality

(2) Limited edition. For customers looking for a paper product that is special

CUSTOMER RELATIONSHIP

We have regular customers and those who want our knowledge (paper or design) for a unique opportunity

CHANNELS

Our website

At some events where we have presentations, or when we write some notice in magazines Social networks (LinkedIn, Facebook, Instagram)

CUSTOMER SEGMENTS

Designers

Companies that need some special product for their own promotion

COST STRUCTURE

Operating costs (1 kg of paper has a price varying between 13 and 17 €)

The most costly activities – workforce, raw materials (cellulose), electricity, gas and water

REVENUE STREAMS

Sales of paper sheets

Knowledge and services (testing paper and paper products, sharing the knowledge of paper production, use of paper in everyday life, having technician days for schools and kindergartens)

WOOD PRODUCTS

The most suitable woods for wooden products production are the tree of heaven, horse chestnut, box elder and above all black locust, which is also suitable for outdoor products. Staghorn sumac, honey locust and cherry plum also have very decorative and colorful textures.

When printing posters with movable letters, we use large wooden letters. Traditionally, wooden letters are made of pear wood, but we have proven that box elder also works great. The technique of letterpress printing has received considerable attention in the last decade. It is being rediscovered by artists and graphic designers and is increasingly involved in the educational process in schools and art academies.

TO-DO LIST:

Step 1: Analysis of wood samples,

Step 2: Cutting and wood sawing,

Step 3: Drying of wood,

Step 4: Design of products and prototypes,

Step 5: Product production,

Step 6: Use or sell products.

METHODS OF WORK: office work, laboratory work and field work.

EQUIPMENT NEEDED: computer. Wood must be sawn and dried before the products are manufactured. The basic equipment to produce wooden products consists of a circular saw machine, a band saw machine, a levelling and thickness planning machine, a drill, carpenter's clamps, a set of dowels, sandpaper and surface protection for wood. Basic equipment for wood type manufacturing: log band saw, vacuum drying chamber, block leveler, drum sander, circular saw, orbital sander, engraving machine (pantograph).

EXAMPLE OF THE APPLAUSE PROJECT

Wood products designed and produced: box with stamps, picture frame, frame and sieve for handmade paper production, bookcase, dining table, desk, wardrobe, footstool, composter, xylophone, nesting box, Christmas tree, serving board, mobile kitchen, box for storage, wooden mat, shoehorn, wooden pointer, wooden Christmas decorations, wooden pebbles, bottle holder, didactic tools for schools and bag carrying holder.

(from top to bottom)
Serving board
Xylophone
Picture frame
Nesting box with green roof

EXAMPLE OF THE APPLAUSE PROJECT

Canvas business model for woodworking workshop and wood products.

KEY PARTNERS

City of Ljubljana

Educational institutions

Relevant resellers of sustainable and local products

Supporters of DIY culture and green citizenship

Tisa (cuts the trees)

The saw (cuts them into half products)

Dryer (dries the wood, unless drying is done at JP VOKASNAGA)

KEY ACTIVITIES

Production of wood products

Workshop facilitation

Business strategy & marketing

Offer of other services (repair, renew)

KEY RESOURCES

Knowledge

Staff and equipment for work

Workshop facilities

Sufficient quantity of wood

VALUE PROPOSITION (VP)

General VP: The establishment of a wood workshop as a place for the development of sustainable wood products, the implementation of educational events and the possibility of repairing products in the public interest (COL) or repairing the products produced and already sold there.

VP1: Production and sale of attractive and functional craft-made wood products made from IASP that promote circular economy and sustainable living (price range: 5 euro bag holder, 4000 euro 3d printer). Some products are designed to be made at the workshop, at home or meant to be rented around the city.

VP2: Through workshop activities, participants will gain new knowledge about IAPS while learning hand wood working skills and greater awareness on sustainable approach to IAPS management.

VP3: Maintenance and repair of public street wood furniture and repair services for sold products

CUSTOMER RELATIONSHIP

Returning /recurring clients: Contract with COL for public maintenance, community of DIY enthusiasts, regular contact with educational institutions (for workshops and educational events)

Non-returning clients (e.g. foreign tourists)

CHANNELS

Digital promotion, in store (second hand store, tourism Ljubljana offices, artisans and local souvenir shops)

Sales person and resellers , workshops and IAPS presentations, library of things, Trajna events

CUSTOMER SEGMENTS

CS1 wood products: local community, tourists, educational institutions, business clients (e.g. gardeners)

CS2 workshop activities: Educational institutions and NGO's, DIY and creative community, families

CS3 repair service: COL's urban furniture, individuals as DIY enthusiasts

COST STRUCTURE

Operating costs (equipment, energy, subcontractors - sawmill)

Staff cost (workshop master, sales person, overhead costs)

Wood and material costs for paper & products

PR & Marketing costs

REVENUE STREAMS

Asset sale from products / services /space& machines and products for rent

Municipal funds for manufacture & repair services of public wood furniture

EU funds for workshop program development, inclusion of vulnerable social groups

Canvas business model for wood type letter printing workshop.

KEY PARTNERS

Biomass suppliers: TISA, landowners

Local educational and cultural institutions in Ljubljana

Tourist agencies

KEY ACTIVITIES

Workshops (design and wood type production process), (intergenerational) knowledge transfer

Promoting of technical heritage

KEY RESOURCES

Space, equipment (wood type production and printing), knowledge, staff, biomass, paper, printing ink

VALUE PROPOSITION

(1) Wood type production addresses key steps in educational process of graphic designers and gives a student an opportunity to control and execute all the steps: designing of type, manufacturing process, implementation of type in poster design

(2) Tangible and intangible heritage

CUSTOMER RELATIONSHIP

Public access for a specific and general public

Participation in the workshop activities

CHANNELS

Previously established network, lectures, conferences, other public presentations, printed and social media, direct communication, web page, ephemera, International exchange programme, cooperation with production houses

CUSTOMER SEGMENTS

Local companies / individuals with a need to communicate (metal band, a society of senior herbalists)

Tourists

Education sector: universities, high schools

Cultural sector: art print community, cultural production institutions, arts & craft societies...

COST STRUCTURE

Working space, equipment and personnel (key cost)

Sharing workspace to reduce cost and rationalise space usage (individuals, organisations)

REVENUE STREAMS

Participation fees, selling products made by wood type (posters, cards etc), selling wood type

3D COMPOSITES

Wood processing residues can be used to produce wood biocomposites of various shapes and purposes. A small part of the residues of various wood species can also be processed into liquefied wood, which has already been successfully tested as an additive to adhesive mixtures and surface coatings.

There are also new possibilities in the production of wood-plastic composites. We have prepared a working recipe that includes the choice of material, particle size, the best ratio of wood and plastic, the design of the moulds and the geometry of the finished products.

TO-DO LIST:

Step 1: Grind the wood residues in a drum chipper and dry,

Step 2: Mix dried wood chips with polymer and compatibilizer,

Step 3: Pour the mixture into the mould of the desired shape,

Step 4: Place the mould in a heated press and press it hot,

Step 5: Cool the product in the mould to room temperature,

Step 6: Remove the product from the mould.

METHODS OF WORK: office, laboratory and workshop.

EQUIPMENT NEEDED: computer, wood drum chipper, laboratory scale, moulds, press.

EXAMPLE OF THE APPLAUSE PROJECT

We have prepared a working recipe for WPC (Wood Plastic Composite) that includes the choice of material, particle size, the best ratio of wood and plastic, the construction of the moulds and the geometry of the finished products.

The wood residues obtained during the primary processing of wood and the production of wood products are firstly grounded in a mill and secondly in a drum chipper to the desired particle size. In the next step, the dried chips of invasive wood species are mixed with a polymer and a biodegradable compatibilizer in an optimal ratio. The mixture of wood chips and polymer is subsequently hot-pressed in a mould and cooled into a 3D product.

IAPS wood processing residues processed into a WPC (Wood Plastic Composite) container.

CONTACT

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NANOCELLULOSE

Nanofibrillated cellulose as a material has attracted great interest in recent years, especially in the biomedical field, where it can be used to produce highly hydrophilic materials that can retain large amounts of water. These materials are also known as hydrogels. The potential of nanocellulosic hydrogels or aerogels is great because they are versatile and are usually benign when in contact with human tissue.

TO-DO LIST:

Step 1: Grinding and mechanical processing - defibering,

Step 2: Soxhlet extraction,

Step 3: Lignin removal,

Step 4: Removal of the hemicelluloses,

Step 5: Oxidation with TEMPO reagent,

Step 6: Homogenization,

Step 7: Preparation of nanocomposite films,

Step 8: Preparation of the hydrogel,

Step 9: Lyophilisation (for aerogel).

METHODS OF WORK: office, laboratory and workshop.

EQUIPMENT NEEDED: computer, mill, ultrasonic probe, Ultra-Turax mixer, kitchen mixer, Soxhlet apparatus, ASE extractor (apparatus for accelerated extraction), laboratory glassware, homogenizer, centrifuge, dryer, microscope, conductometric titrator, FT -IR spectrometer, VIS spectrophotometer, freeze dryer.

EXAMPLE OF THE APPLAUSE PROJECT

The nanofibrillated cellulose was isolated from the cellulose of honey locust and staghorn sumac by a combination of chemical and mechanical processes. We developed a prototype of a nanocellulose composite based on a water-soluble polymer reinforced with nanocellulose fibrils and a prototype of a highly porous nanocellulose aerogel from a pre-prepared hydrogel. The aerogel can also be used in the field of air filtration.

Highly porous nanocellulose airgel.

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INPUT MATERIALS FOR THE INDUSTRY

Many useful things can be made from waste materials and natural resources that are cheap and easily accessible. The use of waste biomass, like lignin, dyes and polyhydroxyalkanoates, can be very diverse. Waste material can be used to make hybrid colored coatings for glass and wood, or it can represent a source of natural dyes and various useful chemicals.

TO-DO LIST (MICROBIOLOGICAL CONVERSION OF LIGNIN):

Step 1: Selection of plant biomass based on chemical characterization (the content of cellulose, lignin, starch, etc.),

Step 2: Collection and mechanical processing of biomass (cutting, grinding, etc., up to less than millimeter particle sizes),

Step 3: Acquisition, selection and characterization of microorganisms from relevant environments,

Step 4: Verification of the transformation of the prepared plant biomass with the help of selected microorganisms in laboratory conditions,

Step 5: Optimization of the transformation process in the laboratory,

Step 6: "Upscaling" the laboratory procedure.

METHODS OF WORK: laboratory techniques, collection and analysis of scientific literature, mathematical bioinformatics procedures.

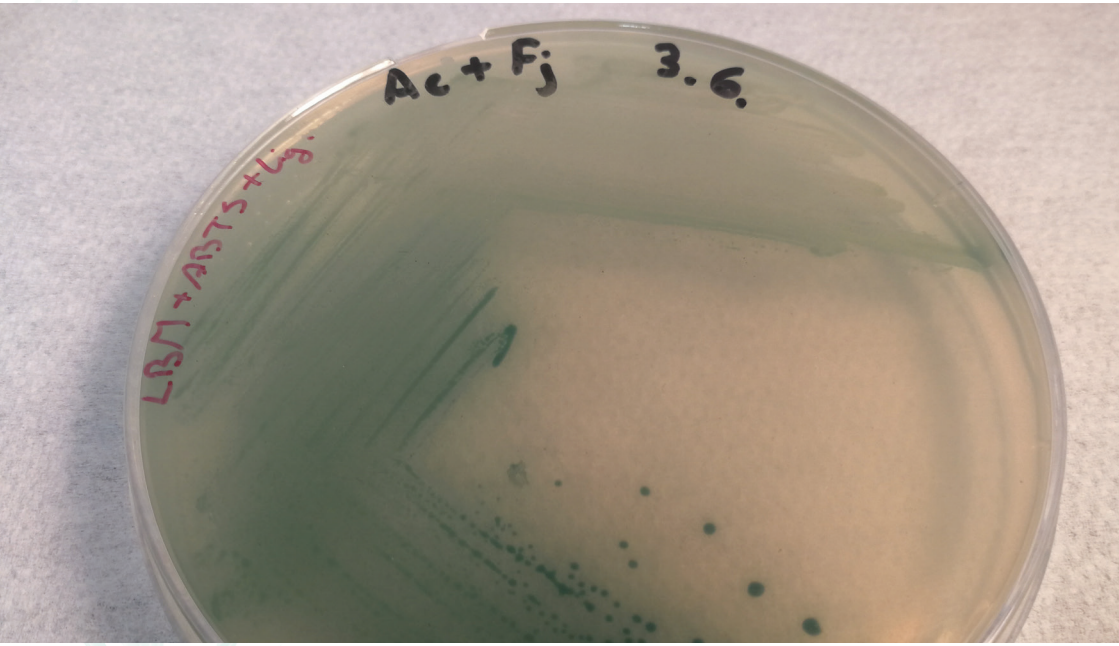
EQUIPMENT NEEDED: computer equipment (high-performance computer systems), biotechnological laboratory equipment (bioreactors, chemical analyzers, incubators, sequencers, equipment for preparation and maintenance of bacterial cultures, etc.).

EXAMPLE OF THE APPLAUSE PROJECT

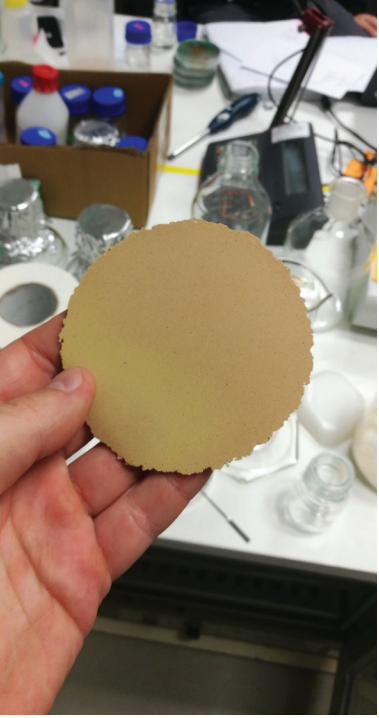
Lignin is a very complex structure that is difficult to degrade, and at the same time, it is one of the few sources of aromatic compounds in nature. It is, therefore, an interesting sustainable source of aromatic compounds. In the project, we investigated the microbiological conversion of lignin to ferulic acid and looked for ways to convert ferulic acid to vanillin. In doing so, we focused on creating an environmentally acceptable process based on oxidation with hydrogen peroxide, in which the by-product is water. At the same time, we also investigated the direct conversion of lignin to aldehyde products by an oxidative process with hydrogen peroxide. Thus, the waste residue that is present in lignin production could be directly converted to vanillin.

We have developed a new, biotechnological way of solving the problem of non-native plant species (colloid biology), using bacteria that - naturally - developed a way of degrading lignin as a mechanism of invasion of plant cells, and in the laboratory, we adapted and optimized the process. In the new method, isolates must first be successfully obtained. Namely, the metabolism of lignin degradation is found in only a few of the 400 isolated bacteria obtained from Japanese knotweed, mainly from the root system and decomposing biomass. The selected isolates proved to be very successful degraders, as we degraded up to 80% of the lignin in the ground biomass of Japanese knotweed. The result of bacterial degradation can, therefore, be compared to the chemical currently used in the paper industry. In addition, this process does not use toxic chemicals and surpasses many chemical processes in this respect. We also proved that the bacterial method at the industrial level of decomposition can be compared in price with the currently available chemical methods, even though the bacterial process of decomposition requires slightly more procedures for the preparation of plant biomass.

The products of biotechnological delignification are (i) water-soluble derivatives of ferulic acid, which are an excellent input material for various industrial processes, and (ii) a solid residue consisting of cellulose. The latter contains short plant fibers that cannot be used directly in the process used in conventional papermaking. For this reason, we have developed a process that allows the production of an alternative form of paper, the so-called “thin sheets.”



A bacterial strain isolated from Japanese knotweed that effectively delignificates plant material.



The representation of a thin sheet of delignified ground Japanese knotweed in combination with alginate.

This process combines the use of fine-grained biotechnologically delignified material using natural polymers that are either abundant (e.g., alginate) or represent waste material from another industry (e.g., chitosan). The material is a composite of flexible polymer molecules of chitosan, alginate, etc. and less flexible material coming from the plant biomass. The process of material preparation represents a new concept of fabrication of thin sheets, which is based on the interaction of the electrostatically charged polymers, the shading of charges of polymer molecules and the appropriate drying procedure. With a different formulation of a combination of salts and polymers and their different proportions in the treatment mixture, the strength, elasticity and brittleness of composites can be achieved. As a result, this process and the corresponding material have a great variety of uses. In addition, such material, if it includes chitosan, may also be suitable for food packaging or serve as a binding material, as its antimicrobial action may slow down food spoilage or allow wounds to heal faster.

Subsequently, we developed the processes for transforming the obtained cellulosic material into another form of polymer with higher added value. We have developed a process for the transformation of cellulose using biocatalytic aggregates made from cellulolytic bacteria and bacteria capable of accumulating polyhydroxyalkanoates (PHA). The final PHA product can be used directly as biodegradable plastic, an additive to coatings to increase the hydrophobicity of surfaces or the production of filaments in the manufacture of clothing. Other uses can also be envisaged.

CONTACT

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PLANT HARVESTING

Harvesting invasive herbaceous plants for processing requires a lot of work and endurance (e.g., manual harvesting of flowers, leaves, rhizomes). The works are carried out seasonally; they also depend on the weather. Some plant material is not available all year round. For processing purposes, it is important to have a special place for drying plant material and a dark, cold and dry storage place. If there is too much material, it can mold. Picking up logs in stock is not recommended if they are not stored in a dry place, as decomposition processes may continue more quickly. Both felling and primary wood processing (woodcutting) of trees from urban areas require a special approach. Felling trees in an urban environment requires skilled workers, specific work organization and specialized knowledge. Due to the complexity of felling, the tree parts may be smaller than desired. Trees in urban environments often contain small items, e.g., nails, screws that can damage the saw. When the dried plant material is grounded, use a breathing mask.

For IAPS listed on the list of European Union concern, precise protocols for the management of plant parts in the process of disposal and use must be drawn up in order to prevent any spread of seeds or plant parts which may start to root.

When harvesting IAPS, it is very important that the work is carried out professionally and with appropriate equipment. Hazardous work, such as felling trees in an urban environment, must be left to professionals. In the case of the implementation of voluntary harvest activities, we most often face the following challenges: how to motivate participants to devote their free time to harvesting activities, how to provide a large enough group of volunteers and weather. A very rewarding target group for voluntary harvesting campaigns are high school and forestry students. By participating in such activities, they gain valuable experience, which can help them to make better decisions in later professional life.

TO-DO LIST:

Step 1: Prepare an annual plan of IAPS harvesting,

Step 2: Provide adequate equipment,

Step 3: Provide storage space,

Step 4: Establish electronic working orders within the platform for IAPS management,

Step 5: Train the contractors (if necessary also training on the use of personal protective equipment),

Step 6: Regularly check the implemented measures.

METHODS OF WORK: office work and fieldwork.

EQUIPMENT NEEDED: computer, field equipment (long pants, long-sleeved shirts or jackets, summer hat, high work boots, vaccination against tick-borne meningoencephalitis). Necessary equipment for felling trees in an urban environment: aerial lift, transport vehicle for branches and logs, chainsaw, personal protective equipment (chainsaw protection (climbing) trousers and jacket, protective forestry footwear, gloves, helmet with ear protection and visor, radio connection, protective masks if necessary, etc.) and specialized accessories. Specialized equipment and tools for felling trees with tree rope technique (tree climbing harness, ropes, lanyard, climbing devices, climbing spikes and many specialized accessories, etc.), rigging equipment, equipment for cleaning the work site (blower, broom, shovel, etc.) , stump grinder, traffic signs and cones, protective tapes for site closure, first aid, fire extinguisher, skilled workers with certificates for safe work with a chainsaw, for work at height and arborist rope techniques.

EXAMPLE OF THE APPLAUSE PROJECT

In Ljubljana, trees in public areas are not cut down unless they dry out, are infected or endanger passers-by or infrastructure. The input material for processing is therefore not of very high quality, but there is a lot of waste that can be used making 3D composites. Many of the removed trees are small in size and, therefore, not useful for the production of wooden planks. Cut shrub branches can be used for small wooden products.

Amount of biomass harvested: 60 m³ of wood and 13 tons of herbaceous plants

Number of new protocols for IAPS removal: 2

Number of voluntary harvesting actions and participants: 28 harvesting actions, 490 participants

CONTACT

- Herbaceous plants harvesting: VOKA SNAGA, water and waste management public company, Vodovodna cesta 90, 1000 Ljubljana

  Meta Vidovič, meta.vidovic@vokasnaga.si

- Wooden plants harvesting: TISA, Company for arboriculture and forestry, Cesta v Prod 84, 1000 Ljubljana

  Lena Marion, Ph.D., lena.marion@tisa.si

- Organization of voluntary harvesting actions: the City of Ljubljana, Department for Environmental Protection, Zarnikova 3, 1000 Ljubljana

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HANDING OVER THE HARVESTED BIOMASS

After harvesting, the biomass of IAPS must be appropriately sorted: the parts that can be reused are processed into useful products, the parts that cannot be reused and cannot re-grow can be composted, and the rest must be incinerated.

In Ljubljana, we started collecting IAPS biomass in collection centers in 2014 as an activity of the socially responsible campaign Gloves up! We have been upgrading our services over the past years, and our goal is to establish a collection point for IAPS in every collection center in the City of Ljubljana and to process as much of the received material as possible.

So far, the received quantities of material are very small, and the material is usually not properly sorted. In the future, we will focus more on the training of the staff of the collection center, as they can make a significant contribution to the increase in quantities by giving users as precise instructions as possible.

TO-DO LIST:

Step 1: Make a list of IAPS to be collected at the collection center,

Step 2: Prepare info materials for the users of the collection center,

Step 3: Layout and mark the containers,

Step 4: Train the employees of the collection center,

Step 5: Establish a recording of the amounts of biomass received.

METHODS OF WORK: office work and fieldwork.

NECESSARY EQUIPMENT: waste containers, boards with instructions for sorting IAPS, instructions for biomass preparation.

EXAMPLE OF THE APPLAUSE PROJECT

Povšetova Collection Center

In 2018, we set up a special collection point in the collection center on Povšetova ulica 2, where citizens could bring the harvested biomass of eleven IAPS. From 2021, we will continue to collect: Japanese and Bohemian knotweed, giant and Canadian goldenrod, and other species if needed. IAPS can also be submitted to the composting or incineration containers in accordance with the handover instructions. The instructions for handing over the IAPS biomass are available on the website of JP VOKA SNAGA and in the Povšetova Collection Center.

Quantity of collected biomass in the Povšetova Collection Center: 400 kg of Japanese knotweed and 247 kg of Canadian and giant goldenrod.

CONTACT

- VOKA SNAGA, water and waste management public company, Vodovodna cesta 90, 1000 Ljubljana

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IAPS collection point in Povšetova Collection Center

COMPOSTING AND INCINERATION OF IAPS RESIDUES

When harvesting IAPS, special care should be taken to not spreading any parts of the plants. Additional safety measures should be taken when plants already have fruits, when chopping (black locust, tree of heaven, Thunberg's barberry, Amur honeysuckle), mowing (goldenrods, knotweed), uprooting (Himalayan balsam) or carrying out other methods of fruit or seed removal and when transporting plant parts to the collection center. It is, therefore, necessary to make a list of plants where removal methods must be adapted to prevent seed dispersal. A similar problem is posed by parts of plants that take root and, just like seeds, represent a possible source of plant propagation. Cut branches (e.g., American maple) can be rooted, or pieces of removed underground parts, such as rhizomes and hedges (knotweed, goldenrod, etc.). In both described cases, plant propagation units must be collected separately and composted in processes that destroy plant parts or be incinerated.

TO-DO LIST:

Step 1: Make a list of IAPS that can be composted or must be incinerated,

Step 2: Make an agreement with contractors,

Step 3: Layout and mark the containers,

Step 4: Educate the staff of the contractor,

Step 5: Carry out appropriate transport to the composting plant or incinerator.

METHODS OF WORK: office work and fieldwork.

EQUIPMENT NEEDED: waste containers, instruction boards, instructions for proper biomass transport.

EXAMPLE OF THE APPLAUSE PROJECT

In the City of Ljubljana, composting of waste, which is disposed of by citizens in containers for biological waste, takes place in Ljubljana Regional Waste Management Centre (RCERO Ljubljana). The facility can process more than 20,000 tons of biological waste annually. In processing the collected biological waste separately, compost of the highest (first) quality is created, which can be used in gardens and fields. Fermentation produces a lot of gas, which is captured and used to produce electricity and heat for the facility. Biological waste must first be sifted: smaller particles are prepared for the path to the bioreactor (fermenter), while larger ones go to grinding, additional sieving and through elimination of any solid particles and metals. Decomposition or decay of organic matter without the presence of oxygen takes place in a bioreactor. Experts call it anaerobic fermentation. In the bioreactor, special bacteria multiply and eat the waste, which decomposes, and biogas is produced. Another product of anaerobic fermentation is biomass. When the biomass is squeezed, aerated and left to mature for some time, compost is formed.

Parts of plants that cannot be processed or are not suitable for composting are handed over to co-incineration in Koto d. o. o.

The APPLAUSE project focuses on 25 invasive alien plant species; 17 are woody and 8 are herbaceous species

- Amur honeysuckle (*Lonicera maackii*)
- Black locust (*Robinia pseudoacacia*)
- Bohemian knotweed (*Fallopia* x *bohemica*)
- Boxelder maple (*Acer negundo*)
- Canadian goldenrod (*Solidago canadensis*)
- Cherry laurel (*Prunus laurocerasus*)
- Cherry plum (*Prunus cerasifera*)
- Cutleaf coneflower (*Rudbeckia laciniata*)
- Davids' butterfly bush (*Buddleja davidii*)
- False indigobush (*Amorpha fruticosa*)
- Giant goldenrod (*Solidago gigantea*)
- Himalayan balsam (*Impatiens glandulifera*)
- Honey locust (*Gleditsia triacanthos*)
- Horse chestnut (*Aesculus hippocastanum*)
- Japanese knotweed (*Fallopia japonica*)
- Japanese meadowsweet (*Spiraea japonica*)
- Oregon grape (*Mahonia aquifolium*)
- Red osier dogwood (*Cornus sericea*)
- Rockspray cotoneaster (*Cotoneaster horizontalis*)
- Southern catalpa, Indian bean tree (*Catalpa bignonioides*)
- Staghorn sumac (*Rhus typhina*)
- Stinking fleabane (*Dittrichia graveolens*)
- Thunbergs' barberry (*Berberis thunbergii*)
- Topinambur, Jerusalem artichoke (*Helianthus tuberosus*)
- Tree of heaven (*Ailanthus altissima*)

More about the **APPLAUSE project**:
https://www.ljubljana.si/en/applause/.

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