ISSN 1831-9424

European Commission

JRC TECHNICAL REPORT

Outcomes of the JRC Makers-in-Residence programme Edition #1

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2022

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JRC130505

EUR 31244 EN

Print	ISBN 978-92-76-57514-6	ISSN 1018-5593	doi:10.2760/89998	KJ-NA-31-244-EN-C
PDF	ISBN 978-92-76-57513-9	ISSN 1831-9424	doi:10.2760/103695	KJ-NA-31-244-EN-N

Luxembourg: Publications Office of the European Union, 2022

Imparato, V., Rosa, P. and Guimarães Pereira, Â., Gregorova, D., Fàbregas, F., Strivens, F., Motuzaitė, J. and Rees, S., *Outcomes of the JRC Makers-in-Residence programme Edition #1*, Publications Office of the European Union, Luxembourg, 2022, doi:10.2760/103695, JRC130505.

Contents

Abstract

The JRC Makers-in-Residence programme is a short-term research-focused residency for makers, launched at the Joint Research Centre's Makerspace. It is centred on specific concepts and themes directly tied to the science and technology policy topics considered in the JRC Annual Work Programme. Each year a new theme is proposed. The programme promotes capacity building, fosters partnerships with local, regional, national, and international makers, and improves the open knowledge around the residency selected topics.

The programme represents an opportunity for makers' to tackle matters of common concern relevant for European policies. It creates spaces of dialogue and co-creation between EU makers and JRC scientific staff and promotes a new way of collaborating with bottom-up ideas, integrating them as support for citizen engagement practices into the policymaker cycle.

In the first edition of the makers-in-residence programme (2020-2021), the themes addressed were:

- Youth: a life through a pandemic;
- Pollinators decline: can you make the difference?

During the residency, makers were asked to produce a tangible outcome, be it a workshop, a prototype, an artwork, or an exhibition, each of which reflects the personal nature of the maker's exploration process of the theme.

The programme had to be significantly adjusted due to the COVID-19 pandemic restrictions implemented at the Joint Research Centre. The complete closure of the JRC Makerspace resulted in the programme being reshaped, initially into a hybrid format and later, in a fully virtual edition.

This report, based on the final reports and prototypes of the five selected European makers, attempts to present their creative work and to draw some lessons from this experience for internal use in the citizen engagement processes, as well as for future work with policy DGs.

Acknowledgements

We would like to thank the makers who have taken part of the programme and delivered the reports presented here as Annexes, as well as the colleagues from the European Commission and experts who supported the development of their work.

We are also grateful for the support received from Chiara Polce, Vujadin Kavacevic and David Mair.

1 Introduction

The JRC makers-in-residence programme (hereby referred as the **JRC MiR**) is a hybrid programme for makers, launched at the JRC Makerspace.

Largely inspired by other types of residencies worldwide, such as artists in residence in museums, the JRC MiR hosts European makers willing to advance their practices on selected policy relevant themes. It offers an opportunity to create original prototypes, share knowledge within the JRC scientific staff and activate relationship within the JRC and the local community.

The JRC MiR promotes innovation and experimentation across the spectrum of science, engineering, art and craft. As such, the programme provides the necessary space and freedom for makers to explore and interpret the themes in a creative and experimental way, mixing different disciplines and ways of thinking, while fostering partnerships and capacity building with local communities including youth. In this way, the JRC MiR aims to demonstrate the power and potential of the maker movement and bottom-up production for citizen engagement practices and as citizen engagement methodology per se.

In all, the programme aims to bring to the policymaking process new ways of approaching and reflecting on policy relevant themes, with a particular attention to practices and tangible objects that could serve citizen engagement activities.

This report, based on the final reports and prototypes of the five selected European makers, attempts to present their creative work and to draw some lessons from this experience for internal use in the citizen engagement processes, as well as for our work with policy DGs partners.

> ***Maker***: *someone who creates or invents things, either using traditional crafts or technology*[1]. Makers are thinkers, inventors, artists, artisans; all those, who create, solve problems and bring innovation into our society with the power of their ideas.
>
> ***Makerspace***: *a place where people can come together to create or invent things, either using traditional crafts or technology*[2].
>
> ***Residency****: the period of time that an artist, a writer or a musician spends working for a particular institution*[3]*.*

1.1 The JRC Makerspace

The JRC Makerspace is a collaborative and community-orientated space embracing the philosophy of sharing and a spirit of craftsmanship. It is an open space where the community can meet to co-create, discuss and solve problems together, think and tinker over matter of common care. It is organised in different areas and is equipped with a set of tools and fabrication equipment that allow individuals to transform their ideas into reality. It promotes:

- active participation,
- knowledge sharing, and

[1] https://dictionary.cambridge.org/dictionary/english/maker
[2] https://dictionary.cambridge.org/dictionary/english/makerspace
[3] https://www.oxfordlearnersdictionaries.com/definition/english/residency

- scientific research through open-ended exploration and experimentation.

The JRC Makerspace is also a space to explore new methodologies of citizen engagement, as well as on recent phenomena like citizen science and DIY movements as more profound and care-oriented forms of societal participation in techno-scientific innovation processes.

The JRC makerspace, the first of its kind in an EU institution, is located within the premises of the JRC site in Ispra, Italy.

1.2 The JRC Makers-in-Residence programme (JRC MiR)

The JRC Makers-in-Residence programme (JRC MiR) is an annual programme run by the JRC Makerspace. The residency invites makers to undertake a journey of exploration on a set of themes driven by European Commission policy priorities, in an environment at the crossroad between science and policy.

The programme provides a working location (the JRC Makerspace) and resources to EU-based makers willing to further their multidisciplinary practice in connection with research at JRC, with local communities and with other peers.

One of the objectives of the JRC MiR is to create and reinforce spaces of dialogue and co-creation, often involving youth, enabling creative forms of experimentation, engagement and issue framing. Calling for the contribution of the makers' community, the JRC MiR set an inclusive scene for bottom-up and creative approaches for looking into matters of common concern.

The outcomes (or final prototypes) of the maker's projects are envisaged to be a booster for citizen engagement activities and might extend and enrich JRC's current practices.

In sum, the JRC MiR aims at:

- developing original thematic projects (multi-disciplinary; combining art, science and technology),
- attracting innovative ideas,
- promoting partnerships,

The JRC MiR provides:

- unique location at JRC (research centre supporting policy with science and knowledge),
- resources (i.e. JRC makerspace, equipment, grants),
- spaces for exchange of ideas between makers, researchers and locals,
- visibility for cut-edge ideas (publishing, disseminating and communicating the results of the work).

2 The JRC Makers-in-Residence programme Edition #1 (2020-2021)

The JRC MiR was launched in 2020, and its first edition run over 2020-2021. In this first edition, the themes proposed were:

- Youth: a life through a pandemic;
- Pollinators decline: can you *make* the difference?

Makers were selected by the JRC team responsible for the JRC Makerspace, via an open call for entries published on EU Survey. The call was disseminated across the network and published on EU Science Hub, the Joint Research Centre website. Five makers were selected and offered a fully-funded residency and a close collaboration with JRC staff, in Ispra, in connection and interaction with the local scientific community – mainly experts on pollination, social scientists, and members of the maker community – as well as with other external experts with interconnected interest and projects.

In its first edition, due to COVID-19 pandemic, the JRC MiR offered a virtual space on MS Teams and resources such as individual grants, knowledge and connections with experts with the aim of fostering the development of unique projects and creation of prototypes, as well as activating relations with the community.

Tangible outputs included the creation of prototypes and workshops, each of which reflects the personal nature of the maker process when exploring the theme. Through the JRC MiR programme, the JRC Makerspace was also able to establish a connection with new organisations and communities across the EU (e.g. FabLab de Nimes, YCUK, Giardino Faustino).

The JRC Makerspace put forth an immersive community engagement programme to network, incentivize and stimulate European makers and local maker communities through regular meetings, brainstorming and informal sessions and a final event.

MS Teams was used as main platform to connect JRC staff and other experts with the makers, as well as to receive and share relevant documents. A MS Teams group was created with a General channel, used to circulate transversal information and announcements useful for all makers, and Individual channels for each maker that supported dedicated sessions, literature and ad hoc information exchanges. In addition, "*Coffëęė Collective*" was established as a networking channel, where meetings have occurred to boost synergies within the community, and fostering its expansion with the inclusion of experts working on the same theme (e.g. Pollinators Decline) or with similar methodology (e.g. engagement with youth). The *Coffëęė Collective* aimed at offering a place for informal exchanges, collective reflections as well as cross-pollination between the activities and projects. The activities during the programme have been disseminated through internal and external communication channels (i.e. JRC internal network - Connected, JRC website Science Hub, and social media platforms), inviting JRC staff and broader maker community members to contribute or to attend the various activities.

Lastly, the final event was open to a wider public, upon registration, in the form of a Webinar and occurred on Zoom platform. The recordings of the webinar are available on the Science Hub website[4].

[4] https://joint-research-centre.ec.europa.eu/jrc-makerspace/jrc-makers-residence-programme/makers-and-projects-jrc-makers-residence-edition-1_en

3 JRC MiR as an enabler of citizen engagement activities

The maker movement is highly present in Europe, with this been translated in a significant relevant number of makerspaces across the EU member states (Rosa et al., 2017). The proliferation of makerspaces and similar structures has proven that these new models of co-creation are important spaces for innovation and local-based solutions. Moreover, it has been proven that these places have the potential to have an impact on the production processes and on society at large scale, this being particularly evident during the COVID-19 pandemic (Kieslinger B et al., 2021).

The JRC MiR aimed to be a catalyst of creative ideas and fresh thinking over matter of common interest and closely linked to policy priorities which can directly be implemented into citizen engagement activities. The programme intend to create a space where new ideas and approaches coming from the maker perspective can emerge and be developed into a tangible objects useful at enlarging the set of tools and materials for conducting engagement activities over policy relevant issue, e.g. the pollinators' decline. Importantly, the JRC MiR aims at including grassroots methodologies, approaches, reflections and visions, as part of maker bottom-up environment, and recognising the importance, the power and potential of the maker movement and collaborative production. The tangible outputs of the JRC MiR are indeed essential elements to experiment new forms of engagement that go beyond conversational practices and are based on material deliberation.

In this way, the JRC MiR sets the scene to foster the makers' contribution to tackle matters of common concern. Those final contributions could directly contribute to the design of toolkits for citizen engagement activities under specific policy files, as well as serve as inspirational model for citizen engagement processes and methodology.

The final prototypes have not yet been implemented in current activities within the citizen engagement endeavour of the JRC, but rather used so far as aspiration for the JRC projects, especially within the theme related to pollinators decline. Nevertheless, there is an overall sense that the JRC needs to keep engaging the makers' community and other emerging grassroots practices and approaches, ensuring the completeness and robustness of participative ways to tackle matters of concerns.

4 The makers and their projects

The JRC MiR first edition hosted five EU-based makers (including UK and Norway) willing to undertake a journey of exploration of the themes proposed. They were:

1. Dalia Gregorova
2. Ferran Fàbregas
3. Finn Strivens
4. Justė Motuzaitė
5. Sam Rees

In the subsequent sections, a short summary of their contribution is presented (a visual extract in Figure 1), while the full report of their work is included in Annex.

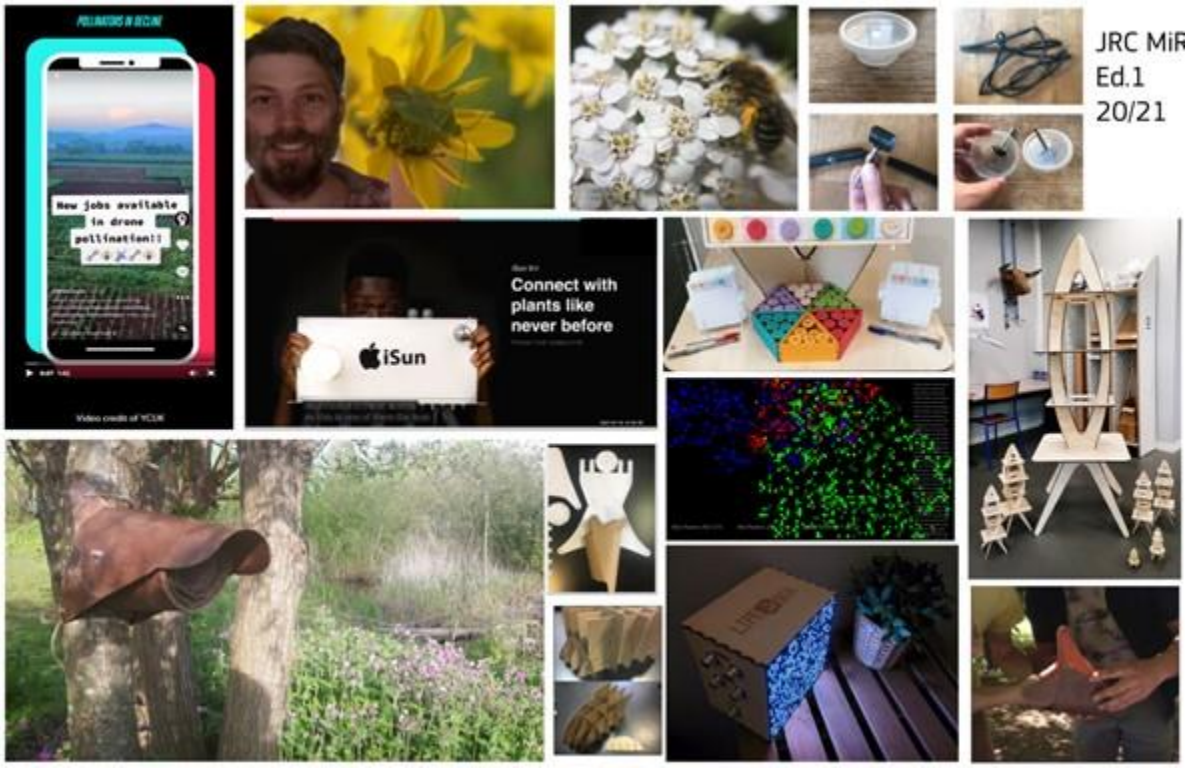


Figure 1. Collage of pictures extracted from the makers' reports.

4.1 Dalia Gregorova

Dalia Gregorova is a Slovak freelancer residing in France with a background in architecture and information technologies. During her work for the JRC MiR, Dalia focused on digital fabrication, the maker movement and participative architecture, examining her conviction that everyone is capable of creation, which is at the heart of her project.

More information about her background and portfolio is available in the link:
http://dalia.gregor-design.eu

From Prototype X to Rocket X project:

Prototype X starts as a participative project focused on the challenges that the COVID-19 pandemic crisis poses to young people. The project has been developed with a small group of young people from the Booster social centre in Beaucaire, France.

She worked under the theme of **Youth: a life through a Pandemic**, working on an intentionally open proposal that leave indeed open to the possibility to tackle various topics or challenges that young people have faced during covid 19 pandemic and have a link to the local context. The nature, size, material, and purpose of the final prototype are intentionally unknown, as the 'journey' of its collaborative creation and experimentation is as much relevant as the final result.

The process included collective reflection with the young community, creative and participative design workshops and digital fabrication laboratories at the partner makerspace FabLab Nimes, with the help of our colleagues – Anna Paola Quaglia and Magdalena Tendera.

During the process, the emerging dominant effect of the COVID-19 pandemic for youth was isolation. Hence the final prototype, **Rocket X**, developed with the idea of creating an artistic object that could serve as *Conversation Starter* (setting a physical object in front of which people could start a conversation about the impact of the pandemic on young people's life), but also as a *Witnessing Item* (collecting stories and being a place where people can share, read others and do not feel alone).

So, Rocket X is an object that host stories, experiences, losses and gains of who contributes. It is composed by qualitative modules with testimony of written stories as stackable post-it, and by quantitative modules with colourful chips representing how the life of people was affected by the pandemic replying to the question: "What did the pandemics affect in your life?"

The shape resembles the idea of dreaming about the future and also it is the symbol of the Booster Social centre. Rocket X has been co-created and produced, now implemented in its local context at the Social Centre. It could also be re-used for other local or not local projects.

In the Annex I, the full report and images can be found.

4.2 Ferran Fàbregas

Ferran Fàbregas (https://ferranfabregas.me/lifebox/) is a computer scientist and programmer by professional and student of a biostatistics and bioinformatics master. Ferran started in the "maker" world 7 years ago, in which he havs developed a cross-disciplinary knowledge in different disciplines from digital manufacturing, electronics, robotics, microcontroller programming to education.

Pollinators in a box

Ferran has applied his expertise of computer scientist and programmer to the theme of **Pollinators decline: can you *make* the difference?**

Pollinator in a box is an artistic, interactive educational simulation of a virtual ecosystem where different pollinators and flowers interact, and where users can observe their lives, relationships and evolution over time. After setting the parameters of the species, the user can visualize species behaviours and their evolution in real-time and have a sense of their dynamics and relationship. The parameters can be set digitally through a Web controller - accessible via website, allowing the simulation to be projected, or manually through a Physical controller with knobs, resulting in an object.

The project developed through research and thanks to the collaboration with a pollinator expert from the JRC network. Indeed the collaboration provided with knowledge and with the understanding of the biological concepts and relationships and supported its translation into a code that wants to recreate and simulate the ecosystem. Programming, iterations and testing resulted into a final deliverable called Pollinators in a box

The project can be implemented in museums, exhibition and schools for educational purposes.

In the Annex II, the full report and images can be found.

4.3 Finn Strivens

Finn Strivens is a designer, researcher, and foresight practitioner with a drive to enable diverse groups to imagine and influence their collective futures. He is an NGFP fellow with the School of International Futures, where he is working to enable young people to influence scientific research by imagining alternative futures.

Tik Tok Futures

Finn worked on the theme of **Pollinators decline: can you *make* the difference?**, using an innovative and co-design approach, to explore how humans might interact with pollinators in the future.

Supported by interviews to researchers and experts in biodiversity, pollinators conservation and colleagues at the JRC, he set a future framework that served as a base for dialogue on the future imagination scenarios with the youth group.

Preliminary to the final prototype and in a creative, fun and participative fashion, he offered to the group of young people the tools to imagine the future, to build the knowledge and the understanding of pollinators, as well as to build ability to be imaginative about the future. In this way the group started by prototyping hypothetical fictional objects that might exist in the future world they have imagined (e.g. iSun a speculative device able to concentrate the sunlight to plants and attracts pollinators in the garden in a possible future where tech companies have massively capitalized on the environment and biodiversity).

Finally, **Tik Tok Future** resulted in 8 fictional Tik Tok videos and a re-usable format for youth engagement through Tik Tok. They are prototypes of a number of possible futures (e.g. a future news format reporting the crisis; or a short clip imagining people sharing underground copies of the bee movie to learn about pollinators in a censored world; or a job advert for agricultural engineers using drones to drive pollination).

Those videos are lens on the future. They can be used to inform our actions in the present and help to take informed decisions about where we want to go. The work of Finn can be implemented on citizen engagement activities on other themes, as new and creative way to engage youth to have a voice.

In the Annex III, the full report and images can be found.

4.4 Justė Motuzaitė

Justė Motuzaitė is a Product Designer pursuing her Master's Degree of Integrated Product Design at Delft University of Technology (The Netherlands). In 2019, by doing her internship in Milan, she got into the maker community and had experience in various Fablab projects including sustainability, co-design and design for empowerment.

Urban Wild Pollinators

Justė worked on the theme of **Pollinators decline: can you *make* the difference?.** In the project **Urban Wild Pollinators** she explored the relationship between human and nature in urban contexts, focusing on biodiversity and habitat conservation. Furthermore, she included interesting aspects as the intentional wilderness as important element to

relate with biodiversity and its very beauty exploring its possible implication in the change of prospective, and the aspect of the fear of insects sensed by the citizens who lives in cities but with different geographical backgrounds.

Urban Wild Pollinators is an open source toolkit that includes wild pollinator habitat design, ground unit design, embedded in a workshop framework. Justė imagined this toolkit to serve as tool for citizen actions to fast-forward a regenerative urban transformation and help discussions about possible local initiatives for habitat creation. The application of her work in educational context where different levels of fear of insects can be explored, including VR experience, or used as a CE activity in planning greener and more bio-diverse cities.

In the Annex IV, the full report and images can be found.

4.5 Sam Rees

Sam Rees studied Interactive Arts in Manchester, UK and has been teaching interactive media at the Iceland University of the Arts, Reykjavik since 2015. A generalist with a passion for zine and maker cultures, in his personal practice he repurposes robotics to create interactive installations. Recent events include participation in Reykjavik Festival of Electronic Arts (RAFLOST) and a residency at Signal Culture (USA). More information at:

www.ififoundafrozentimewarpidputitinthemicrowaveatyourhouse.co.uk

Unidentified flying animals

Sam worked on the theme of **Pollinators decline: can you *make* the difference?.** The project **Unidentified flying animals** develops three final prototypes experimenting with three parallel streams of investigation related to the human-nature interaction, such as standardization of the records, perception of insects and the resolution of the records.

The prototypes constituting **Unidentified flying animals** project are: a camera trap prototype to obtain systematic recordings, a prototype for selfies with pollinators with augmented reality, and a prototype tool to support 3D scanning.

The camera trap for insects using a simple phone macro lens results in a cheap and reproducible method for standardization, enabling users to have a good level of identification of insects. To approach the relationship between humans and insects, Sam has used a creative, playful, and artistic approach based on AR to shoot selfies with pollinators, allowing proximity with the insects and some fun results.

Last, he worked on the ethics aspect of the insects observation developing a tool to support the identification of insects avoiding the killing aspect of the specimens Sam work aims to provide tools for the community of observers (e.g. users of iNaturalist), raise reflection on ethics and explore the emotions linked to the relation between human and insects, like fear of hate and how to challenge that, with a playful approach.

In the Annex V, the full report and images can be found.

5 Challenges due to COVID-19

The JRC MiR was intended to be a residence programme physically located at the JRC Makerspace, in Ispra, Italy. The COVID-19 pandemic has posed great challenges to the original plan, given the distributed closure and the local inaccessibility of the site. The programme had to be reshaped, initially into a hybrid format and later, ultimately in a fully virtual edition.

The reshaping of the programme consisted mainly in extending the duration of the programme and adapting some activities and part of the projects into distributed proposals while excluding site visits and central work at the JRC Makerspace. This reshaping included the involvement of communities in the makers' local environments, or a more extensive participation at their local premises, establishing new collaboration with local makerspaces or groups, and supporting the exchanges with scientific experts through digital means (emails, virtual meetings).

The COVID-19 pandemic posed mayor challenges for makers in the construction of material objects, due to the reduced resources in terms of consumables or access to shared equipment. Moreover, as the measures to contrast COVID-19 pandemic entailed physical distancing, this has challenged aspects of projects and skills development related to working together and boosting community building. Digital networks and virtual meetings revealed to be weaker or slower to establish.

The COVID-19 pandemic forced a multiplication of events and action mediated by screen, increasing people fatigue for engagement. The digital word revealed its constrains in terms of community building and ideas exchange. All the communication were conducted through the MS Teams platform and dedicated channels, which was extensively employed and supported the individual work of the makers as well as the work as a team. Interaction in the platform was scarce mostly used for unidirectional announcement or all types of meetings, possibly due to inexperience with the platform or excess of online stimuli. Nevertheless, COVID-19 pandemic has determined the extension of the collaboration time with the makers, enabling deeper reflections and development of the proposals.

The makers were flexible to adapt their projects and generated new solution to fulfil the work within the MiR programme. They worked with dedication and enthusiasm, managing to deliver innovative and useful final products.

In sum, the COVID-19 pandemic represented a 'stress factor' for the makers and for the whole programme, but it also highlighted the flexible and resourceful nature of the community.

6 Reflections and recommendations

Programme

The JRC MiR programme was an initiative that managed to overall involved the makers in experimenting with policy relevant topics. The success of the programme can be measured by noting that:

- The proposed deadlines were met in all activities and the final event was successfully carried out;
- It raised interest within the maker community, resulting in invitations to present the initiative (e.g. at the Pop-Machina General Assembly) and requests for information (e.g. municipality or local groups);
- The number of Twitter impressions and link clicks on the day of the publication of the programme, respectively 4,875 and 35;
- The feedback received from the makers participating was very positive. Moreover, all of them were engaged in all activities during the programme (including informal meetings such as Coffëęė Collective).
- The growing interest within the JRC expert community with a high potential for application of the makers' final prototypes (e.g. positive feedback from experts working in STING Pollinators Decline).

The dissemination of the programme has followed mostly the content management plan (relevant channels, #, @ and communities identified, content was prepared in advance). The plan was communicated to the social media team in advance. Extra effort was put in the appearance of the web presence of the makers and projects. However, more posts communicating the progresses in the development of the prototypes would strengthen the dissemination of the programme and increase its visibility. This would imply to increase the number of posts/tweets from JRC side, as well as to establish a structured effort from makers' side.

The milestones of the programme were achieved during the programme. However, the timeline had to be adjusted due to COVID-19 pandemic and resulted in a final event for July. An immediate consequence was that the attendance was below the expectation. The timing of the social media promotion was also not ideal with the promotion of the final event being done at last minute and mostly from personal accounts.

Online environment

The communications with the selected makers was done through the MS Teams platform, via dedicated channels. The main purpose was to support the individual work of the makers as well as the work as a team. However, the interactions in the platform were scarce and resulted in it was mostly used for unidirectional announcements or for the meetings either official or informal. This was most probably due to the inexperience of using the platform, being unfriendly for some users (e.g. those with Linux environment), or due to an excess of online stimuli during the COVID-19 pandemic.

The establishment of virtual network with the JRC MiR programme (e.g. with *Coffëęė Collective*) aimed to foster the exchanges of ideas among the makers as well as of expertise and resources in the hope of boosting the creativity and potential inspirations with transversal exchanges with other experts. The programme also intended for an independent use of the online platform as a mean to have regular check-ins about the status of the various projects. However, given the size of the group, the meetings were challenged by running online, often with overtime presentations and not always leaving enough room for productive discussions. Possibly the restraint was the size of the working group associated with a dilution effect and therefore individually less effective. A programme with a smaller maker group might provide different results in terms of networking, checking-in and willingness to interact. For example two or three makers are likely to feel less distressed or more engaged. Moreover, unstructured, co-created agendas

or guiding question-based meetings could improve the results and meet the engagement expectations, being more effective, constructive and boosting the group creativity and fun. In this way, the participation can be experienced as a value for better networking, productive iteration, project development, capacity building and exploitation of the resources.

Makers, connections and projects

The makers were selected examining the candidates' profiles, portfolio and proposal submitted to EU Survey. Geographical and gender representation was only considered in last resource. Eventually, five EU-based makers were selected to participate to the JRC MiR programme First Edition 2020-2021.

The project proposals were aligned with the scope and themes of the programme, introducing the citizen engagement aspect present in the call. The inclusion of certain citizen engagement aspects in the projects, such as prototype co-design, workshop co-creation or introduction of experiential approaches, improved the capacity of adaptation of the projects to external factors (e.g. COVID-19) and offered the possibility for new collaborations (e.g. in local makerspaces). However, the same aspect introduced a certain degree of complexity for conducting the activities with others and for accessing public spaces due to the COVID-19 pandemic restrictions. A possible way to tackle this is to look for projects with a stronger prototyping element that are not structured on participation of others into the process. Therefore, it would be excluded any proposal with workshop as part for the development of prototypes. Instead, testing the final prototype could be structured as a workshop. A future call might be requesting applicants to present or establish connections with local spaces or organizations that can host and support the maker work within the JRC MiR. The list of network and local affiliation can be implemented into the EU survey as mandatory section.

Generally, makers followed the activities with enthusiasm, providing text and material also for the MiR website. They participated to all formal meetings as requested, as well as to the informal gatherings such as the **Coffëęė Collective**. However, their activity on the MS Teams platform was quite limited, if not absent. A possible way to tackle this is to have sessions which are more interactive, e.g. suggesting a topic to unpack, or proposing a question on the channel to motivate engagement. In addition, another suggestion is to establish a structured interaction within the MS Teams platform and with the group. Specifically, makers could be asked to compile an online logbook to record activities and interactions with other makers during the programme, and shared it with a weekly frequency. A template could be created with a section dedicated to the community contribution. Lastly, the networking activity of the maker could be acknowledged in the final certificate, which could be done in a form of a passport where categories include networking and community contribution.

7 Conclusions

This report provides an overview of the JRC Makers-in-Residence programme, describing the projects developed in its first edition (2020/2021). It gives also insights into how ideas, approaches and solutions coming from the maker environment constitute significant contributions to citizen engagement activities and participatory practices, especially in organisations at the crossroad between science and policy, such as the JRC.

The JRC MiR showed that the makers' final prototypes have a potential immediate application in citizen engagement activities, even more as an expression of civic engagement from bottom up in matters of common interest and care. In addition, the makers reflect their local environment and knowledge, providing key lens of interpretation and application in specific context and conditions.

Lastly, the report shows that the programme enacts as empowering enabler, giving capacity to certain groups to face and confront with topics of impact in European policies. The makers' response was highly committed and inventive, as well as resilient and flexible.

COVID-19 pandemic represented a major challenge for conducting the programme and for the makers, but also revealing the wider possibility in connecting people as mass. It also highlighted the indispensable role that physical presence can play in initiate creative processes and in boosting collaboration.

The JRC MiR first edition was a pilot programme to test the concept, structure and the general response.

References

Kieslinger, B., T. Schaefer, C.M. Fabian, E. Biasin, E. Bassi, R.R. Freire, N. Mowoh, N. Arif and P. Melis (2021). "Covid-19 Response From Global Makers: The Careables Cases of Global Design and Local Production". Front. Sociol. 6:629587. doi: 10.3389/fsoc.2021.629587

Rosa, P., F. Ferretti, A.G. Pereira, F. Panella and M. Wanner (2017). "Overview of the Maker Movement in the European Union".Publications Office of the European Union, Luxembourg, EUR 28686 EN, ISBN 978-92-79-70525-0, doi 10.2760/227356, JRC107298.

List of abbreviations and definitions

JRC	Joint Research Centre
MiR	Makers in Residence
COVID-19	Corona Virus Disease in 2019

Annexes

Annex I

Youth: a life through a pandemic: «prototype X»

Dalia Gregorova

Dalia Gregorova

http://dalia.gregor-design.eu

Youth:
a life through a pandemic
« prototype X »

Partners:

European Commission

JRC makerspace

Booster ESPACE DE VIE SOCIALE

LE FABLAB DE NÎMES

Acknowledgements

I would like to thank all the people that participated and allowed this project to happen – JRC Makerspace's scientists, staff and young people of EVS Booster social center and staff of the Fab Lab de Nimes. Also, special thanks to Rajaa, Pierre, Driss and Thomas for their help and support.

TABLE OF CONTENTS

1. INTRODUCTION

1.1. AUTHOR

I am Slovak freelancer working in architecture and digital fabrication currently residing in France. While growing up and spending time in hacker culture and through my architecture studies I have developed particular interest in the DIY (do-it-yourself) and maker movement and the notion that everyone is capable of creative design , when given proper tools and knowledge.

In my work and studies, I am trying to explore the role of an architect and a designer in an era that some people call the new industrial revolution, where anyone is becoming able to create, download, modify and produce design.

I believe that architects and designers have an obligation to use their "powers" to make the world better, not only through their design skills, but through the multidisciplinary nature of architecture and design. As architects, we should be able to let go of our "creator's" ego, however painful that is and share our pen with others. We should listen, learn and teach (and make and build). We should use our knowledge to guide others, but we should also gain knowledge from others and be guided by them. I believe this is the way to assure true value and quality.

1.2. CONTEXT

In 2020 Makerspace of the Joint Research Centre of the European Commission has launched a call for applications for the 1st edition of makers-in-residence programme with the themes:

- Youth: a life through a pandemic
- Pollinators decline: can you make the difference?

Since in my older projects I focused a lot on youth, digital fabrication technologies and participative design, I have decided to answer this call and apply for the theme "Youth: a life through a pandemic". It seemed like an interesting fit and a good opportunity to develop my interests, help others, and make something interesting.

1.3. PROPOSAL AND OBJECTIVES

I have submitted proposal for a participative project named "Prototype X" focused on the challenges of the Covid crisis that involves a group of young people that, together with me and the researchers from JRC and staff of a local Fab Lab, would help develop a prototype, from which they would benefit by learning new skills and hopefully by better emancipation in regards of their technological and design capabilities.

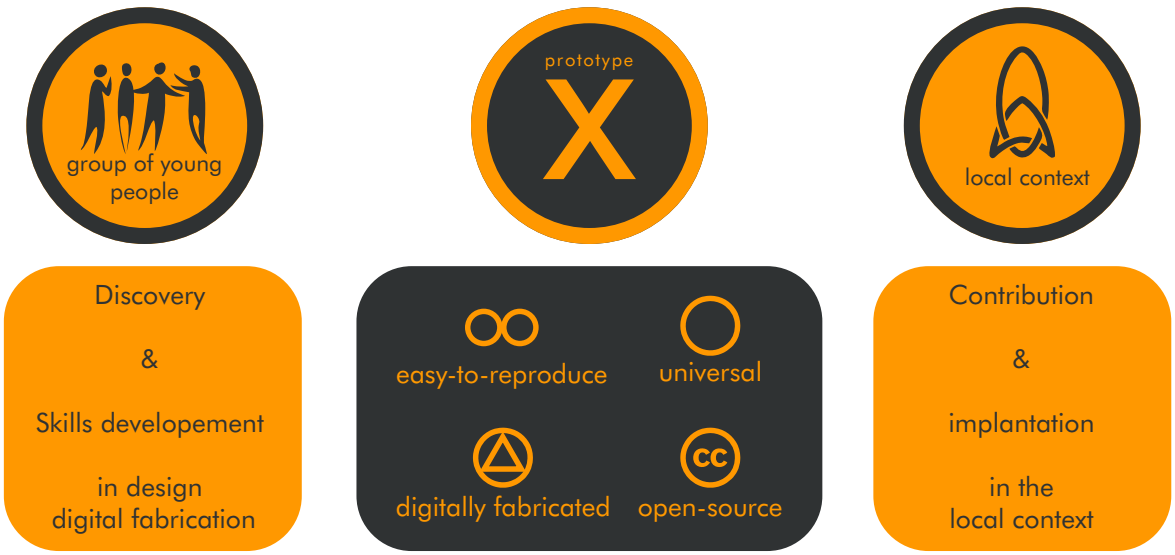
Given the participative nature of the project, its form and purpose were intentionally unspecified as they would evolve as the project progressed through making and collaboration. The only objectives at the beginning regarding the final prototype were that it would be easy to reproduce, universal to use, open-source and digitally fabricated with the basic equipment of a Fab Lab.

At the very beginning, there were many ways to imagine the outcome. The final result could have been anywhere from a tiny gadget, through artistic object to public space design.

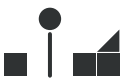
Multiple themes were considered, for example how to be socially distanced, but together. Or how to spread covid19 awareness between the youth, how to deal with the intergenerational rupture the pandemics causing. It was also conceivable to develop tools to facilitate learning or help them with their future prospects.

The prototype was destined to implant itself and serve purpose in the local context of its co-creators (the group), which in the end happened to be the local social center.

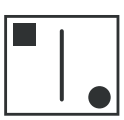
project's objectives



possible outcomes



An open-source public space design for being safely together but socially distanced.

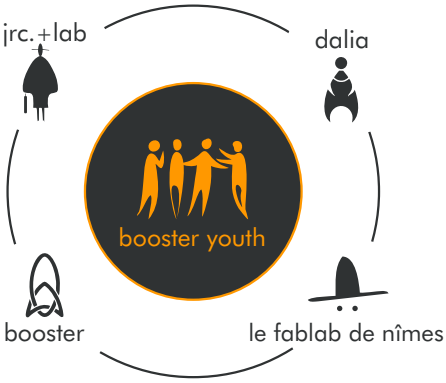


Open-source interior hangout space design for being safely together but socially distanced.

An open-source gadget that can facilitate distance learning.

A digitally fabricated open-source object or installation that creates awareness to the challenges of Covid19 crisis.

2.1. GATHERING THE PARTICIPANTS



Once JRC gave the project a green light, I started to gather the participants and create partnerships.

I have invited a local social center EVS Booster in Beaucaire, with which I worked before on other projects, to collaborate and organize a group of young people with the intent that the fabricated prototype would benefit their space.

Then I got in contact with the Fab Lab de Nimes, if they would be willing to host us for a few sessions and let us use their equipment so the participants could learn the technologies and prototype the object with me.

Once all parties were on board, the project was ready to start in February 2021.

The group that Booster put together consisted of 5 young students – Amina, Souad, Nour, Fadwa and Salim, who are all between 17-20 years old. Fadwa, who is 17 just successfully finished her high school in administrative management, the rest of the group are university students studying to be journalists, education counselors or to work in banking. All of them are also currently working at the social center, either as an internship, civic service or part-time employees.

This group of young people did not have any previous experience with digital fabrication, design or DIY techniques or any particular interest in them, but they were eager to try and learn.

The EVS Booster social center itself works predominantly with the North African and South American local population and their descendants and helps them with various practical and administrative processes. It also provides various activities for local children and accompanies local young people in professional integration which was partially an intent of this project.

AMINA

Amina, 20, is a communica-tion and journalism student in Montpellier. She likes collecting memories, and moments through photography.

SOUAD

Souad, 20, is doing her degree in Econo-mic and social admi-nistration at the Univ-ersity of Nimes.

She would like to become a senior education counselor in middle and high schools.

NOUR

Nour, 20, is doing her senior techno-logist's diploma in banking.

She likes to swim, play football, and spend time with her family and friends.

FADWA

Fadwa, 17, is a high-school student in administrative mana-gement in Nimes.

She is currently doing an internship at the Booster social center, helping minority po-pulation with various administrative pro-cesses.

SALIM

Salim, 20 is studying Economic and social administration to become a special-needs educator . He speaks french, arab and spanish and is currently employed by the Booster.

2.2. ROADMAP

The project started with a brainstorm phase to begin various reflections to define the purpose and the nature of the prototype, formalize it and begin to visualize it.
During this phase the participants were also introduced into the world of makers and digital fabrication.

In the prototyping phase the participants developed and experimented basic technological and design skills and further advanced the prototype.

Then we moved to an intensive final prototyping and fabrication week at the Fab Lab of Nimes and finished with testing the prototype in-situ in the space of Booster

All in all, the project took 6 months to be completed. During this time, I had organized 10 sessions (3-8 hours) with the participants at the Booster or at the Fab Lab, followed by 6 full intensive days of final fabrication work at the Fab Lab de Nimes.




PHASE 1 BRAINSTORM

- Introduction into the world of makers and digital fabrication
- Decisions on the focus of the project
- Basic formalization and visualization of the ideas

PHASE 2 PROTOTYPING

- Development of basic technological and design skills
- Development of basic prototype and its functions
- Experimentation

PHASE 3 FABRICATION

- Fabrication & Finalization of the prototype

PHASE 4 TESTING IN-SITU

- Testing & evaluation of the prototype in-situ

2.3. BRAINSTORMS

In our initial sessions we have researched, discussed, and identified some of the issues the young people, including the participants, are encountering due to the pandemic such as amplified impact of discrimination and abuse, precariousness, depression, isolation, sense of abandonment and many more.

Methods used:
- Free discussions
- Research of various sources (articles, interviews, debates)
- 6 thinking hats brainstorm method

We had several ideas on what we could focus on, mostly practical things to battle the isolation or precarity of young students. We have also considered the educational tools to teach kids and youths about the Covid19.

The problem that stood out the most was the social isolation the young people were facing. We had many doubts if we were capable of responding to it sufficiently. After a deeper reflection, we started to ask ourselves whether the ideas we have collected so far are relevant and could truly make any difference and whether this problem wouldn't be better addressed in a practical sense through the virtual world.

Also, due to the possibility that by the time this prototype would be finished, the worst part of the pandemic would be over (which has proven to be rather wishful thinking), we have decided to orient ourselves into a more of an artistic direction.

Finally, we have decided to create an object that would open a discussion about what we were going through and allow us to share it between each other. It would serve as a witness, a sort of remembrance of our experiences and sentiments regarding the past year and a half.

At first, we have imagined it as a sort of a metaphorical tree and the experiences and emotions as its branches and leaves. The tree would grow organically as more stories and experiences would be gathered.

Fully grown, it would witness the life during the pandemics of the local population that frequent the social center, and hopefully, give sentiment to some that they are not alone.

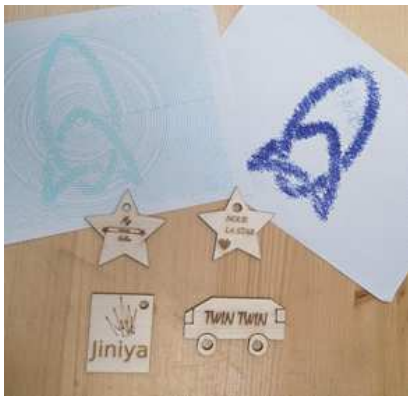
2.4. **EXPERIMENTATION**

To make things more fun for the participants, give them some context and improve their skills, I have also inserted some fabrication workshops and general discovery of the maker movement into our program.

We did some hands-on experimentation with 2D and 3D design and fabrication with 3D printing and laser cutting. I have also introduced them into the philosophy and history of maker movement and through my past projects illustrated the journey from the idea, through concept into the final object.

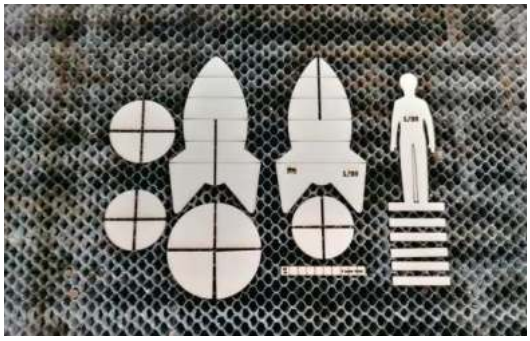
These workshops consisted of :

- presentation about the prototyping process of the FABCAT project, a house for stray cats fabricated by laser,
- detailed tour of the Fab Lab de Nimes by its fabmanager Rajaâ,
- Maker movement presentation - roots, evolution, main personalities and inventions, philosophy, ideology, purpose and various typologies of making,
- 3D modeling & printing initiation - conception, modeling in tinkerCAD and printing a personalized ring,
- and 2D drafting and laser cutting initiation - drafting a personalized keyring in Inkscape and cutting/engraving it on the laser.



2.5. **DESIGN & PROTOTYPING**

As the project progressed it started to take form and fill with content. We have slowly started to define the function, basic form, purpose, various components, and materials. The tree was transformed into a rocket, which is in the logo of the social center and also, according to participants, it makes them dream about the future, and better times.



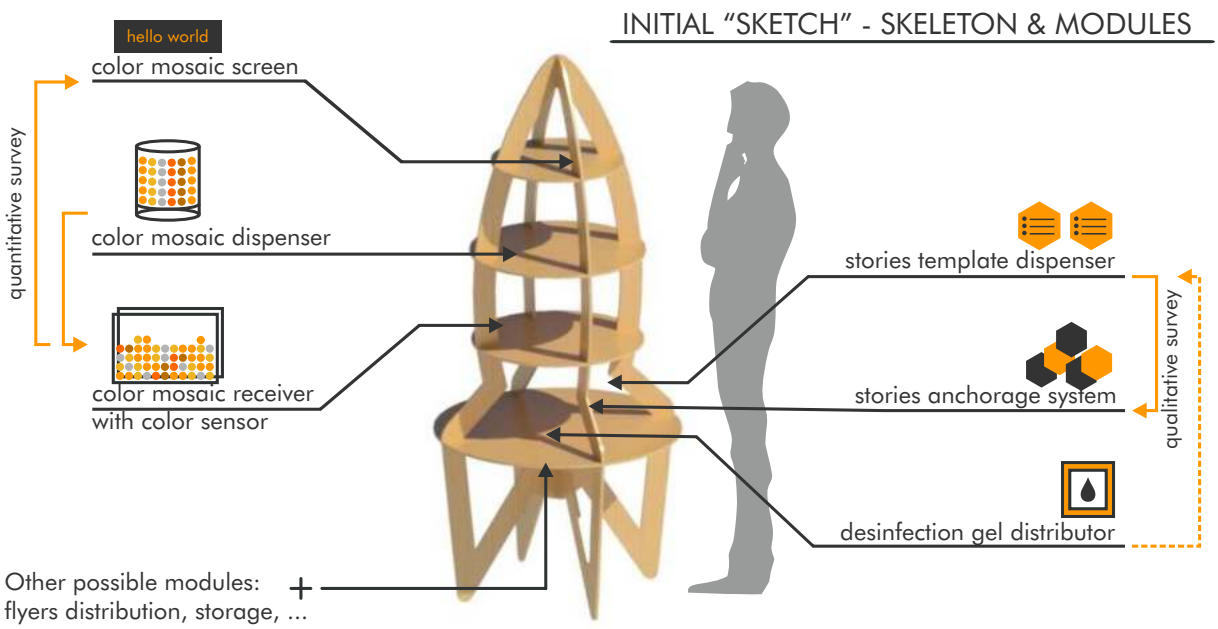
The principal object in the form of a rocket would serve as a sort of a "skeleton" for the modules whose role would be to interrogate the impact of the pandemic on life of people that frequent Booster.

The rocket could later serve other purposes in the lobby of the Booster, such as to showcase their projects, distribute flyers and information and so on.

The participants later also suggested that we could conceive our interrogation modules in a way that they could also be reused later by Booster for example for visitor's satisfaction survey.

Regarding the modules, it took a long reflection on what we wish to capture by them. There were many options on the table – capture the emotions, stories, secrets, losses and gains, create surveys, or write letters to each other through the object.

We have decided to collect the experiences and sentiments in two ways, one more quantitative to create a color mosaic of experiences and one more qualitative that would explore them further.
We also wanted to use some electronic elements such as color and movement sensors but have abandoned these ideas. As another confinement hit, I did not have time to go into the electronics subject and also, we were doubting the usefulness and necessity of those elements.



2.6. **CONTENT**

After our brainstorming session with JRC social scientists Anna Paola Quaglia and Magdalena Tendera we made the final decision about what and how we wish to examine and achieve.

The purpose of our object is to share experiences and start a conversation about what the pandemic does to us, to see others' points of views and discover how our lives were affected. The purpose of our "surveys" is not scientific research, but rather a look into each other's lives and hopefully, some feeling that even though we were isolated, we were not alone.

To this end, we have decided to ask people of Booster two things:

WHAT DID THE PANDEMICS AFFECT IN YOUR LIFE?

MY EDUCATION | MY RELATIONS | MY HEALTH mental/physical | MY FINANCES | MY LIBERTY | OTHER (tell us)

WOULD YOU LIKE TO SHARE MORE? TELL US/DRAW MORE

2.7. **FORM**

The design of the rocket also went through various transformations. I was looking forward to this to be a participative process, but sadly, due to the confinement imposed in April, I had to take this part on myself with few online exchanges with the participants.

I also wanted to work more with laser cut models and test the form in real life, but the fab lab was also closed so I had to rely on my imagination and 3D modeling software.

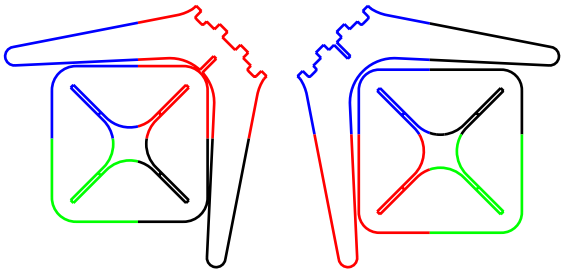
I tried to work with the concept of the rocket to my best ability, simplify the design and make it more subtle while keeping in mind the fabrication and assembly requirements. The round shape for each level was not working very well, especially for the implementation of modules so I tried to play with various forms, such as hexagon, octagon, many-many-gons, until I arrived at an obvious most logical and practical conclusion – a square.

3.1. MAKING THE ROCKET

In June, I spent an intensive full week in the Fab Lab de Nimes, to finalize the object with occasional help from the participants, who were quite busy at the time with their studies.

The first two days were filled with making small models of the final object, to test and verify its assembly process and stability. It only took 4 models to find a satisfactory solution.

For the final fabrication of the rocket, I have used 1cm thick plywood from poplar. Since the material was not completely flat, the laser focus was often off, so I had to divide the drawings into many pieces and cut them with adjusted focus individually. It took me a long time to figure this out the correct way, but afterwards, the whole object was cut out in a matter of hours.



I am aware that the CNC would have been more suitable for this kind of object, but I wanted to stick with the laser cutter technology, since it is more accessible and participants were familiarized with it. However, the plans can be used both on CNC and laser.

Laser cutting left assembly elements with a lot of burns and ashes, so afterwards, together with participants, we cleaned them, painted the edges and using an electric sander we sanded each face to obtain a nice clean finish.

And after that was done, the pieces were ready to be assembled.

3.2. ASSEMBLY

The assembly was very easy; it only took about 5-10 minutes. The only difficult part was to put the bottom(2) and the top(6) part together at the end. With the help of two other people, we managed to push it in, but it needed quite an effort. I believe that was a good thing because it assured a good stability.

Two layers of varnish later, the object was done. In the picture, you can appreciate the mothership with its little baby ships.

For the assembly purposes, to slide the parts onto the frame, there is a hole on the top three levels. It is possible to fill it with leftover wood from laser cutting, but we thought that for the aesthetic qualities we would try to fill it with 3mm acrylic glass.

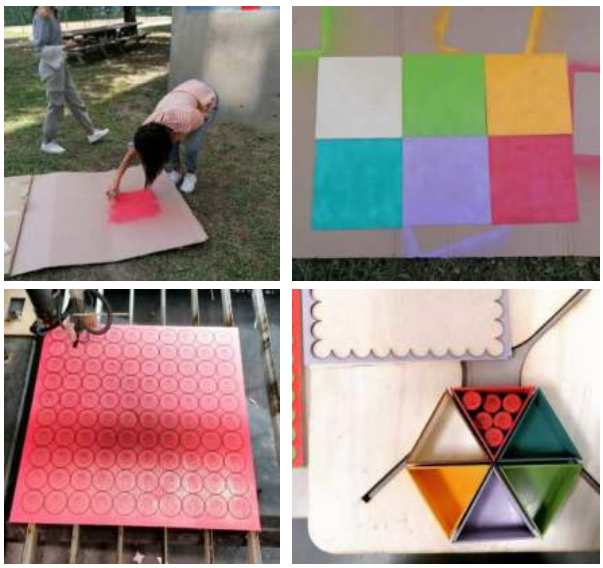
To resolve the question of holding them in place was a bit of a challenge. What we did was to cut little 1cm squares from some leftover 6mm plywood that was lying around the Fab Lab to serve as holders and glued them to the main structure. Then we just placed the acrylic glass on the top of it. This is definitely a part of the design that can be improved.

3.3. MAKING THE MOSAIC

After the main part was done, it was time to move onto the modules. I have decided to start with the mosaic part, which demanded a lot of time on the laser.

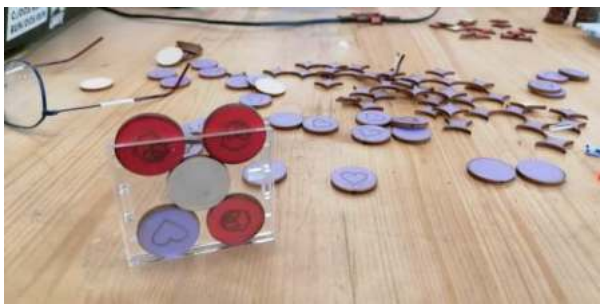
There were three parts to make:

- Colorful chips that represented various areas of life that have been affected by the pandemic,
- colorful distributors for the chips,
- and finally, the object that would hold the mosaic.

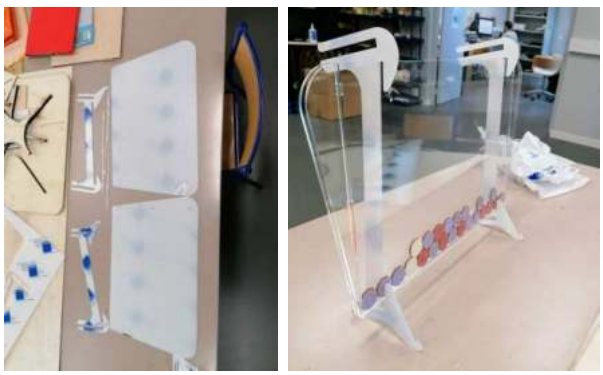


For the chips we have used 3mm plywood that we spray-painted according to the color code, then engraved and cut. We have made in total 100 chips for each color. Every color took about an hour to fabricate.

Since there were six colors, we decided to make the distributors in the shape of triangles for each color, so together they would create an interesting hexagonal element. For these, we have also used 3mm plywood. After the cutting we assembled and glued them together and for a nice finish sanded the edges. At the end, we decided to spray paint them each with their color.



The receiver (mosaic) was to be installed in the main part of the object, in the height of the hands. It is quite a dominant position and the receiver is quite big (50x30cm). To not interfere with the main structure of the rocket, I decided to use transparent acrylic glass that could slide onto the object and could be removed when not in use.



The mosaic receiver is also equipped with a holder for the main question which was printed on a paper and can be replaced at any time to pose another question.

3.4. MAKING THE STORIES

For the stories part, I inspired myself with Enzo Mari's Fable game and developed a stackable system so the people that want to contribute to the object could also contribute to the structure.

I originally wanted to use cardboard and engrave the question on it, but I was bothered by the fact that that the staff of the Booster social center would have to always create new ones, and also, that people who would contribute to the object would break the templates while trying to forcingly attached them onto each other.

In the end, I decided to go with 1mm polycarbonate that is much more durable and offers the possibility of further reuse and, finally, also has better aesthetic qualities. The templates themselves were printed out separately on thick paper and cut.

The template with the questions can be then attached to the polycarbonate with double scotch, or in my case – with little stickers that are used for the photographs.

Later it can be removed and replaced with something else, for example kid's drawings or photos.

I have then quickly drawn up a distribution holder for the stories from the remaining 3mm acrylic glass, which can be also used for flyers distribution.

After all parts and modules were ready, it was time to carefully pack the object and load it into my car and transport it 20km from Nimes to Beaucaire. I was very worried about this part, but all went well in the end.

4. AFTERMATH

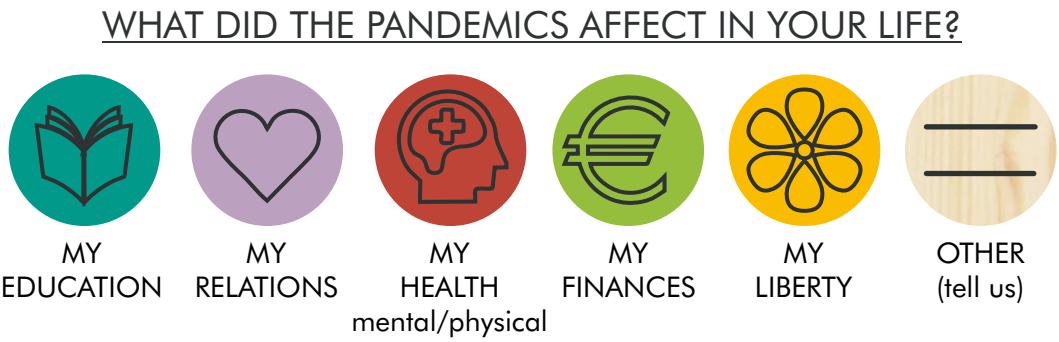
4.1. TESTING PROCESS

And finally, the day came, when the rocket was ready to be installed and tested in-situ in the reception space of the Booster social center. The participants, who work there, were there to explain the project to the visitors and help and encourage them to contribute. I checked every few days on the progress which grew steadily.

4.2. **MOSAIC - RESULTS**

In total, we have collected about 160 engagements through colorful chips and 36 stories. The mosaic contained chips that represented how people's lives were affected by the pandemic.

It contained a big variety of answers and not just one that stood out. I personally expected to see yellow, that represented liberty, the most. But for many of the contributors, the pandemic's most important impact was diverse – red represents mental and physical health, purple relations, finances in green and education in turquoise. There was also a wooden chip that represented other areas, where people were free to write – most from this group indicated – everything.



4.3. STORIES- RESULTS

All in all, people stopped at the object, many just read, some just threw in chips, others wrote stories and sentiments and hopefully, our objective to allow others to share and feel less isolated in our individual experiences served some purpose.

Many people also shared interesting fragments from their lives and their sentiments. Some in a positive manner, some negative. Here are a few examples of the stories we collected. Some people were confronted with loss, some found love, some saw their lives evolve and some just felt alone.

Covid has put a distance between myself an my loved ones. I don't see them anymore.

Thanks to the covid, I have received financial help.

I have found a job in health departement.

I have lost loved ones.

Covid made me more distrustful, I used to me more naive

Covid allowed me to get in terms with myself

I miss my grandma :(

I finally got a year where I was able to concentrate on my projects.

I have found my love while getting vaccinated.

I have met the man of my life in a line for PCR test.

We couldn't go out. No more friends, no more holidays. All that thanks to the confinement.

5. CONCLUSION

These past seven months were an extraordinary experience. I feel honored that I was allowed to participate in the JRC makers-in-residence programme and to work on this project. I believe I learned a lot from it, not only from the technical perspective, but also in terms of working with people and managing multiple parts of the project, often at the same time. I enjoyed the multidisciplinary aspect of this work, combining the strengths of the participants with my own, engaging the design and functionality, working the technology and as well as a little peek into the social direction and artistic expression through the collective process.

I greatly appreciate the support and responsiveness of the staff at the JRC. My only regret is that due to the pandemic, it was not possible to go work in Italy and meet the scientists and fellow makers. I was really looking forward to the actual "making" part there, exchange of ideas, brainstorming and testing, all in a new environment. However, I managed to adapt and find it in the Fab Lab de Nimes, whose staff and makers with various backgrounds and skills were more than helpful and very inspiring.

Managing the group of young people from the Booster Social Center was also a challenge. Given their humanities backgrounds, I have sometimes found it difficult to engage them sufficiently in the creative process, but in the end, I believe we got there, and they have also learned some new skills and gained new perspectives.

My three objectives – to engage a group of young people and let them learn about new technologies and design, to create a multifunctional, open-source and easy-to-reproduce object and to contribute to the space of the social center were met. I believe we have managed to create an interesting prototype, from the design and functional view and our goal to capture lives of local people during the pandemic showed some interesting results and allowed people to share, reflect and maybe even discuss the past year and a half.

Of course, as with any prototype, there are always ways to improve it, but I am going to leave that part to my fellow makers, in the spirit of open-source creation.

In the future, I hope to continue developing myself through the maker movement and collective creation.

ANNEXES

ROCKET X

HI! Thank you for downloading my project. It's a laser-cut shelf in a form of a rocket. This project was done by me, Dalia Gregorova, in a collaboration with makerspace of the Joint Research Centre of the European Comission, the Fab Lab de Nimes and young people from Booster social centre in Beaucaire, France.

There are several modules that are possible to attach on the main structure that can be use for example for customer satisfaction survey, or to publish pictures or stories.

ROCKET X

WHAT YOU NEED

- 4x 1cm thick plywood, min150x70cm
- Varnish
- Sanding paper for details

WHAT YOU NEED (OPTIONAL)

- Color for wood , brush..
- Acrylic glass 2-3mm, 68x52cm
- 6-8mm thick plywood, 5x3cm

MACHINES

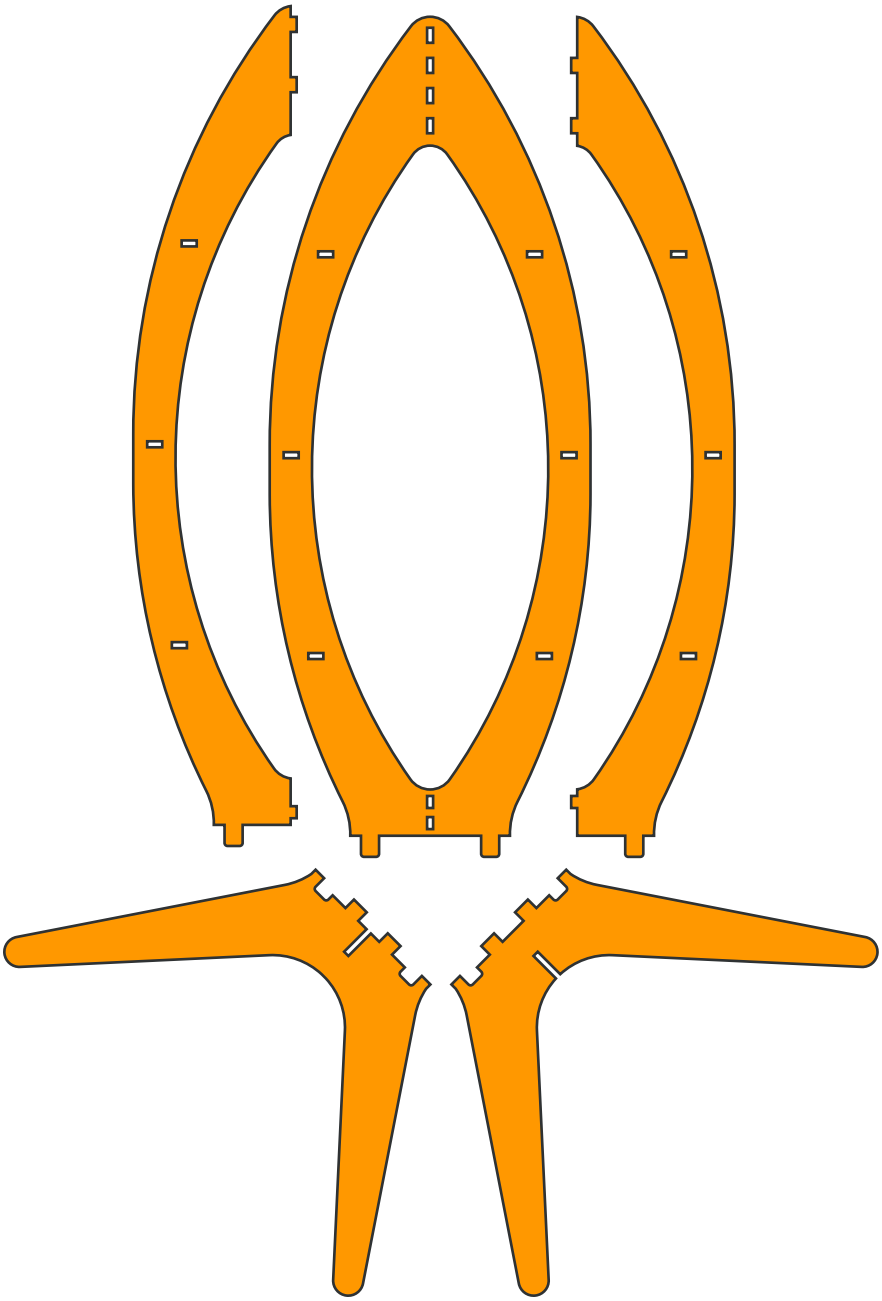
- Laser, bed size min 150x70cm, but should also work on CNC mill
- Electric sander (much more practical, but you can also use sanding paper)

AUTHOR:
Dalia Gregorova is a Slovak freelancer residing in France with a background in architecture and information technologies.

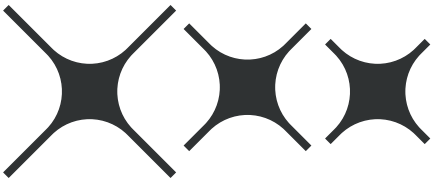
In her work, she focuses on digital fabrication, the maker movement and participative architecture, examining her conviction that everyone is capable of creation

Download files here -> **http://dalia.gregor-design.eu**

ELEMENTS



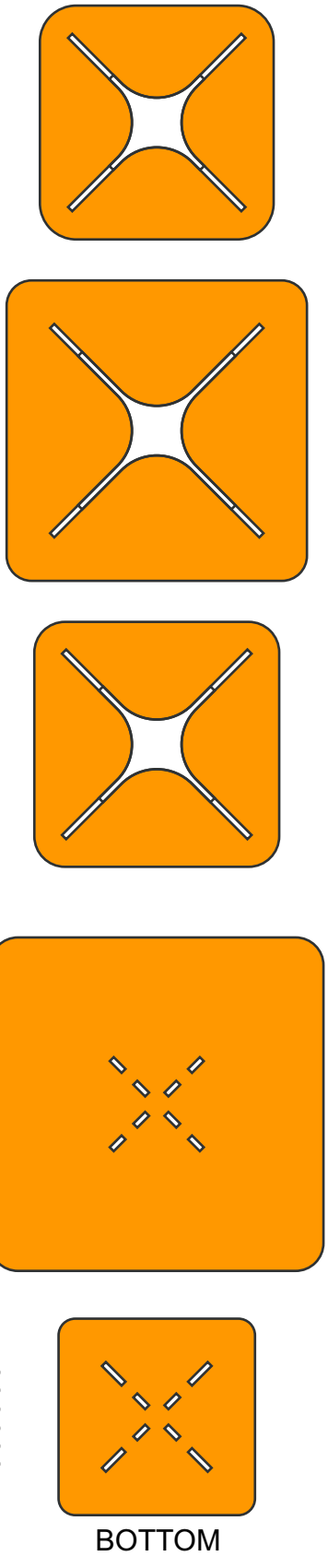
VERTICAL FRAME
1cm plywood/acrylic glass



HOLE INFILL
3mm acrylic glass

INFILL HOLDERS
6-8mm

TOP

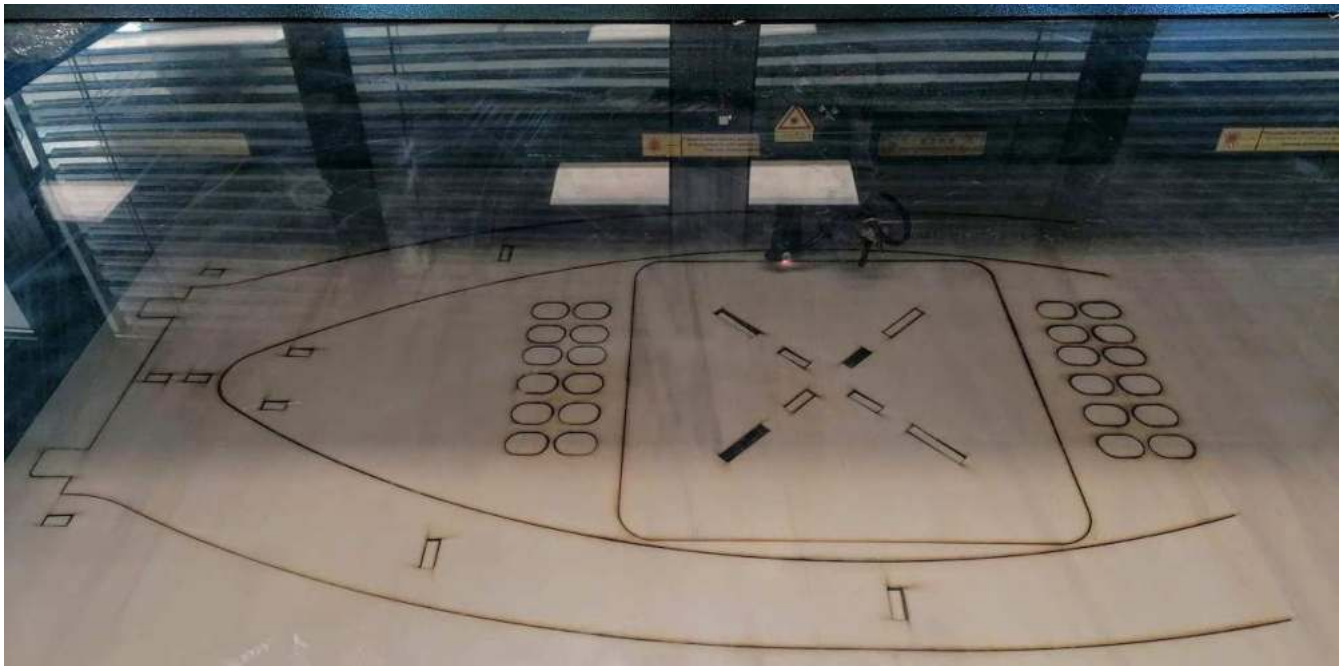


board holders

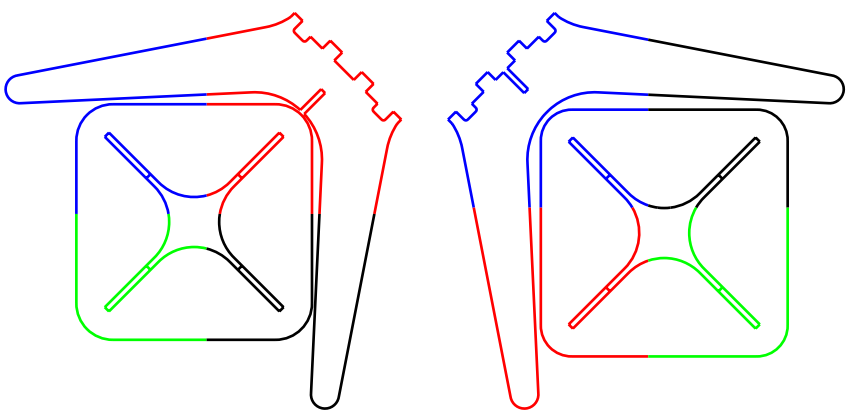
BOTTOM

HORIZONTAL ELEMENTS
1cm plywood/acrylic glass

FABRICATION



This part is little bit tricky if you are using laser and your material is not completely flat or your laser not well calibrated. The consequences is that laser will not have correct focus on different places on the board. This was my problem and what I did was to divide the drawing into multiple parts and cut each of them separately while adjusting the focus for every color. (see drawing below)

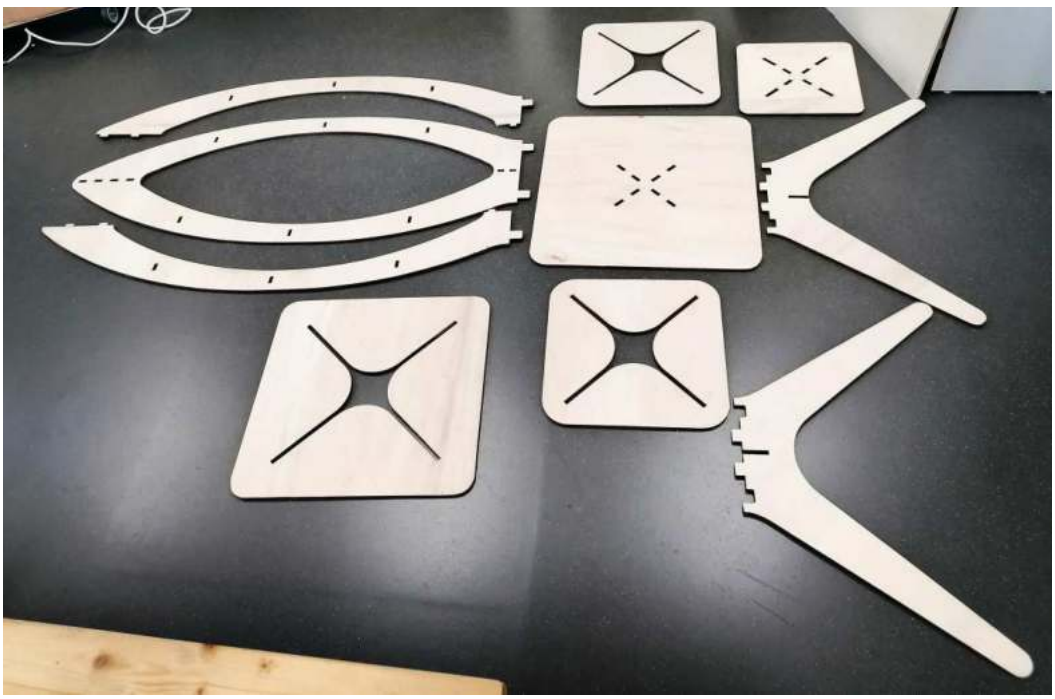


PREPARATION

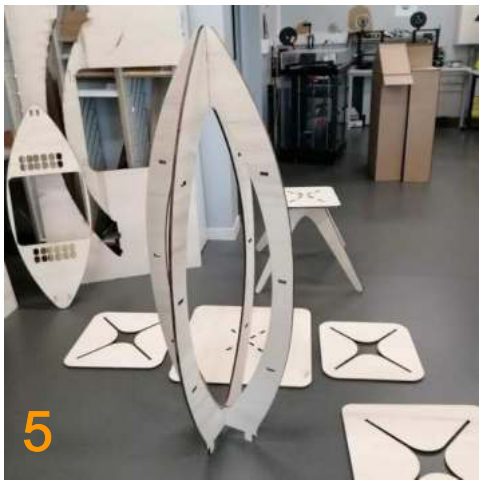
Since the cutting probably left your assembly elements with lot of burns and ashes, the sanding is very important.

First sand the edges to get rid of the ashes, then paint them with the color of your choice. Doesn't matter if you spill a little bit over you can get rid of the spills later during sanding.

After that's done, you are ready for the big sanding. Using an electric sander is of course fastest and easiest. And after that's done, you will have nice pieces ready to be assembled.



ASSEMBLY 1/2



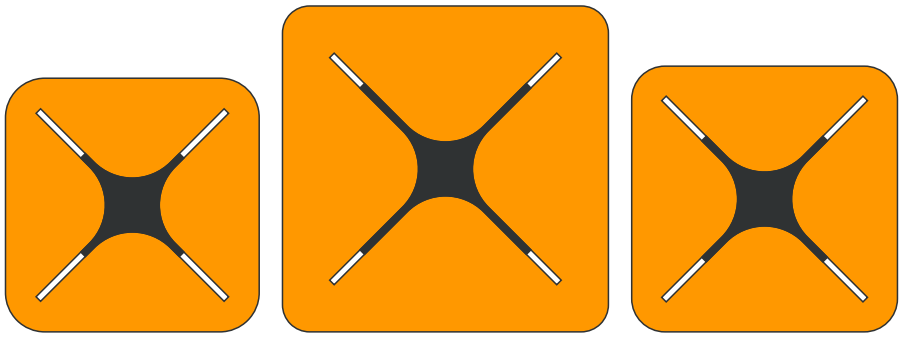
The assembly is quite easy, I did it in matter of minutes. However, for the last part try to get a help of 1 or 2 people because you will have to use some force to push it in. Which is a good thing, because it assures good stability.

ASSEMBLY 2/2

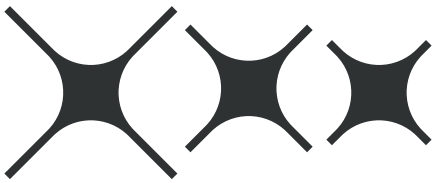
And now apply varnish to protect the object and install infills for the holes.

FINISHING

You probably don't want to be left with object that has holes in its shelves in the the superior planks so it's good idea to fill them in.



In case you want to fill it with wood, you can use the remaining wood pieces from the cutting and just glue them in with classic silicon glue for wood while securing the glue with masking tape si the glue doesn't spill over and can dry in peace :). As you can see, the drawing for the laser already contains lines for this alternative.



ACRYLIC GLASS ALTERNATIVE

I have found an option with keeping a transparent holes more aesthetic so I decided to fill-in the holes with 3mm acrylic glass.

The question of holding them in place was quite tricky. What I did I have cut some squares from 6mm plywood to serve as holder and glued them onto the bottom edge of the holes (orange circle in the photo). Then I just posed the acrylic glass on the top of it. But you can be creative, you could maybe even fill it in with epoxy :) Anyway, if you find a better solution, please let me know :)

ROCKET X - MOSAIC

This is the element that can be used for example for **customer satisfaction survey.** It was originally designed to interrogate the people that frequent the social center EVS Booster in Beaucaire about the pandemics asking them, what in their life was affected. Each color represented part of their lives: yellow - liberty, red - mental and physical health, purple - relations, turquoise - education, green - finances and natural plywood color - other, where they could express themselves.

All the elements are fabricated with **laser cutter**.

It contains:

- a main mosaic receiver part that is attached to the object of the Rocket and can be removed and emptied at any time. It also contains a holder for a question you wish to ask,
- little colorful engraved chips,
- and 6 triangular boxes to hold them that contain chips and together make a form of hexagon.

WHAT YOU NEED

receiver and question holder

- 3mm thick transparent acrylic glass min 85x64cm
- glue for acrylic glass
- 1mm opaque material (cardboard, polycarbonate..) size min 9x33cm

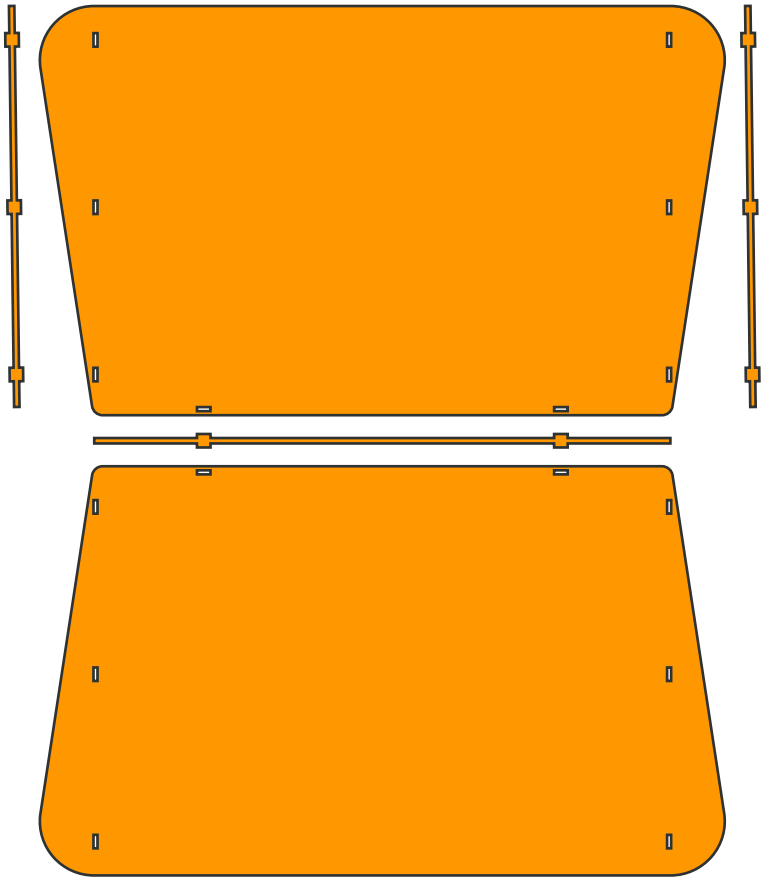
colorful engraved chips (per color)

- 3mm thick plywood 30x30cm for 100 chips
- spray paint

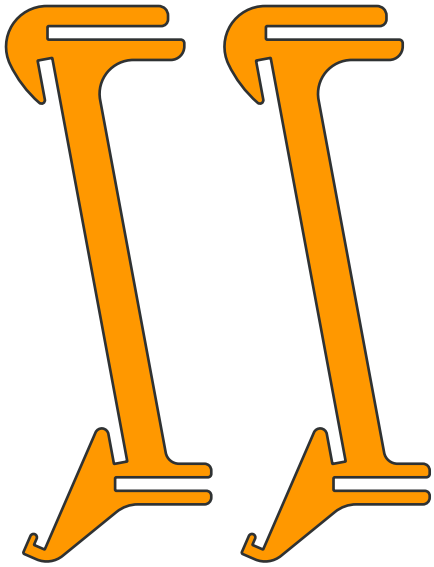
triangular boxes (per box)

- 3mmthick plywood 26x18cm
- spray paint
- glue

MOSAIC ELEMENTS

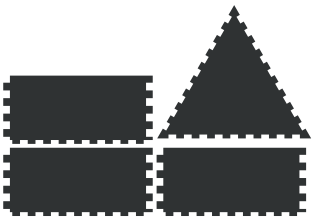


CHIPS HOLDER
3mm transp. acrylic glass



MOSAIC HOLDER
3mm transp. acrylic glass

QUESTION HOLDER
3mm transp. acrylic glass
1mm opaque cardboard/polycarb.



CHIPS HOLDER
3mm plywood/acrylic glass/etc

Depending on how many you need you can easily generate different boxes on sites such as: https://www.makercase.com/

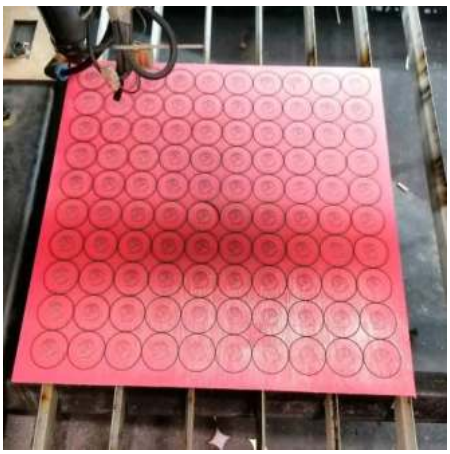
CHIPS
3mm plywood/cardboard/etc..

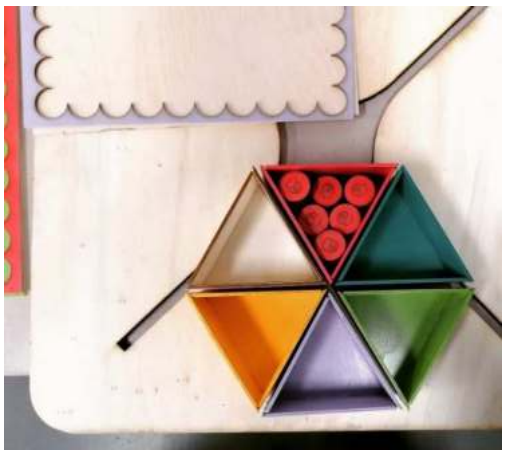
MOSAIC MAKING

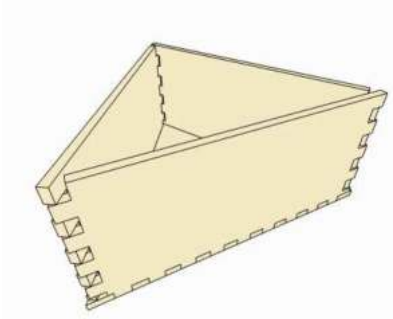
Planks for the chips are at first spray-painted to fit the color code of the mosaic (two layers).

Let them dry well and then pass onto the engraving first and cutting later, to avoid losing the focus of the laser by the possibility that they might move/fall through.

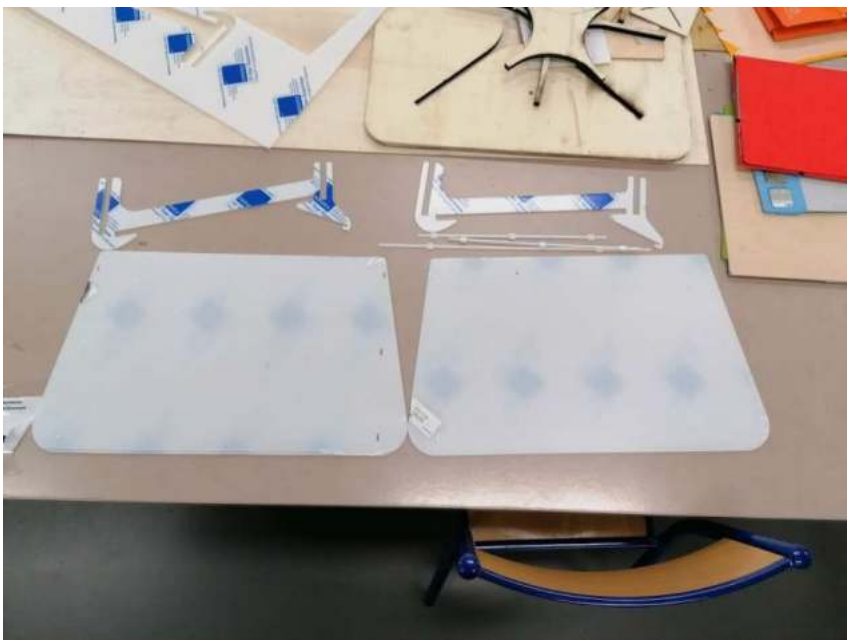
For the boxes, the method is opposite - first cut, then glue, and only then spray paint.

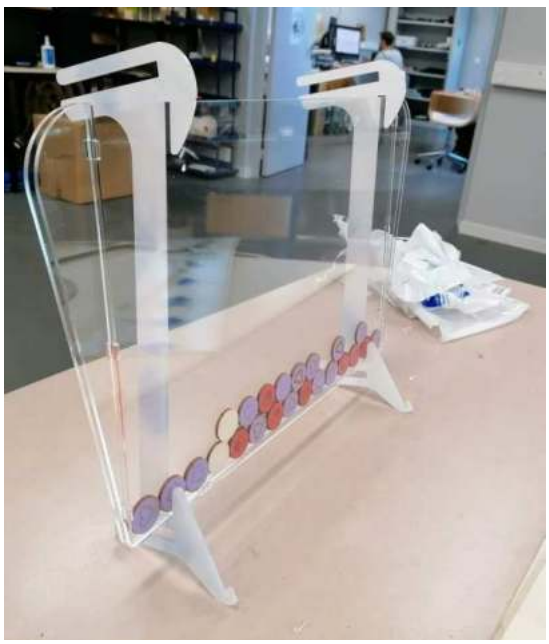






I think this assembly is quite straight-forward. Long sticks go between the mosaic panel, and that slides into the holders, and those slide onto the main object of the rocket.





ROCKET X - STORIES

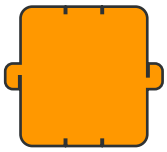
Stories were designed to document experiences of the visitors of the EVS Booster center during the pandemics. Anybody could take a template and write a little story and then attach it onto the object.

These cards can be also used to attach photos, drawings, user experiences, etc.

For the material I originally wanted to use cardboard 1mm and engrave the question on them, but in the end I have decided to use poly-carbonate (1mm) and use double-sided tape to attach printed out templates with question. In my case, I have used a 1x1cm double-sided tape used for attaching photos. You can buy it in any office-supplies shop. Or otherwise, just engrave it on the original material before cutting.

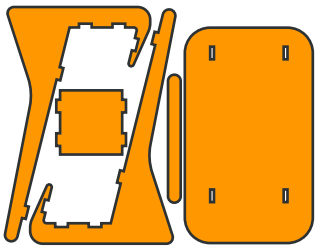
I have also created a card holder, that can also serve to distribute flyers from 3mm acrylic glass.

WHAT YOU NEED



cards

- 1mm opaque material (cardboard, poly-carbonate..). Size of 1 card is 12.5x11cm.



card holder

- 3mm thick acrylic glass/plywood 26x20cm
- glue

Annex II

“Pollinators in a box”

Ferran Fàbregas

“Pollinators in a box”

About the author

Ferran Fàbregas is a computer scientist, bioinformatic, data scientist, programmer and teacher. Ferran started in the maker world 9 years ago. In this time developed a cross-disciplinary knowledge in different disciplines as digital manufacturing, electronics, robotics, microcontroller programming and education, trying to turn his passion into a full-time job.

The *pollinators in a box* project links Ferran interests in programming, bioinformatics, electronics, digital fabrication and the maker world.

Pollinators in a box: the idea

The *pollinators in a box* project is based on a previous project called “lifebox: virtual ecosystem in a box” (https://ferranfabregas.me/lifebox/) (Figure 1), created several years ago. The inception of the pollinators in a box project idea was to try to create a simulation based on real world elements rather than an abstract implementation.

The possibility of transforming the simulation into something that tries to reproduce elements of the real world - like the biology of insect pollination and pollinators behavior - was a very interesting challenge and an opportunity to take the project to a new level of complexity. The JRC MIR programme was a great opportunity to tackle this challenge and develop a whole new simulation system thanks to its experts and collaborators.

Figure 1: Original lifebox with the simulation screen and the knob controllers on the left side

Pollinators in a box: the process

The idea of the *pollinators in a box* project starts with a simple concept: create a complex and non deterministic (stochastic) simulator based on a simple set of rules. This project involved a long creation process, from a simulator of abstract virtual ecosystems - in the beginning to the development of a version based on real variables and dynamics. *Pollinators in a box* has evolved thanks to the collaboration with the JRC in Ispra and with the pollinator expert Simon Potts.

To develop the final project, online interviews were run with the JRC team and Simon as a pollinator expert to define how the original simulator could evolve to a pollinator specific one. The process implied creating a new set of parameters and algorithms that simulates pollinators behaviour and relation schema between the pollinators and flowers.

After defining the standards, iterations and simulation tests were run, finally resulting in the new simulation model. *Pollinators in a box* project is an educational interactive tool / installation based on a virtual flowers & pollinators simulator.

The goal of the *pollinators in a box* project is about developing an artistic, interactive and mostly **educational simulation** of a virtual ecosystem related to pollinators and flower behaviour, allowing users to control the interaction and evolution of different kinds of pollinators and flowers in real-time using a self-developed controller device.

Pollinators in a box: the basics

Inside the *pollinators in a box* virtual ecosystem live six virtual entities, such as 3 pollinator species and 3 flower species. Each species has several configurable parameters. The user can change the behaviour of the species inside the virtual ecosystem, modifying all the parameters and seeing the consequences of their actions inside the virtual ecosystem simulation.

For example, in figure 2 it is shown a generic relationship between the pollen generation of flower species, the gathering efficiency of the pollinators and their growth. These parameters can be useful to limit or enhance the number of individuals and keep the system in balance.

As shown on the figure 2, the number of individuals grows when the pollen generation and the gathering efficiency become higher, but not in the same proportion, and the growth is not unlimited because when new individuals arise the availability of resources decreases and the system tries to find a new balance state.

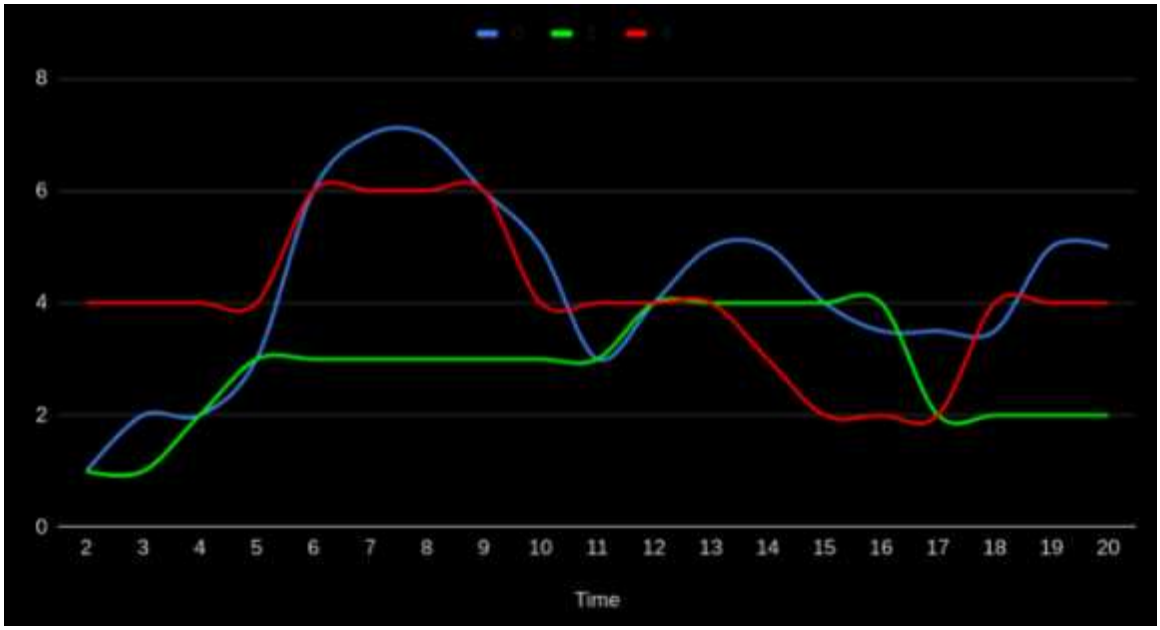


Figure 2. Blue (individuals) Green (pollen generation) Red (efficiency)

Each flower species has 3 parameters, while each pollinator species has 5 parameters. In addition, there is a common parameter related to the number of pollinator individuals of the simulation.

Some parameters, like the pollinator efficiency, the pollen gathering or the life expectancy, can be turned on / off to change the complexity level of the simulation.

Detailed information about the simulation parameters can be found in the following section related to the controller and especially in *Addendum I*.

Pollinators in a box: the controller

To allow the control of the simulation, such as modifying the different parameters and the behavior of the flowers and the pollinators in real time, a web app controller (Figure 3) has been developed.

A physical controller (Figure 4) created for the original *Lifebox project* can be easily used / adapted / expanded to control the *pollinator in a box* project, thanks to the software controlled, knob / parameter relation of the controller.

You can get more information about the physical controller and how to build it at: https://github.com/ferrithemaker/Jumble/tree/master/lifebox

The web app controller is based on node-RED open source software and uses a web interface, allowing the user to control the simulation from a mobile phone, a laptop, a computer or any other device with web browser capabilities.

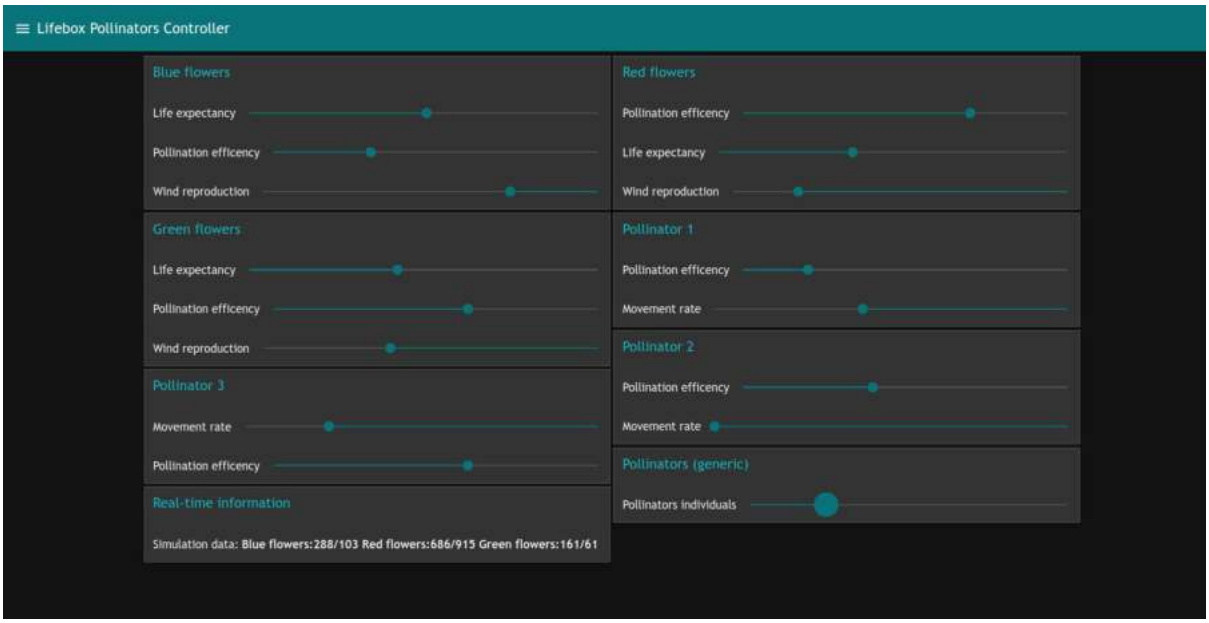


Figure 3: node-RED web app controller

The physical controller (Figure 4) has been built using an Arduino microcontroller, a laser cutter machine and also different kinds of digital fabrication tools like 3D printer or vinyl cutter.

The physical controller has several knobs connected to the Arduino microcontroller with WiFi capabilities, allowing the possibility to connect to other devices.
Similarly to the web app controller, with the physical controller the user can control every parameter of the simulation in real time.

The physical controller must be connected to the computer running the simulation, via USB cable or with a WiFi connection using MQTT (https://mqtt.org/) as the communications protocol.

The MQTT protocol (Message Queue Telemetry Transport) is a standard protocol for IoT (Internet of Things) messaging.

Figure 4: Physical controller

Pollinators in a box: the simulation

The simulator of the *pollinators in a box* project has been developed using Python and Processing and the source code is available[1] under creative commons Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) licence[2].

Detailed information on how to download the code and make it run on your device can be found in the *Addendum II*.

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[1] https://github.com/ferrithemaker/Jumble/tree/master/processing/lifeboxPollinators

[2] https://creativecommons.org/

Pollinators in a box: collaborations & testing

An initial prototype version of the *Pollinators in a box* was tested in order to adjust the parameters of the simulation. The testing phase was a key element of the prototyping process, helping to find a balance between the reliability and accuracy of the simulation (Figure 5) and the simplicity that requires an installation designed for educational purposes mainly for kids.

For example, figure 5 presents a screenshot of the evolution of the three flower species in relation with pollinators. Although it is impossible to see the real scope and dynamics of the simulation in a static screenshot, it is possible to sense a better behavior among some pollinators and the green flower species.

In particular, figure 5 shows a simulation in which pollinator affinity to the pollen of the green flower species is high, while the pollinator affinity to the pollen of red and blue flowers is rather low. This setting, mixed with the increase of pollen generation efficiency parameter of green flowers, has resulted in a relevant increase of the green flower species individuals in relation to other flower species.

In this process, the collaboration of the pollinator expert Simon Potts helped with the development of the project and its improvements for a more elaborated educational installation, but also more complex.

The expert has supported the project by helping to better define the parameters as well as the expected behaviour of the whole simulation, giving very useful information and scientific resources about the real pollinators behaviour and their dynamic interrelation with the flowers species. The collaboration has helped to understand the complexity of the elements involved in the simulation and has provided relevant information to create a new set of parameters, defining the links and correlations between them in detail.

Thanks to all documentation, advice, resources and information provided, the pollinators in a box took a step ahead of being only an educational tool, developing towards a faithful virtual representation of the relation between pollinators and flowers.

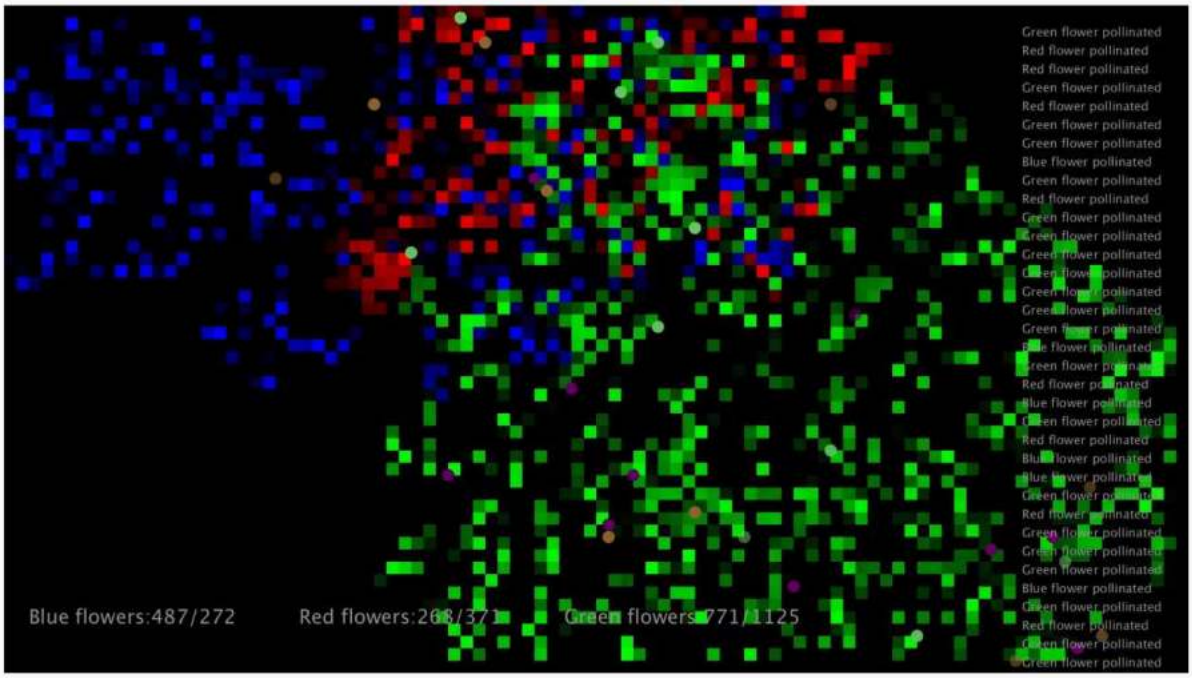

Figure 5: Screenshot of the pollinator in a box simulation running

A video recording of a real simulation running is available at https://www.youtube.com/watch?v=1-b0IggTrU8. In the video a test scenario is shown from the beginning, starting with almost no flower species individuals (only randomly generated seeds).

The simulation starts with the appearance of the pollinator individuals (insects) in a random position inside the virtual ecosystem, the number of pollinators is defined by the *pollinator individuals* parameter.

Yet, the pollinators-mediated spread of the flowers is associated with the visit of the insects, the reproduction can occur stochastically (it also depends on parameters like the pollination affinity and the pollination efficiency) every time that one pollinator individual interacts with the flower individuals.

Before the pollinators start to act on the system, the wind pollination strategies begin to work. As blue flower species have a better configuration for this parameter (more than 80%) than the red and green flower species (less than 50%), they start to grow faster.

When the pollinators start to interact with the flower individuals, they begin to have a relevant impact on the simulation and the green flower species individuals start to reproduce faster because they have:

- Improved configuration related to pollen generation efficiency (more than 75%),
- Improved affinity (more than 75%) with several pollinator species.

Blue and red flower species individuals remain stable as their parameters related to affinity and efficiency are configured as approx 50%.
The parameters can be set in advance and / or can be modified during a running simulation, allowing the user to visualize the effect of the changes. If endless mode (check *Addendum I* for parameter description) is enabled the simulation will run forever.

NOTE: The mentioned parameter values are only example values for this test.

The final prototype: the vision

The *pollinators in a box* is an educational installation based on a virtual flowers & pollinators simulator.

The final prototype of *pollinators in a box* has been developed combining technology, creativity, science and education in a multidisciplinary approach.

From a mixed perspective of teacher, maker, creativity lover and technology professional, children and youth would highly engage in exploring scientific concepts through interactive installations that are visual, enjoyable and fun for them, and at the same time infused with solid academic concepts.

It is important to create ways to approach scientific concepts and learning processes through experiences and analytical thinking, as well as to promote the importance of creative education, of open source and free software philosophy and the maker values.

Therefore, the vision of the *pollinator in a box* project is to enable teaching basic concepts of biology and the relevance of pollinators in some ecological processes through an interactive and engaging artistic

installation, creating a meeting point between the arts, education and science.

The project is designed to be shown in schools, educational centers and fairs (Figure 6), allowing students to interact with the installation, engaging students with scientific and biological concepts.

The maker movement with public and / or private makerspaces and FabLabs in cities and towns, allows people to discover new creative and artistic communities, helping them to improve and transform their projects, dreams and ideas into reality.

The development of the *pollinator in a box* project is an example of how the maker movement can create not only conceptual prototypes but also fully functional projects that can be useful for people and contribute to society.

This project can also help the maker movement itself to gain more visibility to the teachers, students, and the educational sector, allowing them to be more aware that it is a movement capable of helping them find new ways of doing and approaching the daily challenges of the current and future educational processes.

Figure 6: The interactive installation running live on an educative event at Convent de Sant Agustí Civic Center of Barcelona

Further improvements

One of the most ongoing relevant improvements of the project is the implementation of a system to store all the data related to the simulation. This feature will allow the user to replay any simulation scenario and perform a post-simulation analysis of the recorded data. This upgrade will allow the simulation to improve its educational potential.

Final reflections

It’s impossible to analyze the participation in the makers in residence programme (JRC MIR) without taking into account the impact of Covid-19 pandemic. This circumstance implied that the residence could not be on site, facing the consequent modification of the proposal approach, going from a project with a relevant maker part to a project more focused on the development of the simulator itself. In hindsight, even though this was a great challenge because of my prior little knowledge about the pollinators,

the result, thanks to the collaboration of the JRC and the experts, has been very positive and a great experience overall. The final result of the project and all the collaboration process has also been very engaging, sharing the knowledge with amazing people with different backgrounds, and creating a community that has enriched the project far beyond what I might expect.

The JRC MIR programme has been a great opportunity, helping to develop a project and transform an idea into a real prototype. This has been possible thanks to the collaboration with experts as well as circulation of ideas between the group, other invited experts and the members of the programme, always with the objective of improving our society and environment.
.

Also, the programme has helped to create a relevant network of european contacts, that will be an invaluable resource for next maker projects and very productive further collaborations.

Addendum I: simulation parameters & concepts

NOTE: The values described below are abstract values. The values do not have a specific meaning or range definition rationale. The generic range intends to be adaptable to produce simulations with any kind of flower. The parameters are not related to any real specific pollinator. Thanks to this, the simulation can be adapted to anything and properly configured.

For example, low values on the life expectancy parameter mean high chances of low life expectancy while high values mean high chances of high life expectancy. Yet,the data are expressed only in percentiles and stochastic probabilities, not real days / months / ages.
This gives an open possibility of parametrization that can be adapted to specific educational needs and allows a high range of configurations.

The user, the single expert or the teacher would be able to adapt the parametrization data - if deem necessary for educational scopes - - to specific values modifying the parameter ranges on the configuration section of the source code.

- Cycles -

Within the simulation and with regards to *time*, every iteration of the simulation is a *cycle* where a *cycle* will be the minimum time unit for running a simulation. *Cycles* are not related to any real time measurement.

- Endless mode -

The simulation has an *endless* mode flag, enabling or disabling automatic respawning (spontaneous generation) if there are no individuals of a particular species. The objective of *endless mode* is to avoid flower species extinction.

- Flower parameters -

Every flower species has a set of parameters to define its behaviour[3], as described here below:

Life expectancy:

This parameter controls the maximum life expectancy of each individual flower in the *cycles*. Range is from 1 to 100 life expectancy cycles.These *time-cycles* are not related to any real life time span expectancy of flowers, but can be easily adapted to, if required.

Pollination efficiency:

This parameter defines the efficiency of the flower to release pollen to the pollinator. Flower species have different physiology configurations with different traits allowing pollinators to get more or less pollen from the flower.

Range is from 0 (poor pollination efficiency) to 100 (high pollination efficiency)

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[3] Pollen and Stigma Structure and Function: The Role of Diversity in Pollination:

https://academic.oup.com/plcell/article/16/suppl_1/S84/6010548?login=true

Wind pollination efficiency:

This parameter defines if and to what extent the flower species evolved wind pollination strategies[4], shifting to anemophily rather than being supported by pollination services for reproduction.

Range is from 0 (poor wind pollination efficiency) to 100 (high wind pollination efficiency)

- Pollinator parameters -

Every pollinator species has a set of parameters to define its behaviour, as described here below:

Movement rate:

The pollinators have a general strategy based on proximity to the areas with high concentrations of nectar / pollen. But there are some pollinator species that tend to be more static - moving slowly / nearer - or more dynamic - moving quickly / further.

Range is from 0 (static movement) to 100 (dynamic movement)

Pollinator gathering efficiency:

This parameter defines the quantity of pollen that insects gather from flowers. This parameter is directly proportionally related to flower pollination efficiency.
.

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[4] Transition from wind pollination to insect pollination in sedges: experimental evidence and functional traits:

https://nph.onlinelibrary.wiley.com/doi/full/10.1111/j.1469-8137.2011.03762.x

Range is from 0 (poor gathering) to 100 (high gathering).

- Pollinator individuals -

This parameter indicates the number of individuals of a pollinator species. The abundance of individuals of a species recruited simultaneously in the simulation has a direct impact into the pollination process. Increasing or decreasing the number of individuals has a great impact on the availability of pollen (for example high abundance of pollinators can cause pollen scarcity, while low abundance can cause a decline in pollination capacity of the pollinators) and, in general, has a great impact on the balance of the pollination process. A high number of individuals can affect the sustainability of the whole system, leading to unbalance and eventually to system collapse in extreme cases. But the lack of pollinator individuals can also put the pollination process at the same risk.

However, the specific relation is multifactorial, such as dependent on all other parameters.

Range is 0 for no pollinators and 100 for maximum number of individual per pollinators species.

- Pollinator affinity parameters -

Every pollinator species has a different affinity to different kinds of flowers / fruits[5], this affinity can be set up using 3 independent parameters that define the affinity of each pollinator species to red, blue or green flowers.

As we have 3 pollinator species and 3 flower species, we have 9 different affinity parameters to set up.

Range is 0 for no affinity and 100 for maximum affinity.

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[5] Investigation on the Affinity of Different on Pollinating Combinations among Apricot Species

https://en.cnki.com.cn/Article_en/CJFDTotal-GSKK1995S1014.htm

Addendum II: the source code

The simulation is developed using *Processing (https://processing.org/)* and the code is released under creative commons Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) licence.

The control interface is developed using *Node-RED* and uses the *MQTT* protocol to create a bidirectional communication between the GUI controller and the simulation.

The *Node-RED* flow is also available with the same licence and repository as the simulation code.

https://github.com/ferrithemaker/Jumble/tree/master/processing/lifeboxPollinators

Ferran Fàbregas

2 August 2021

Annex III

“Tik Tok Futures – Pollinators in Decline”

Finn Strivens

TIK TOK FUTURES

POLLINATORS IN DECLINE

Final report for the JRC Makers in residence program

YCUK

European Commission

ALL IMAGES BY YCUK

Contents

Introduction

01

INTRODUCTION

Young people need to be more involved in decision making, particularly around climate change. It is their future, and they are the ones whose voice matters. Campaign from 'Friday for future' to "Climate change now' have catalysed many young people to be the voice of change in their generation.

But current approaches to climate policy are generated in a youth-free manner and are unlikely to reflect the values and priorities of diverse young people. When they are consulted, it is though traditional approaches involve surveys and transactional methods of asking people their thoughts on the future. This project explores an alternative way to gain insights into views of young people: by engaging them to tangibly make their visions of the future. Be making an enjoyable and youth friendly activity, we hope to appeal to young people who are not currently involved in youth climate movements.

To achieve this projects involves working with young people to co-create Tik-Tok videos that provocatively bring to life the biodiversity crisis through the eyes of young people.

The goals of the project are to:

- ***Build young people's knowledge of pollinators***
- ***Build young people's sense of agency and efficacy over the future***
- ***And encourage youth action around biodiversity***

> "I TRY NOT TO THINK ABOUT THE FUTURE BECAUSE I JUST END UP TRIPPING OVER WHAT'S IN FRONT OF ME"

CIVIC PARTICIPATION

A democratic wave is sweeping Europe. People feel a right and a desire to have a say in decision making and tools are being developed to help them do so. This is in stark contrast to a sense of powerlessness that makes people feel disengaged and disenfranchised with traditional politics. Local civic participation Is sweeping the UK through movements such as Transition Towns and Flatpack Democracy, while citizen's assemblies are growing in number and influence. A recent vision of the future of local democracy in the UK paints an optimistic picture, where citizens regularly participate in local activities and take ownership of change that they care about.

Critical to the success of these activities is grassroots engagement, where time is invested in high quality dialogue around complex subjects, and where citizens get hands on to start making change.

The situation for young people in the UK is particularly dire. On average between 2002 and 2016, the electoral turnout among UK 18 to 24 year-olds was a mere 37.1% (the lowest in Europe.) For young people in particular, it is often the lack of civic efficacy (the belief that you can make a difference) that often prevents them from making a difference.

By involving young people in grassroots civic participation, allowing them to make content that is shared online, can influence their peers, and will be viewed by policy professionals within the JRC, this project can re-connect young people with the belief that they can make a difference.

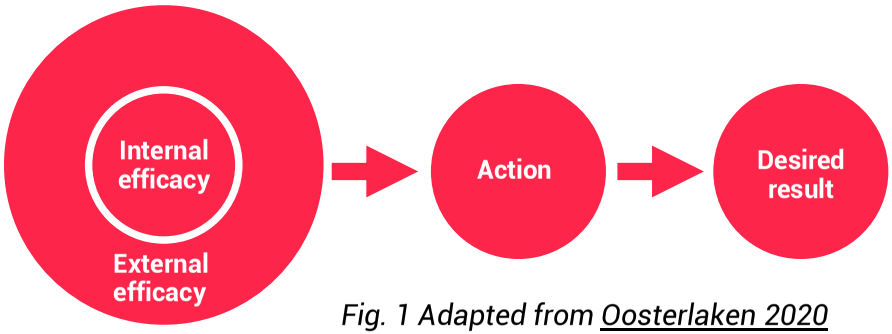


Fig. 1 Adapted from Oosterlaken 2020


PROCESS
02

PROCESS

The original plan was to set the project in Ispra, where the JRC makerspace is based. As the theme of the project is 'Pollinators in Decline' the aim was to engage local citizens with the pollinators in their area of Ispra, creating speculative objects around the town that would spark discussion about how best to engage with these amazing creatures.

Unfortunately, Covid 19 made it impossible to run the project in Ispra and instead I opted to work in London with a group of young creators who are described on the next page.

To create the eventual film making futures project, I first conducted 4 workshops with experts in pollination science and policy from the JRC. These interviews informed the discussions I had with young people about the future of pollinators, and in particular the framework that we used to imagine four alternative futures of pollinators.

After this I had two meetings with young people from YCUK to discuss what kind of workshop they would want to participate in, and what they would want to learn form the process. These meetings were invaluable to understand how to engage them with this material. Many of them hadn't heard of pollinators, didn't know why they were important and they helped to frame the information in a way that would be engaging and accessible.

02 PLANNING MEETINGS WITH YOUNG PEOPLE

03 DAYS OF WORKSHOPS

04 EXPERT INTERVIEWS

YCUK

The project partnered with a youth group in South London called YCUK. YCUK is a creative hub for young people, run by young people. By offering free access to equipment, training, mentoring, mental health support, workshops, software, business support, safe and professional workspace, employment, and internships, YCUK aims to break down barriers in the creative sector and get young people into successful creative careers regardless of race, gender or socioeconomic background.

This project gives YCUK members the chance to build their storytelling and mixed media skills, to engage more young people in their network in civic participation programs, and to build awareness of their work across new sectors, that they can leverage to create more opportunities for young creators in the UK.

Throughout the 3 days of workshops we worked with 11 young people from 16-21 years old, who were largely not familiar with pollinators, and had not engaged in systematic ways about thinking about the future. They all had film making and media backgrounds, but many of them were new to Tik-tok content creation.

Particularly inspiring, was that many of them had never linked their passion for film making with a passion for other topics, such as climate change or biodiversity. This workshop allowed them to make that link, and hopefully will inspire them to do so in the future.

> **"I HAD LOOKED AT CLIMATE STUFF AND POLLINATORS BEFORE AS I DID A LEVEL GEOGRAPHY BUT I'VE NEVER DONE ANYTHING WHERE YOU ACTUALLY MAKE SOMETHING. IT'S WAY MORE INTERESTING AND FULFILLING. IT MAKES IT SEEM LIKE SCHOOL WAS ACTUALLY WORTH IT."**

FUTURES

Interviews with JRC scientists were conducted using the 7 questions format, and informed a matrix of four 'sketched' futures that the young people would work from in the workshops. Tis method was inspired by Angheloiu et al. at Imperial college.

One axis describes a shift from intensive agricultural practices to regenerative practices, while the other axis describes the method for implementing change, whether through top-down government policy, or through civic participation and social action.

Pollination was the perfect topic to start a discussion about civic participation, as it is both a very localised issue that individuals can act on, but also relates to larger systemic and policy challenges. Young people were really exited to see and discuss how the future could evolve in multiple different ways, and how they could help to shape its trajectory.

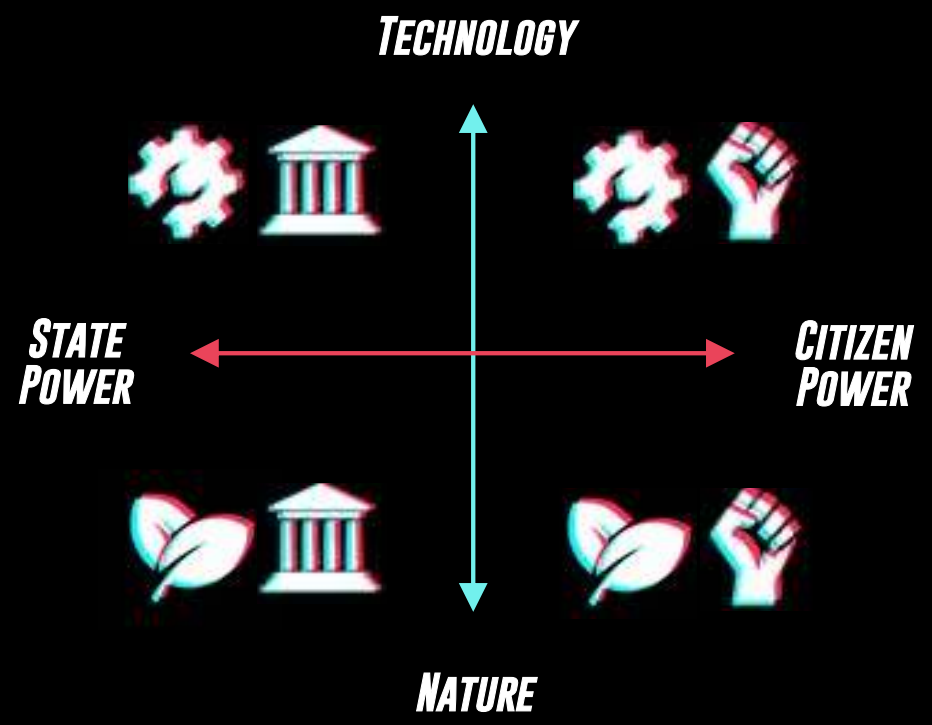
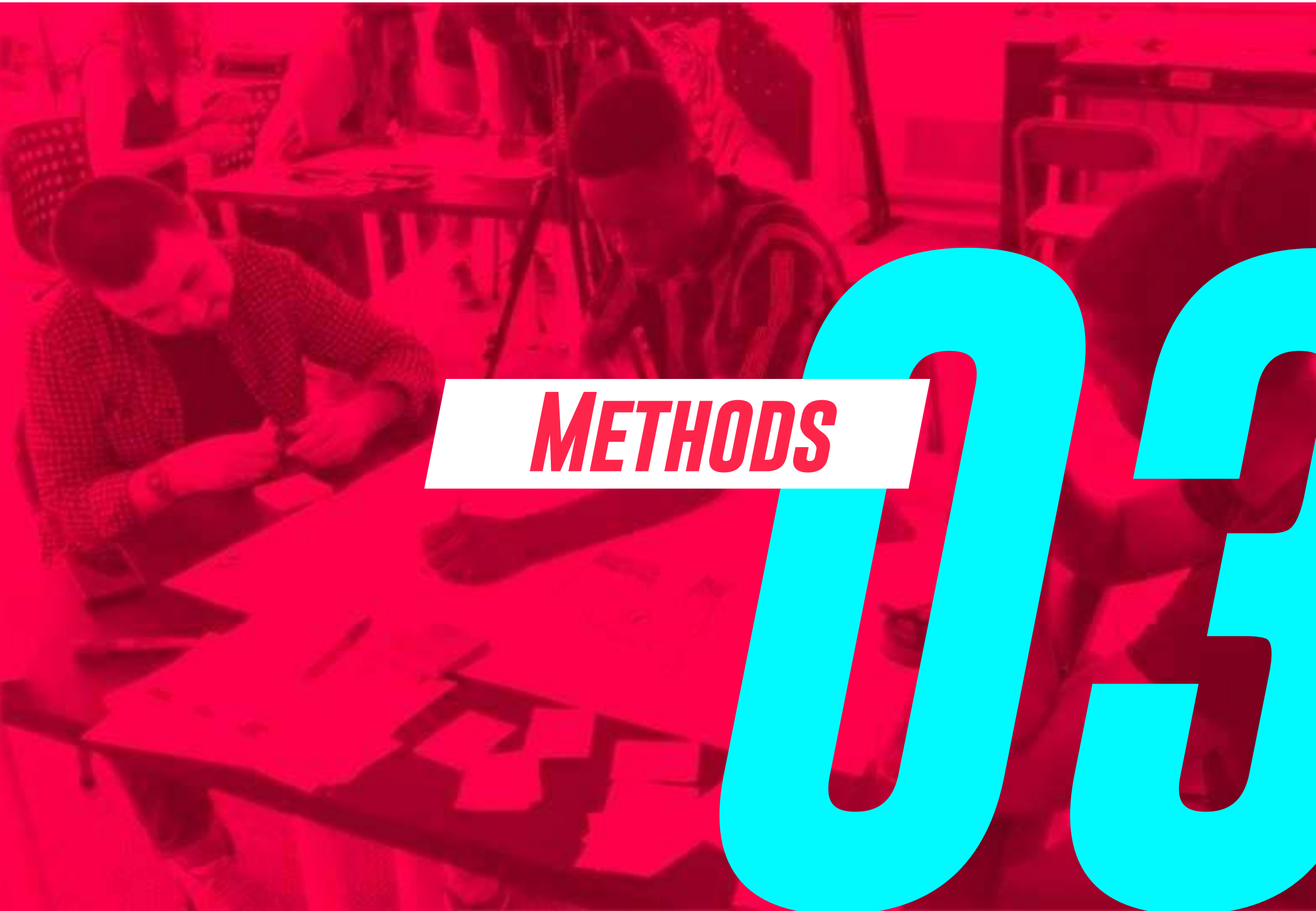


Fig. 2 Matrix of futures presented to young people (each future is described in more detail in appendices 1.)



Methods

03

METHODS

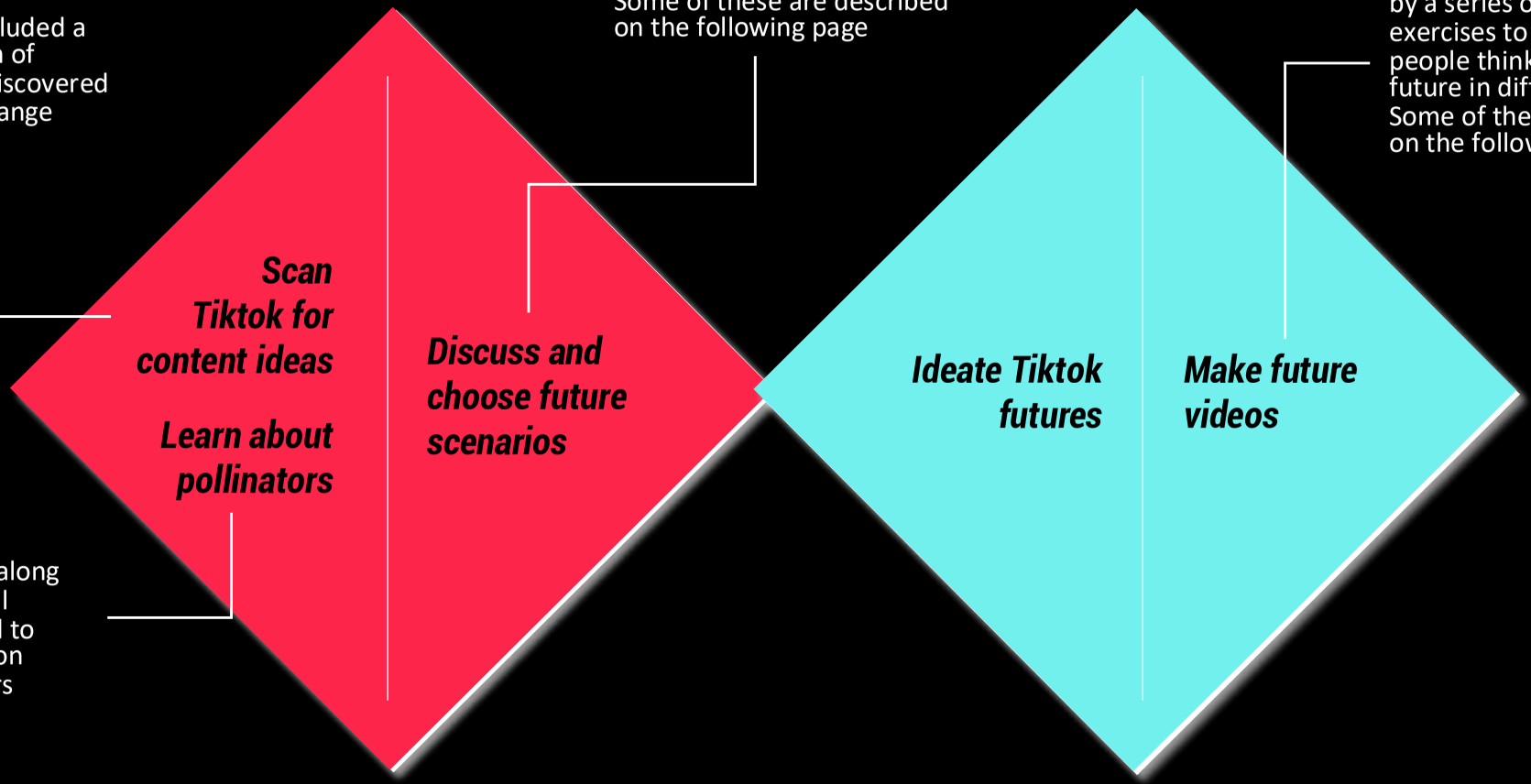
The workshop used a double diamond approach with two sets of divergent and convergent steps. In this futures process, Tik-Tok was used as a tool to both imagine, and subsequently to prototype the future. In the first diamond we used Tik-Tok as a lens through which to view alternative futures. We discussed pollinators, and the four alternative scenario sketches, before imagining what kinds of Tik-Tok content we would see in this world.

The format of the discussion allowed it to be framed in terms that the young people found engaging and familiar, where they could reel off their favourite videos and adapt them for new contexts. I also think these discussions gave rise to genuinely new, and very nuanced discussions about the future where every event was contextualised through an observer and how they chose to present the event. It allowed us to jump very naturally from imagining future events, to imagining all the different people that are effected by those events and how they feel about them. It was therefore a very human, and a very fun discussion of the future.

For the citizen led and technological world this included discussing how bubble pollination could induce hay fever and be hard to avoid, as they imagined farmers getting key worker status and public regard, and new jobs for people hand pollinating plants, using a combination of bubble and handheld technologies. For another scenario they imagined a balklands state like Bulgaria becoming a leading global power due to large scale investment in pollinator health and subsequent export to the rest of the world.

Each of these scenarios were arrived at by imagining the videos that individuals would make about the events. It made the events seems real and possible, even though we were only discussing the videos and hadn't actually made them yet.

DESIGN PROCESS



ACTIVITIES

The workshop contained many small activities to get people thinking ab out the future in new ways. A number of the are described in this section.

METAPHOR SESSION

In this exercise, based off the Polak game, young people were encouraged to invent a metaphor to describe how they think about the future. Interesting all the metaphors they imagined were about inclusion and opportunities or lack thereof. One described the future as a poker game where you have to play the cards you're dealt, while another described the future as a dice where you have a chance if you can get the opportunity to get a roll in the first place.

PICTURE GAME

In this energiser young people had to race to pop 5 balloons, each containing a random picture. They then had to tell a story about that future by combining all the pictures in sequence. In this exercise, many of the stories, although created independent of each other, centred around the importance of youth voice. Two example stories are below with images in brackets.

The fall of the berlin wall (Berlin wall) enabled mass capitalism (coke can) which is polluting our planet and maybe one day even the surface of the moon (red moon). If we don't stop this growth fuelled capitalism and global warming soon we will be reliant on genetic engineering (DNA) humans to survive and will only be left with plastic plants (pot plant).

There is an authoritarian world that worships monuments and there is so much old stuff around (pyramids) that people are unwilling to change. Young people and new ideas come along and people start to riot against the traditions that are out of date and oppressive (riot) All the rioters get arrested and put in this glass dome prison (domed greenhouse) but the young people dig themselves out to protest again (spade).

ACTIVITIES

FILM EXERCISE

We watched some short, 5 minute clips of sci-fi films, each relating to a different future archetype – Growth, Collapse, Transformation or Control. We then made an a1 map showing how the word developed from today into this strange future world. Films included Judge Dredd, Waterworld, Cloud atlas and Mad Max. They were chosen by young people in the planning sessions as films that their peers would like to see.

FUTURE PROTOTYPING

After exploring future worlds we went about creating prototypes that could exist in these worlds. The purpose of this exercise was to start thinking about the small touchpoints that. You can use to communicate a fictional future world. The prototypes were made using hot glue and found objects from around the space. A description of one object is below:

The iSun is designed for a future where people are much more connected with nature. Unfortunately It happened too late; there is so much smog that the sun isn't very bright and they need to artificially illuminate their plants

CARD GAME

I created a 'Cards Against Humanity' style card game called "Cards Against the Future" where players picked a prompt and an answer to form a random future prediction. They then had to speak continuously for 30 seconds to describe this future world. Examples of prompts included:

- *A radical new religion… Forces everyone on earth to become a vegan*
- *The president of Europe and the Americas… Sets of into space in search of something better*
- *A jar of sentient kombucha… Brings down capitalism overnight*

The full list of prompts is in Appendix 3.

> **"I HAVE NEVER DONE ANY WORKSHOP WHERE YOU ACTUALLY GET TO MAKE STUFF. THIS WAS GREAT TO GET SO HANDS ON AND IT WASN'T LIKE YOUR CLASSIC WORKSHOPS WHERE YOU FILL IN A WORKSHEET."**

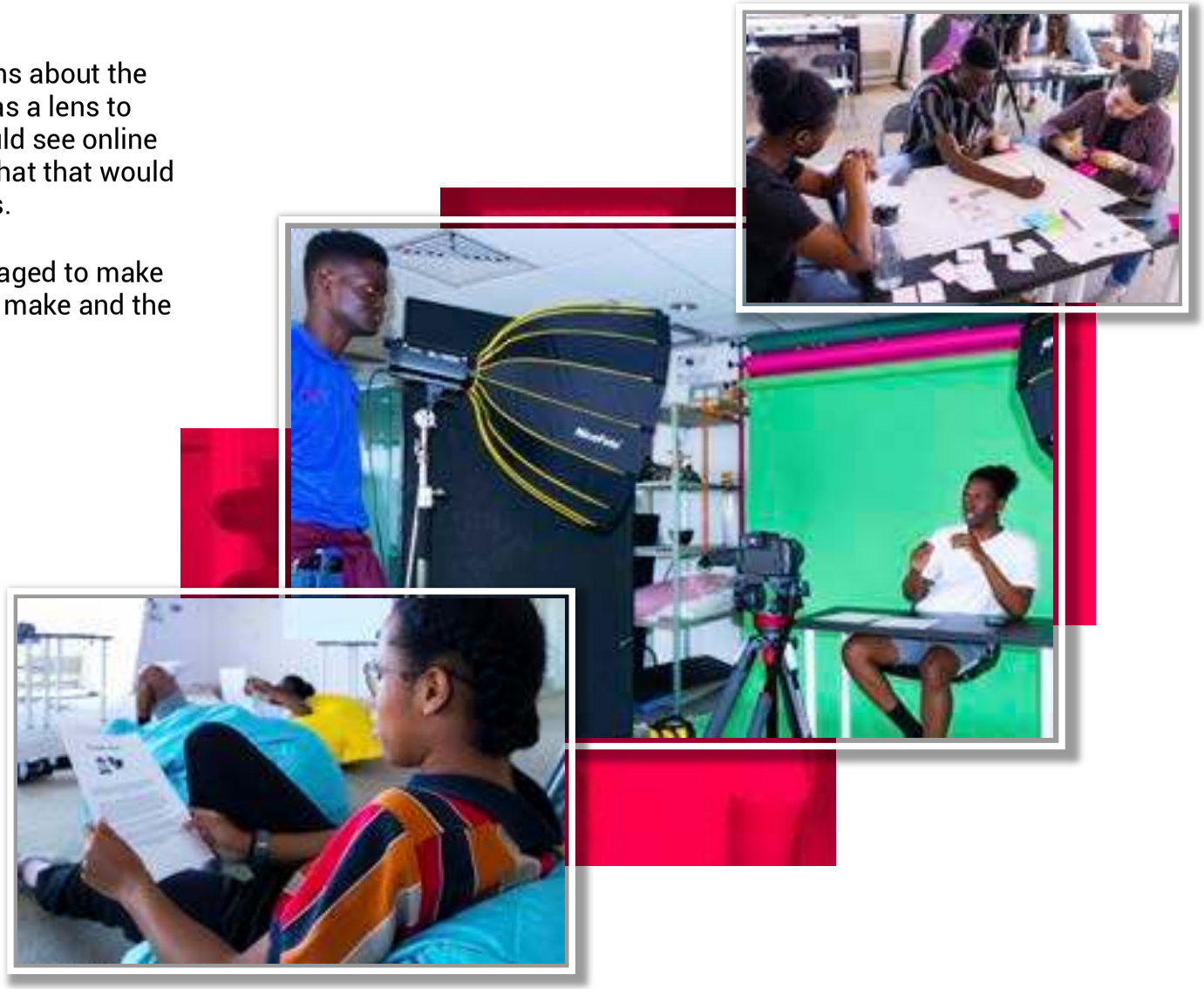

iSun
iSun X
Connect with plants like never before
Preorder 14.09 Avilable 21.09

ACTIVITIES

FILM MAKING

Finally we held group discussions about the different futures, using Tik Tok as a lens to think about what videos we would see online in these different futures, and what that would tell us about these future worlds.

Young people were then encouraged to make whatever videos they wanted to make and the rest was up to them.



RESULTS

04

RESULTS

The workshop resulted in 8 videos by young people, which all went live on Tik Tok under the handle @Tiktokfutures. In total these videos have been watched more than 7000 times, widely sharing young people's ideas about the future. The videos also received likes and other engagements, such as people asking questions about these future scenarios.

The videos included a future news report from a society divided over the government's approach to the pollinator crisis, a David Attenborough home video calling for people to start caring about bees, and a Tiktok articulating young people's desire to be given freedom about how to act on the pollinator crisis.

I consider these videos to be prototypes of a number of alternative futures. A prototype is an object designed to communicate or 'mock-up' an object ahead of time, and to give an impression of the finished product without having to build the final thing. This is exactly what these videos do – by giving us an impression of the future ahead of time, we can use that to inform our actions in the present.

An additional result from the project was the creation of a re-useable format for youth engagement through Tik Tok. Having the opportunity to experiment and explore was critical to being able to develop the method. I still want to iterate on the approach, in particular to try running a shorter session, but the thinking and practice of running this workshop has laid the groundwork for a suite of future work.

8 VIDEOS

4000+ VIEWS

VIDEOS

VISIT @TIKTOKFUTURES TO VIEW THE VIDEOS

YOUTH PERSPECTIVES

This section outlines how young people said they want the pollinator crisis to be tackled. These perspectives were drawn from a series of discussions using the four alternative future scenarios.

GOVERNMENT TAKE THE REINS

The group as a whole had a preference for greater state involvement in climate action, preferring the scenario of strict state control. They stated that "not everyone can be a leader" and emphasised the need for strong systems to ensure action was effective. They did however state a preference for systemic solutions that made behaviour change subconscious and easy to fulfil, rather than ones that placed the burden on individuals. For example, referring to one future scenario they suggested that rather than requiring citizens to do a certain number of hours a week of community service, it should be required for workplaces to allow one hour a day of work time to be spent caring for nature. These changes felt like less of an imposition on them as they fitted into their daily routines, rather than imposing on them.

EDUCATION IS KEY

The group also stressed the importance of education, particularly in order to enable a citizen led approach where people have the freedom to make their own choices, but are supported in doing so by provision of appropriate education and information.

TRUSTED SOURCES

Finally the group talked about what would encourage them to change their behaviour around pollinators and the climate. They generally agreed that it was about the messaging coming from someone that they trust, with individuals particularly favoured over trusted systems. This included influencers, friends and family, but more generally the young people were more willing to trust a farmer they could interact with about their efforts towards ecosystem health than they were to trust a government approved certification system.

YOUTH PERSPECTIVES

AN INTERNATIONAL AND INCLUSIVE FUTURE

On both days the young people were quick to consider the interests of others, particularly thinking about the effects of pollination on other countries and cultures. In one future scenario they considered the economic impacts or even exploitation of other countries who might be the only places with pollinators remaining, and the existence of new pollinator export markets to the rest of the world. They imagined the experiences of migrants who might be lured to the UK with the prospects of jobs in pollination (which they were experts at in their home countries) only to be denied work they were qualified for. And on the previous day they highlighted that we should not view the future from an overly western standpoint but should incorporate other cultural viewpoints as well.

UNCERTAINTY AROUND TECHNOLOGY

There was a divide within the group, with a number of young people preferring technological futures, while a number rejected them outright. Technological solutions were seen as not future facing, being subject to failure and less able to adapt to change or to the complexity of natural systems. Young people imagined power cuts and drone failures leading to crop failure, or even an overly simplistic technological solution leading to ecosystem imbalance. They expressed a desire for investment in longer term climate solutions instead, involving education as a key component.

05 Evaluation

EVALUATION

The workshop was evaluated by recording discussions throughout the process, including capturing quotes and reflections on the process. I addition we recorded an audio evaluation in the form of a podcast to finish the week. The podcast can be listened to at www.tiktokfutures.com.

The workshop firstly did a good job of building young people's knowledge around pollinators. Many of the young people didn't know what a pollinator was coming into the workshop, and afterwards they know about a variety of different pollinators, as well as having a broad understanding of their societal relevance an importance for the future. If I were running the session again, however, I would try to involve researchers more directly in the in-person workshops. Although I have read broadly about the subject, there were still some questions I could not answer, and a pollination researcher or activist could probably have given a more inspiring introduction to the subject.

My second aim, to build youth efficacy and agency about the future was also highly successful. As show by the quotes on page 23, young people felt motivated and informed by the new foresight skillset they had been given, as well as a broader literacy around how to think systematically about the future. Even besides the individual tools, the experience of imagining multiple possible futures allowed them to see the future not as something that is set in stone, but something that can be shaped and influenced with the right kind of pressures.

I personally learned a huge amount from the project about doing futures work with young people. A number of my biggest learnings are shown on the next page.

5 KEY LEARNINGS

And what I would do differently next time

01 Get sign ups

One of the biggest challenges was finding participants – we had to re-scope the workshop for a new audience at the last minute. Next time I will ask for sign ups ahead of time and put more effort into 'selling' it in the first place.

02 Quick and Dirty

The best Tik Toks are made fast, without overthinking it. In some ways the access to fancy cameras was unhelpful as this workshop would have worked just as well with phones and TikTok green screens.

03 Frame the output

Give young people the freedom to make whatever they want, put provide enough constraints that every output can be 'framed' in the same professional looking way.

04 Simplicity

The power of this method is the simplicity; it is just young people communicating sharing their voice with their phones. Keep it simple to keep it powerful.

05 Get Making

The young people were really energised by creating. At one point we ran a podcast session on low energy, but as soon as we started recording the energy levels bounced right back.

LIMITATIONS

01

CORONAVIRUS

Where else to start! Not being able to come to Ispra meant that the project had to be completed from London. Without a makerspace I ended up moving towards a video output. I am really happy with this decision in the end but it was definitely a limitation imposed by Covid.

02

PARTICIPANTS

Finding numbers of participants for the project was really challenging. We were running the project during half term so nobody signed up on our first time of asking. We than had to re-scope the project at the last minute to an older audience and with a shorted time frame. I think it was again a good decision to shorten it but it meant the re-design of the programme was very last minute

03

COLLABORATORS

Working with YCUK was fantastic but they are also a very chaotic organisation! They are youth led and believe that a sprinkling of chaos is a very good thing. This made it much harder to plan the sessions in a tight and efficient manner.

COMMENTS

"I'd never seen futures as a series of steps before."
"The exercises we were doing were fun and creative and it didn't seem like futures but then you kept relating it back to imagining the future"

"I never thought to myself that I would be making content about bees"

"I got a bit of a reality check. [Now] I'm realistically positive. I know we have problems and I'm hopeful we can find a solution."

"It was brilliant how all of us interpreted things differently...that is the most interesting part of thinking about the future, that everyone has a different interpretation"

"We only think bees are pollinators but in actual fact there are so many different types of pollinators"

"What was interesting about this week was giving us the idea that you can change the future. I felt really stuck and really pessimistic [before]."

"After these workshops it opened my eyes and I really realised the importance of pollinators"

"Teaching people [futures methods] changes your mentality. People won't be as scared and people will just do stuff"


Next Up
06

NEXT UP

The workshop format will evolve from here. I am in discussion with other youth groups in London to design a 2-3 hour version of the session. I would also love to combine it with a session from an IRL TikTok influencer who can give training about how to make it big on TikTok. I think that would teach really valuable skills in media creation, and could be a big draw for young people to participate.

I also want to see how it can be re-scoped as a youth consultation. I want to structure the discussions around more targeted questions so that I can learn more, and more deeply from the workshops about young people's attitudes about the future of a specific subject. As part of this I am talking with the school of international future about their program the National Strategy for the Next Generation. This is a national youth consultation about the future of UK security. I am a youth ambassador for the project and we are interested in trialling this method as a way of broadly engaging young people to think about, and to share their thoughts on national strategy making. This method has the potential to form a central part of SOIF's work to create a national conversation about the future role of UK in the world.

Part of the rationale for re-naming the project to Tik Tok Futures is to allow the method to evolve, and to move past a focus on pollinators onto other subjects. This will make it easier to fund further developments of the project, but will also allow @TikTokFutures to grow in the number of videos it holds and the number of viewers it reaches. Over time I would like to see it used as a platform that can hold and communicate hundreds of videos that show many different contrasting views of the future, all owned and created by young people from different parts of the UK.


Thank You

APPENDIX 1

DESCRIPTION OF MATRIX AXES

TECHNOLOGY

- Crops are grown in a Monoculture
- The care of plants and nature is generally automated and mechanised
- Nature is viewed as a resource, with scale prioritised over health and diversity
- There is a clear divide between urban and rural environments – on the whole people don't see or interact with nature or food production

NATURE

- Plants are grown in biodiverse way, with many different species sharing the same space.
- People live in close proximity and connection to nature – they are responsible for part of their own food production and the ecosystems around them
- The scale of production is sacrificed for health of the ecosystem.
- People have to invest more time in nature, at the expense of doing other things

CITIZEN CONTROL

- Power is centralized with individual citizens or local communities
- Local councils and groups of citizens have large budgets to effect change but the government doesn't make strict rules about what can and cant be done.
- There is a lack of coordination between different groups – everyone is allowed to use their own processes and methods for maintaining nature
- People have a high degree of freedom, but as a result they have to take responsibility for doing everything themselves

STATE CONTROL

- Power is centralized at the level of the government
- The government enforces strict regulations saying what people can and cannot do
- This leads to coordinated and highly effective action but people lack the freedoms to do differently

APPENDIX 2

FUTURE SCENARIOS - STATE CONTROLLED + TECHNOLOGY

The year was 2041. The number of humans was growing rapidly and the UK government didn't think that there would be enough food to feed everyone in the way they were used to.

The government's primary concern was having enough food, while also maintaining the economy and allowing everyone to continue living their lives as normal.

The government invested in large scale agriculture, allowing huge areas of the countryside to be ploughed for monoculture fields. Many countryside residents were forcibly relocated to high rise buildings on the edge of the cities. Since only a few large tractors were needed for each field, these people had to stop being farmers and find new jobs.

By 2049 the bees were dying fast with only 10% left. The government decided it was too late to save them and instead replaced them with robotic drone pollinators. In spring the fields make a loud buzzing noise as the drones fly up and down the rows of crops. Food is delivered on time, but sometimes the governments planning goes wrong and some foods are unavailable for months at a time.

Most people living in cities didn't have to change their lives very much, that is what the government wanted. The government built bigger parks in the city as people no longer wanted to visit the countryside. Some people missed their local bees and butterflies and kept them as pets instead. Although the countryside was changing fast, many people's lives went on as normal in the city.

APPENDIX 2

FUTURE SCENARIOS - CIZEN POWER + TECHNOLOGY

From 2041 it was too late to go back. The government had let everyone do what they wanted, deciding not to make strict rules about how people interacted with nature. The population kept growing and the government thought that more freedom would allow farmers to react better to changing food demand and changing weather from climate change.

Farmers were allowed to use any pesticides they wanted to keep their crops healthy. A small number chose to grow organic food, but as demand for food went up it was always more profitable to go for bulk. Most farmers started spraying their fields with strong pesticides.

Very quickly new viruses started to be discovered in bees. Their population started to fall and there were food shortages across the country. In the cities people were having to change their diets as food just wasn't available. When you went into the supermarket you could no longer find any berries, fruit was rare and incredibly expensive. Most people had to take pills or meal replacements every day to stay healthy.

People started taking their anger out at farmers –they were the ones to blame. People got more and more angry at the richest in society – why should they be able to get fruit when we cant? Some groups of climate protesters illegally chopped down crops to plant flowers instead.

Farmers eventually realised they had to pollinate their crops somehow but it was too late to bring back the bees. Most farmers couldn't afford fancy drones to pollinate their crops - It was too much investment in expensive technology. Some of them made their own hacked solutions and other started hiring manual labourers to hand pollinate their crops. Poor people from the cities would travel to work in the fields for little pay.

APPENDIX 2

FUTURE SCENARIOS - CIZEN POWER + NATURE

The year is 2041. The UK no longer exists. It is now a collection of small counties who all have independent rule.

After ten years of climate protests, strikes and riots, a radical government handed power and money to local communities.

Lots of these communities embraced nature to its fullest. Many city spaces were filled with plants and wildlife, abolishing roads to form wildflower meadows and community beehives. In these areas the council gave everyone an allotment, along with money and free lessons to teach them how to grow their own food. As a result they spent less time working and more time growing and gardening.

Other areas, however, took a different approach, deciding not to change much at all. In these areas people wanted to keep living life as they had always done. The UK quickly became very divided. Different areas hated each other for their different opinions or for not pulling their weight in the climate struggle. Sometimes areas would refuse to share food or trade with each other. Some counties even closed their borders to counties that still used pesticides.

It was hard to implement any UK wide measures to stop climate change in an effective way. Every community was doing something totally different. Despite some people radically changing, carbon dioxide levels kept creeping up.

APPENDIX 2

FUTURE SCENARIOS - STATE POWER + NATURE

In 2041 the government realised that the climate crisis was getting serious. They realised that giving people the choice wasn't going to be enough to save the planet. So they implemented a series of very strict rules.

To begin with it was made illegal to purposefully kill a pollinator, punishable by a fine of £250. All farmers were forced to break up their fields, incorporating meadows and sparse woodland. This made it impossible to farm at a large scale and across the whole country local parks and car parks were converted into urban farms. Soon all buildings were required to have either food or flowers growing on top of them, and the inhabitants of the buildings were required to look after them.

Diets were forced to change as well. There was a limit of one meat meal per month and the vegetarian diets soon became the norm.

In 2045 the government went further and all young people were required to do community service of 10 hours a week planting wild flowers, maintaining beehives and picking vegetables on roofs around the city.

Greenery and biodiversity thrived around the UK and Britain completely reversed its impact on the climate, taking in, rather than giving out carbon emissions.

APPENDIX 3

CARDS AGAINST THE FUTURE GAME

Rules: Players randomly matching one statement from the first and second lists below to describe a weird future scenario.
When a scenario is generated, the player has 30 seconds to explain exactly how we got from the present day to this future world.
Warning...some will be stranger than others!

Person or group (singular)	Future event or action (present tense)
Arnold shwatznegger	Destroys new york to send a warning
Donald trump's great grandson	Somehow negotiates world peace
The chinese government	Brings down capitalism overnight
Kanye	Establishes a global authoritarian regime
Our artificially intelligent overlords	Decides to cull human kind
The president of europe and the americas	Divides humanity into three tiers
An underground ecoterrorist movement	Forms a totally new isolated society
One enormous rubber duck	Trades their rights with a forest
A genetically engineered super race	Learns to live in harmony with the animals
A radical new religion	Forces everyone on earth to become a vegan
A cult of humans with brain implants	Volunteers their weekends to replace the bees
The new colony on mars	Runs out of food and dies
A legion of identical clones	Kills themself to make a point
The supreme dictator of earth	Establishes a multiplanetary society
The extinction rebellion militia	Sets of into space in search of something better
A bunch of bored grannys	Launches a viral dance video to get attention
An uprising of young people	Makes a naked calendar for greenpeace
A jar of sentient kombucha	Controls world leaders by hacking their personal data

Annex IV

“Urban Wild Pollinators”

Justė Motuzaitė

Urban Wild Pollinators

Report

Project and its results

By Justė Motuzaitė

Project funded by:
JRC makers-in-residence program

2021

Introduction

The project aims to explore these topics and encourage citizens to create more biodiverse habitats in order to tackle a severe ecological problem all over the world: pollinators decline (Zattara & Aizen, 2021). Due to high urbanisation rates and extensive landscape homogenisation for agricultural use, many insect species are experiencing massive habitat loss, and decreased floral and nesting material supply (Hall et al., 2017) – consisting as the main factors of pollinators decline. The importance of wild pollinators abundance and biodiversity is inevitable – many plants (wild and cultivated) rely on specific insect species for reproducing (Zattara & Aizen, 2021).

At the same time, cities provide an important opportunity to become a refuge for biodiverse insect species and play a key role in conservation (Hall et al., 2017). The project tries to leverage on these opportunities, in order to make easier and begin with the many steps that still lie ahead to create a balanced habitat where citizens and nature would co-exist.

Pollinator decline and maker movement

While governments are taking longer to react with regulations and legal terms, many grassroots initiatives are taking shape in the cities: from urban gardens encouraging local insect habitat, to national bee count in countries such as The Netherlands.

At the same time, local maker hubs are created all around the world. They push the maker movement forward, empowering citizens to develop their ideas and engage with the issues our societies are experiencing today. With the values of openness and innovation, which can be seen by Distributed Design initiatives, fab labs and makerspaces want to encourage idea circulation around the globe. Having the grassroots initiatives strengthened by tools and approach of the makerspaces, great actions can be taken to halt the wild pollinator decline.

Project overview

For this project a workshop has been developed to promote awareness and let urban dwellers explore the meaning behind humans, and wild flora and fauna. In addition, a newly created open-source toolkit provides tools for action to fast-forward a regenerative urban transformation. Together, the workshop and the toolkit have one coherent vision - a symbiotic urban environment, where cities do not cast out nature, but treasure and nurture its wild and biodiverse essence.

Wildflower strips along Dutch canals. Delft, The Netherlands, 2021.

The Process

The whole process can be divided into three main parts: research, prototype development and pilot workshop-toolkit testing. The project is divided into two parts: open-source toolkit and the workshop. Both parts were developed simultaneously.

Research phase

To understand the problem about the wild pollinator decline better, research was carried out in diverse topics covering insect habitat preferences, current market solution analysis, biodiversity in the cities, psychological aspects of nature and human interaction. Miro board was used as a tool to store valuable information, links to sources and insights as a map and functioned as a knowledge map (figure 1). In this way, it was easier to find necessary sources again, see which areas are explored more and remember the main insights about the topics faster.

Main take always from the research phase:

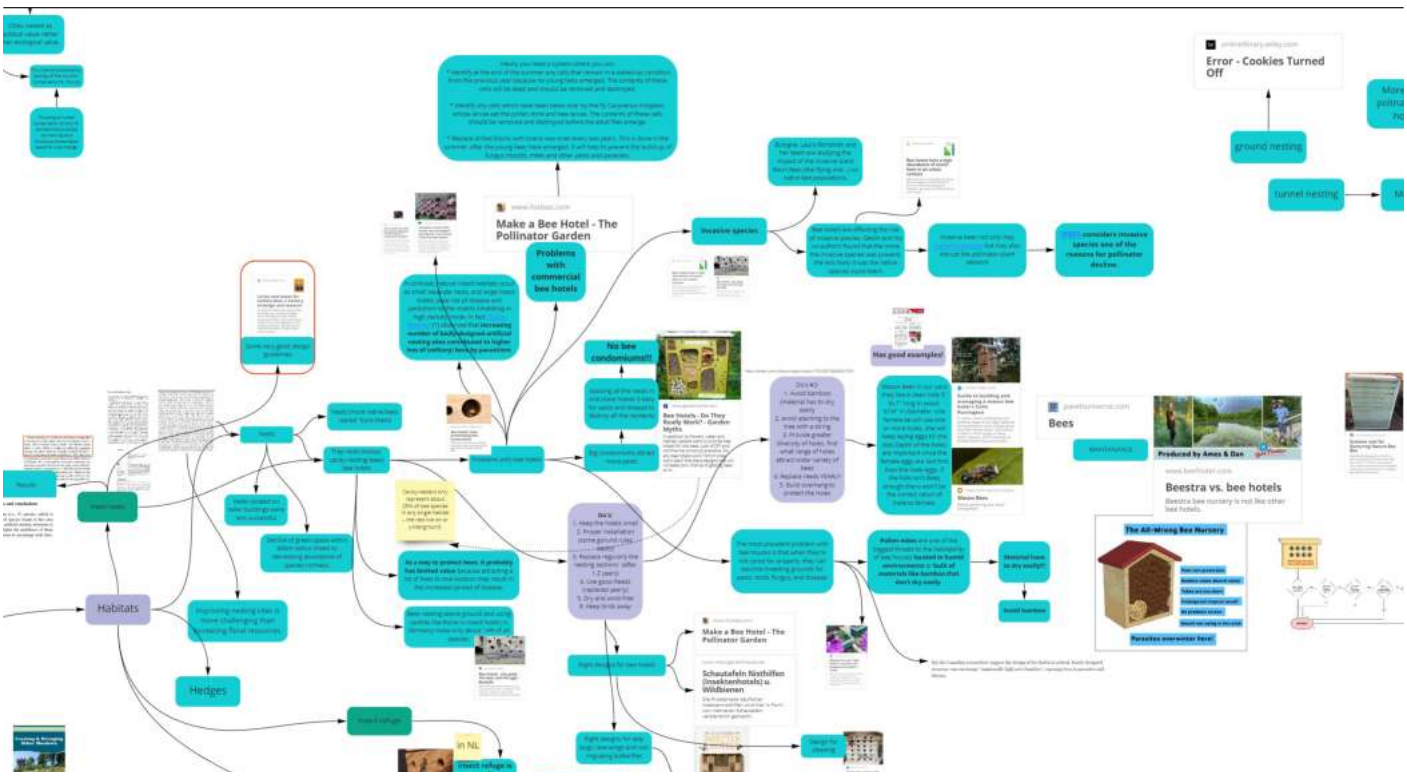
•Insect hotels: market solutions pose some important problems due to incorrect designs and lack of information about how to take care of the hotel. Main design requirements were formulated: nesting cavities should differ in diameter (6 – 12 mm) due to raging species size and should be no shorter than 15 cm in length to prevent unequal male and female number.

•More species are ground nesting insects, but because most of them are solitary and live in diverse and hidden places, significantly less is known about their nesting habits. For ground nesting insects, environment is most important for their habitat.

•City dwellers prefer neatness and tidiness because it represents care, but at the same time those neat landscapes are biodiversity deserts for nature.

•Wild pollinator decline problem is a systemic issue which is affected by a series of many different factors, such a habitat loss due to high urbanisation rates, green space development which is based on neatness and order, pesticide use in the nearby farmlands and many more (figure 2).

Figure 1: Extract from the Miro board, knowledge map about insect hotels.



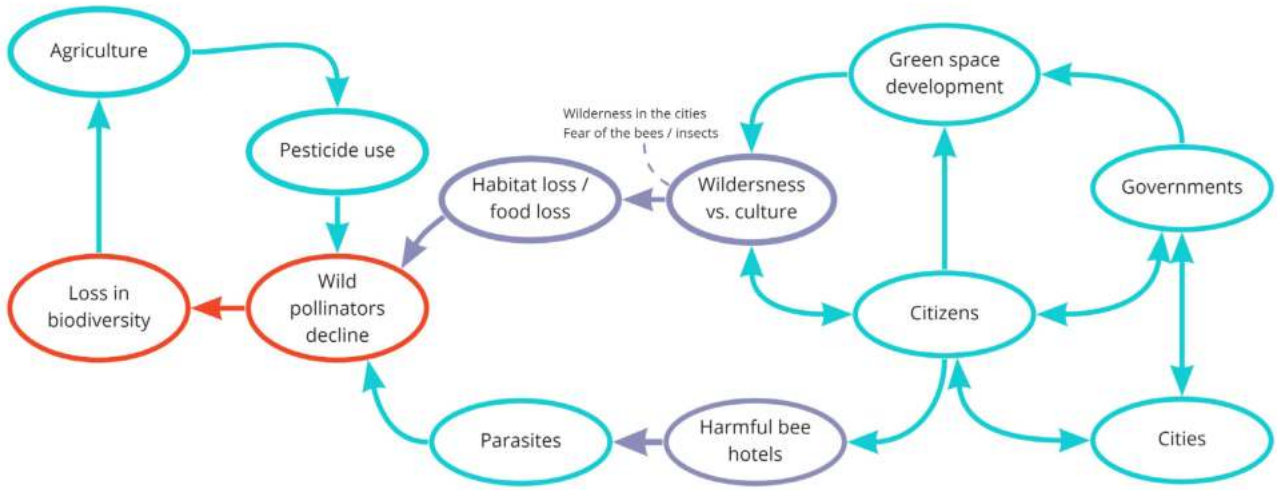
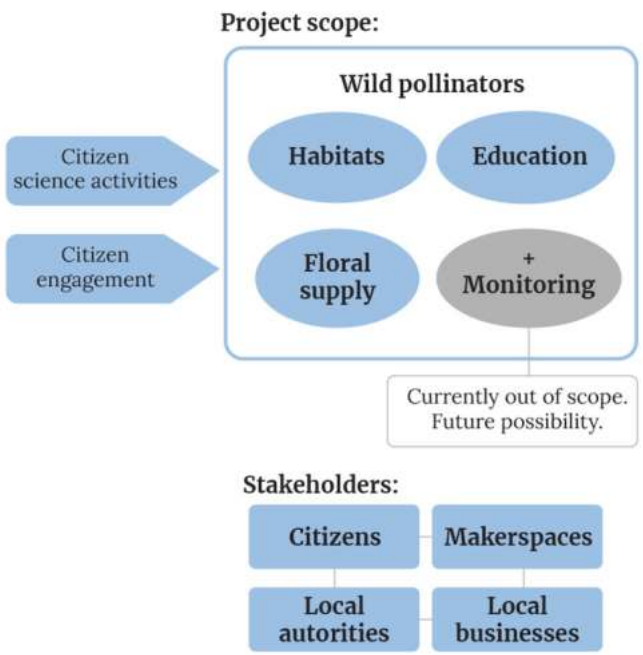


Figure 2: System map of pollinator decline issues for this project.

Problem framing

Systemic problems require systemic solutions. Steps taken from different actors in the right direction can drive a big change towards more sustainable and biodiverse urban environments. Therefore, the project aims to tackle the pollinator decline problem by touching the topics of habitats, floral supply and citizen education. At the same time one of the goals is to encourage citizen engagement and science activities around these topics (figure 3). Currently, monitoring the environment is out of scope, but for the future it would be interesting to implement and measure the effects of this project on a longer term.

Figure 3: Project scope scheme.

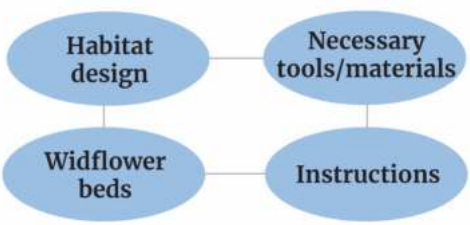


Main stakeholders include citizens from different backgrounds, makerspaces, local initiatives and businesses.

Main deliverables: Workshop + open-source toolkit.

Toolkit includes:

- Habitat design (files, blueprints)
- Unit for wildflowers (files, blueprints)
- Instructions of fabrication and assembly
- List of necessary tools, machines and materials



Because the project was divided into the workshop and toolkit, developments of these elements have been done simultaneously. For clarity reasons, toolkit development process will be presented in the 'Toolkit prototyping' section, and workshop in 'Workshop development' section.

Toolkit prototyping

Toolkit development was highly iterative process, with aim to develop two new designs – insect hotel and aesthetical ground unit for wildflowers.

1. Early prototyping of insect hotel.

In this phase many design requirements have been known. Firstly, the structure of nesting cavities should be no shorter than 15cm in length, to maintain the balance of pupae genders. Secondly, to encourage biodiversity, the diameters of cavities should range in size from 6mm to 12mm . Finaly, the design should encourage yearly maintenance, otherwise if the insect hotel is left unattended it can often become a hotbed for parasites. With these requirements in mind, early cad models were developed (figure 6), followed by a small and large scale prototyping with paper or cardboard (figure 7).

Figure 4: CAD models before and after a few iterations.

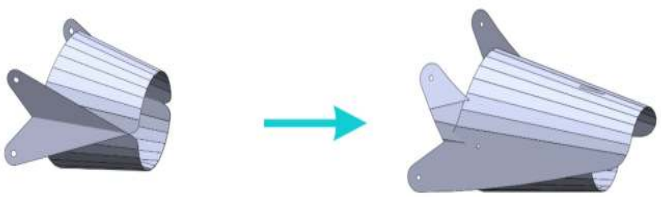
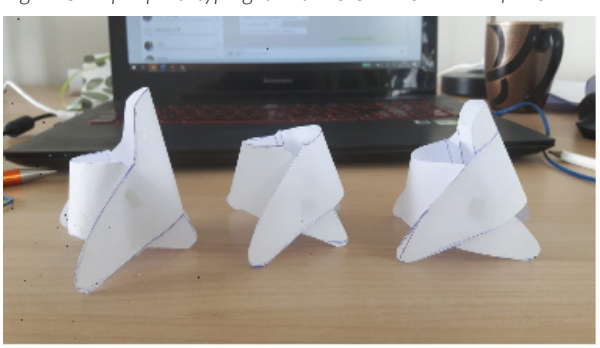
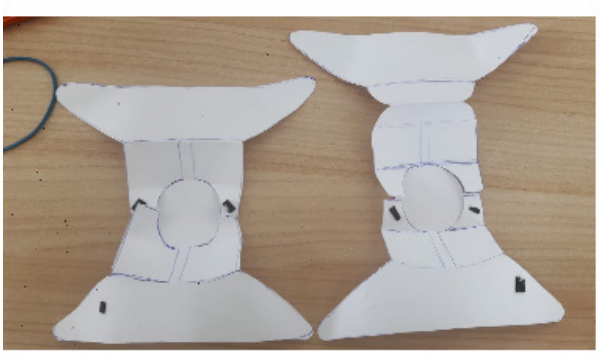
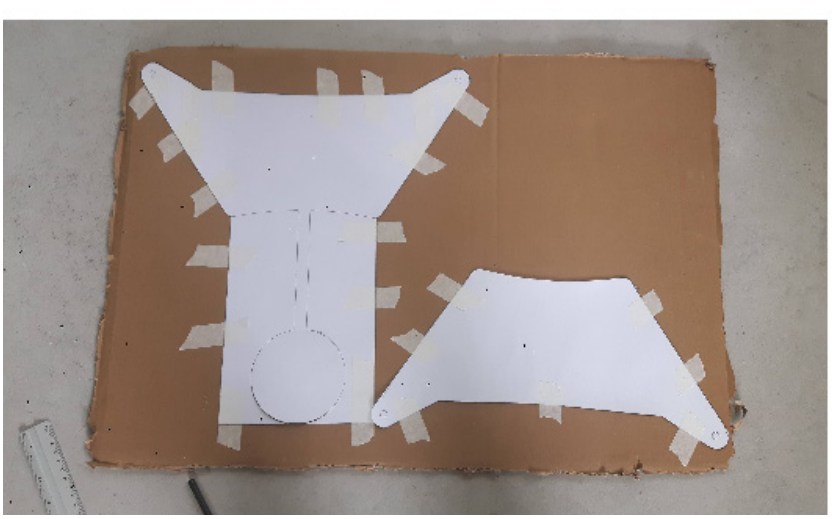


Figure 5: Paper prototyping iterations. Small scale and full-scale models.







2. Material testing

Due to certain requirements by design and sustainability, material choise was an interesting challenge. The material has to have low impact on environment, be weatherproof and be affordable to ensure high replicability. Paper products such as craft cardboard or perforated cardboard became an interesting field of tests. To make the cardboard and paper samples waterproof, they were infused with natural beewax using an iron. Then samples with different types of paper or cardboard were tested in the outdoor environment for two weeks, to test the changes in their condition (figure 6).

Figure 6: Samples infused with beewax are tested outside.

3. Full scale prototyping.

To test the design a full scale model of the isnect hotel was made with beewax infused craft cardboard. The full scale prototype was installed in a park and was left for 10 days on a rainy period to test if the inside medium is not getting wet and if the material witstands stormy and rainy weather (figure 7 & figure 8).

Figure7: Samples infused with beewax are tested outside.

Figure 8: Samples infused with beewax are tested outside.

4. The ground unit – small scale prototyping.

Using the same kraft cardboard, different assembly possiblities were tested out on a small scale prototype to find the most comfortable and easy assembly (figure 9)

5. Prototyping at Opendot fablab in Milano.

Last iteration was done at Opendot fablab, one of project's partners in fabrication and digital communication material. There mainly lasercutter was used to cut both insect hotel and ground unit parts.

6. Finished design

Both designs have been finished, files prepared for the lasercut. In addition a website where all the open-source tools and instruction can be downloaded.

The website can be found at:
https://juste-motuzaite.gitlab.io/wild-urban-pollinators/pilot.html

Figure 10: Two main parts of the insect hotel.

Figure 9: The ground unit small scale prototyping.

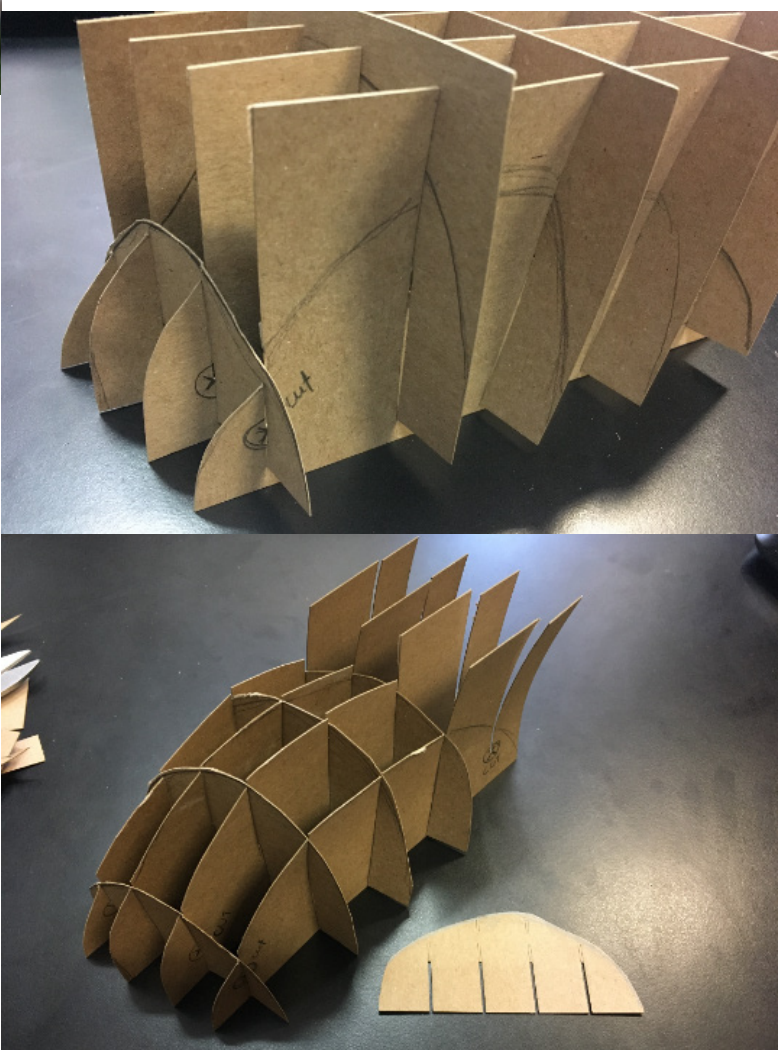
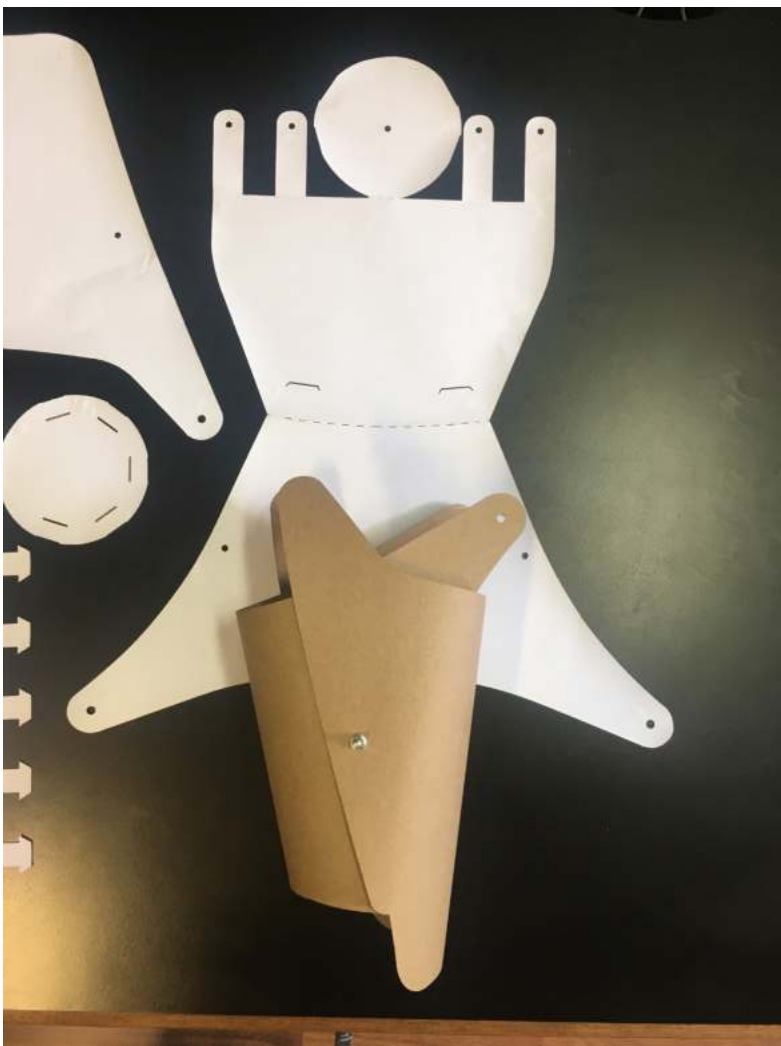


Figure 11: The ground unit small scale prototyping.



Workshop development

For the workshop development several partners have been involved. Main partner, HyperInk, has been helping along the project development, providing workshop framework suggestions, activity planning, finding the place to run a pilot workshop as well as participants. Other partners include Cascina Biblioteca, SIAM1838, OpenDot srl and Giardino San Faustino – a community garden where the pilot workshop took place on June 2021. For the workshop preparation and early framework was developed in The Netherlands, tools and details prepared in Milan.

Figure 12: Partners of this project. Partner links in the references.

1. Early workshop framework

Early workshop framework was settled in early stages with main goals:

- To educate participants about the pollinator and biodiversity problem, encourage them to help with biodiverse urban habitat creation.
- Facilitate discussion and involvement between different stakeholders and participants from different backgrounds.
- Workflow should be adaptible to different areas and help find answers to the local problems.

2. Developing workshop with partners at HyperInk.

With interesting literature findings about the fear of the bees, it was decided to add the sound/haptic session where participants would have a chance to experience the bee presence in artificial and secure way.

3. Further framework.

Further framework iteration consisted of detailing the tools necessary for the workshop, such as equipment and other tools that shall be used in the workshop. It was decided to use Actant Mapping Canvas to facilitate participant discussion about topics related to pollinator. A full workshop framework with agenda has been developed (figure 13).

Figure 13: Agenda for the pilot workshop.

Results

Pilot workshop at Giardino San Faustino, Milan

A pilot workshop was held in Giardino San Faustino, a community garden in Milano run by cooperative Cascina Biblioteca along with six local no-profit associations (stakeholders). Participants from various backgrounds (students of diverse fields and country of origin, volunteers) were invited to test out the toolkit and the workshop framework. Hosting the workshop in the garden allowed the participants to observe the co-existence of urban environments and nature ecosystems first-hand. After an introductory guided tour around the area, the workshop program was divided in three parts: exploring human-insect interaction experiences, discussions about ecosystem issues, and testing out the toolkit.

1. Human-insect interaction – artificial bee contact

Participants were listening to a three-dimensional audio of a flying bee, encouraging the perception that the bee is buzzing around the listener. Participants were blindfolded to enhance the sound perception. At the same time, the activity supervisor would touch the participant's hand with an artificial insect, to mimic the haptic experience. During the reflection part, participants were asked to evaluate their experience, indicating separately sensations of the listening experience and the haptic part. Afterwards, everyone was invited to share their experience and participate in a discussion.

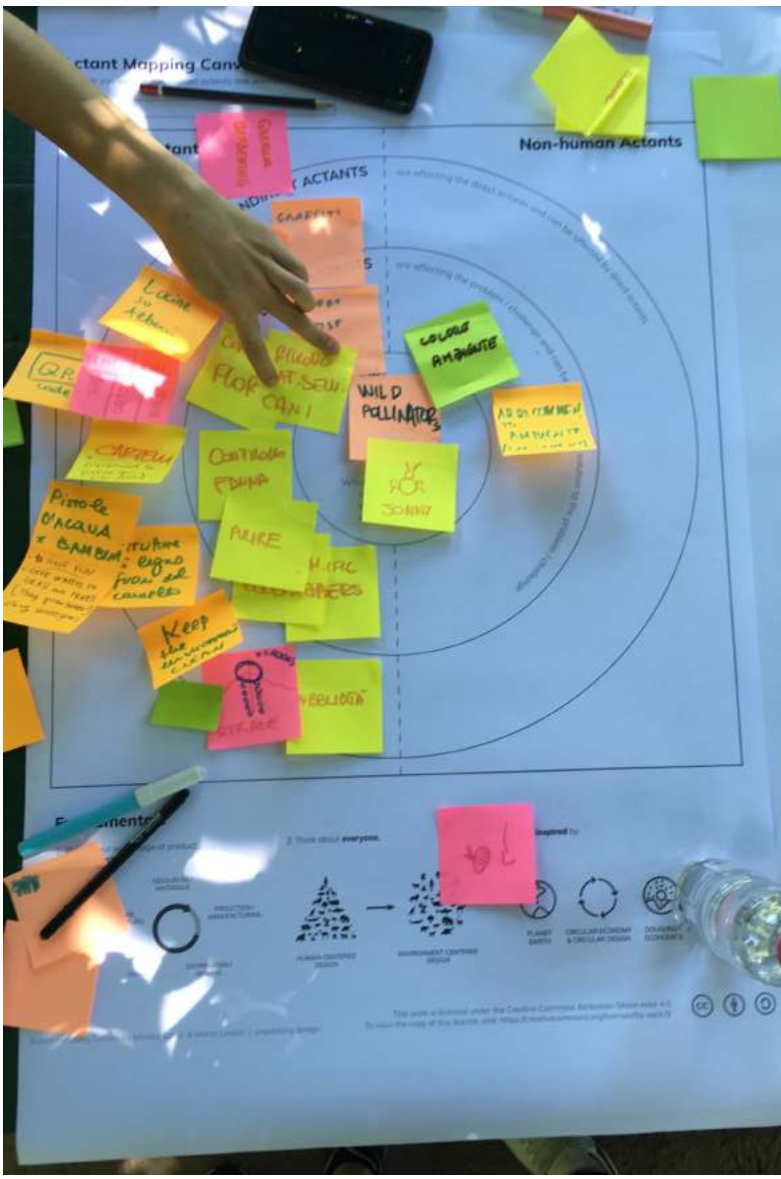
Outcomes of this research: The teams indicated different experiences based on the environment they grew up in. The first group, comprised of respondents who live or have lived in a rural context, expressed more positive reaction towards insects and their presence. They were also more inclined to repopulate urban environments with pollinating insects and biodiversity. The other group – people grown up in urban context - was more reluctant to accept insects and their presence. They felt more afraid of something they do not know and some of them tried to avoid it as much as possible. Some participants expressed more sensations of fear. For them, listening twice to the 3D audio source decreased their sense of annoyance, along with seeing in person real hives during the tour of Giardino San Faustino helped them to prepare mentally.

2. Human-ecosystem interconnectedness – discussion with Actant Mapping Canvas

Participants were given an introduction talk about wild pollinator importance to our ecosystems as well as relevant issues accounting for their decline today. The short lecture was useful to form a basic background knowledge and insights about current attitudes towards pollinator decline and biodiversity, harmful solutions that are offered in the market, and systemic changes that are necessary in today's societies.

To encourage active engagement with the topic and information, a peer discussion format was used around different types of problems: use of pesticides, landscape fragmentation, invasive species. Participants were asked to use an Actant Mapping Canvas template as a tool (developed by Unpacking.design), an approach based on environment-centric (or planet-centric) methodology (Sznel, 2020). The task was set to to map out all the actors (humans and non-humans) that affect or are affected by a problem directly (effects that are felt soonest and for which the connection to the problem is obvious) and indirectly (second chain of results after direct actors are affected and connection is not that obvious).

Outcomes: In the beginning, the Actant Mapping Canvas was complicated to understand, but with the help of supervisors all teams filled the templates while discussing about how each actor of specific problem is affected. Teams were able to allocate and identify direct and indirect effects of previously mentioned problems on the whole ecosystem. This resulted in deeper understanding about interconnectedness and complex human and non-human relationships.



3. Testing the toolkit

Participants were given the materials and instructions to assemble and prepare the two main elements of the toolkit – the insect hotel and the ground unit. The toolkit is released open-source under CC BY-SA license.

The Insect hotel was designed according to the requirements (MacIvor, 2016; Beefoster, n.d.) to host several different insect species for one year, after which it should be replaced. The main material – craft cardboard – was infused with natural bee wax to become weather-proof and help retain nesting cavities dry. The structural parts were designed to be cut out from one A1 sheet and joined using 3 pairs of M4 bolts and nuts. The inner nesting cavities can be created using paper or natural hollow elements, such as reeds or natural straws.

The ground unit was designed to act as an aesthetic element along the edges of wild meadows, to communicate the intentional wilderness preservation in the cities and cue citizens the signs of care. This approach is based on findings that more ecologically diverse places are perceived as messy because they do not contain indicators of human intervention and control (Nassauer, 2011; Qiu et al., 2013).

Outcomes: Participants assembled and installed the insect hotels nearby wild meadows in Giardino San Faustino. With the ground units participants created different shapes, filled them with the soil and used as decorative or functional elements for the wild meadows.

Conclusions

Workshop development

The pilot was carried out to test the workshop activities and the toolkit, and gain insights for further project directions.

With the artificial bee contact activity it was found that citizens from different urban backgrounds have contrasting experiences towards insects and close contact with them. People from urban context expressed more fear and were more reluctant to accept the idea of more insects in the cities. There is no doubt that citizen's acceptance of insects is an important point to be considered in more ecologically diverse urban development and should be addressed with great attention.

Using of Actant Mapping Canvas proved to be an effective way to discuss about interconnectedness of the ecosystems and relating problems. A more elaborated explanation on how to fill the templates (using examples) is necessary to cause less confusion in the beginning.

The toolkit building session provided valuable feedbacks about further design developments that should be considered, such as more effective creation of nesting cavities or more elaborate explanation about the ground unit and their shape requirements. Overall, the toolkit proved to be easy and clear to assemble and use, with materials that can be easily found in different places. The current design iteration offers a low-tech solution without a possibility to measure and assess its effectiveness on the environment.

Workshop movie, more pictures and links can be found via:
https://juste-motuzaite.gitlab.io/wild-urban-pollinators/pilot.html
Additional link to the video:
https://youtu.be/WhEZs9_Lr7g

Evaluation of the programme

Being able to participate in this project has led me to explorations of a completely new field – design for biodiversity, with its own problems and challenges. For example, when designing a toolkit for nature, a lot of research had to be done to create design solutions in a right way. To cover the knowledge gaps, extensive article reading was done, however having a specialist to suggest and provide this information could have saved time.

Due to worldwide pandemic, the first edition maker-in-residence programme has been extended form original 2-month duration, to almost 9 months. I would state that this has led me to improved concepts and overall higher quality of deliverables. Because more timing has been given to the project, there were more opportunities to establish partnerships, develop the concept and organise the workshop.

However, having the whole project online has also led to some negative outcomes. Firstly, if was harder to establish connections with other makers or specialists from JRC. This lack of connections has also led me to some level of anxiety – before meeting my partners I had very limited possibilities to organise a workshop mainly because of space and participant issues.

Overall, the programme has helped me to grow as a designer in the field I am passionate about. With awareness about sustainability rising in the markets globally, the topics of biodiversity are still not a popular point of discussion in businesses. European programmes, such as JRC MIR, allows makers to focus on these important topics, create new solutions and build their concept despite this lack of interest in the business market.

Way ahead (expectations for the future)

The pilot was carried out to test the workshop activities and the toolkit, and gain insights for further project directions.

The artificial bee contact poses interesting directions for the research to understand how to create safe and comfortable environments in urban areas for both citizens and insects. In addition, more activities could be developed to address the fear of the bees: improve artificial bee contact session according to different levels of fear, provide educational sessions about the insects, develop remedial methods using augmented or virtual reality tools to ease the fear and raise insect acceptance levels.

Actant mapping Canvas as a tool could be used for context and background analysis before brainstorming sessions for problems of sustainability, biodiversity, and ecologically effective urban development.

For the toolkit, an interesting future direction would be to design a mid-tech solution where the toolkit elements equipped with sensors could measure the status of biodiversity where they are installed. Tools giving feedback would enhance the interaction in educational sessions and engage more participants in citizen science activities. Gathering data about wild pollinators and status of biodiversity through these sensing tools would also support a more scientific approach and so, hybrid outcomes: by mapping out status of biodiversity in different locations, recording taxonomical status of species, showing effects of environmental changes on species richness and abundance.

With successful partnerships acquired during the project, a few of these new possible directions might be explored in the further rounds of Wild Urban Pollinators development.

Partner links

HyperInk
http://www.hyperink.it/

SIAM 1838
https://www.siam1838.it/

OpenDot Fablab
https://www.opendotlab.it/

Giardino San Faustino
https://giardinosanfaustino.com/

Cascina Biblioteca
https://cascinabiblioteca.it/

Reference list

Beefoster. (n.d.). Beestra vs. bee hotels. Retrieved July 13, 2021, from https://www.beefoster.com/beestra-vs-others.html

Hall, D. M., Camilo, G. R., Tonietto, R. K., Ollerton, J., Ahrné, K., Arduser, M., Ascher, J. S., Baldock, K. C. R., Fowler, R., Frankie, G., Goulson, D., Gunnarsson, B., Hanley, M. E., Jackson, J. I., Langellotto, G., Lowenstein, D., Minor, E. S., Philpott, S. M., Potts, S. G., . . . Threlfall, C. G. (2017). The city as a refuge for insect pollinators. Conservation Biology, 31(1), 24–29. https://doi.org/10.1111/cobi.12840

MacIvor, J. S. (2016). Cavity-nest boxes for solitary bees: a century of design and research. Apidologie, 48(3), 311–327. https://doi.org/10.1007/s13592-016-0477-z

Nassauer, J. I. (2011). Care and stewardship: From home to planet. Landscape and Urban Planning, 100(4), 321–323. https://doi.org/10.1016/j.landurbplan.2011.02.022

Qiu, L., Lindberg, S., & Nielsen, A. B. (2013). Is biodiversity attractive?—On-site perception of recreational and biodiversity values in urban green space. Landscape and Urban Planning, 119, 136–146. https://doi.org/10.1016/j.landurbplan.2013.07.007

Sznel, M. (2020, May 25). Tools for environment-centered designers: Actant Mapping Canvas. Medium. https://uxdesign.cc/tools-for-environment-centered-designers-actant-mapping-canvas-a495df19750e

Zattara, E. E., & Aizen, M. A. (2021). Worldwide occurrence records suggest a global decline in bee species richness. One Earth, 4(1), 114–123. https://doi.org/10.1016/j.oneear.2020.12.005

Annex V

“Unidentified Flying Animals - Open source field tools for the watching of winged-insects”

Sam Rees

UNIDENTIFIED FLYING ANIMALS

Open source field tools for the watching of winged-insects

This project was part of the Pollinators in Decline strand in the JRC Makers in Residence programme 2020-21, performed remotely due to the constraints of the coronavirus epidemic.

INTRODUCTION

The project focussed on three core issues I could see citizen science biological recorders dealing with in the community :

1. **Standardisation of records**
   Citizen science records are sometimes referred to by UK dipterists as "scatter-gun". The concern being that the focus by many recorders will likely be on charismatic or colourful taxa, or on taxa previously unseen - and as such, it will never provide as thorough or systematic a list of species at a site in comparison with a true survey. These records potentially skew the dataset toward these observer biases and limit usefulness of data. I wanted to explore methods for standardisation which might be employed by the general public to overcome this problem.

2. **Perception of pollinators**
   Much of the general public have a perception of insects as being something to fear. Citizen scientists may not wish to spend time recording pollinators as a result, or when recording pollinators might only focus on bees, not realising the broader scope of insects active in this world - particularly flies which are deemed by many to be of limited importance or worth and often seen as biting insects or harbingers of disease despite the limited threats flies actually pose in Northern Europe, relative to total species diversity.

3. **Resolution of observations**
   The quality of detail in observations is often insufficient to be able to identify an observation to species level. Increased resolution can be attained using better, more expensive equipment or through the taking of specimens (killing insects to identify whilst dead). However both these actions are limited in the majority of the public, who might not have budget for expensive equipment or desire to be killing insects for what is essentially a hobby activity.

INITIAL IDEAS

My initial ideas pitched to the JRC explored and responded to these three themes.
They were intended to be scalable in solution, to enable them to respond to the corresponding input from the EU Science Hub. They were also intended to be quite different in approach, ranging from practical to humorous options to more speculative and conceptual solutions.

1. STANDARDISATION : **USING CAMERA TRAPS FOR POLLINATORS**

   Existing methods for standardised recording largely revolve around trapping - using malaise traps and fatal methods. I deemed these to be unattractive to the average recorder on a site like iNaturalist where the user tends to use non-invasive techniques. On previous research papers, a range of different camera trap solutions can be seen to be employed for the recording of insect fauna, but they appear to use more expensive DSLR solutions and bespoke software / hardware. As such, I wanted to create a phone-based camera trap that the average user could afford.

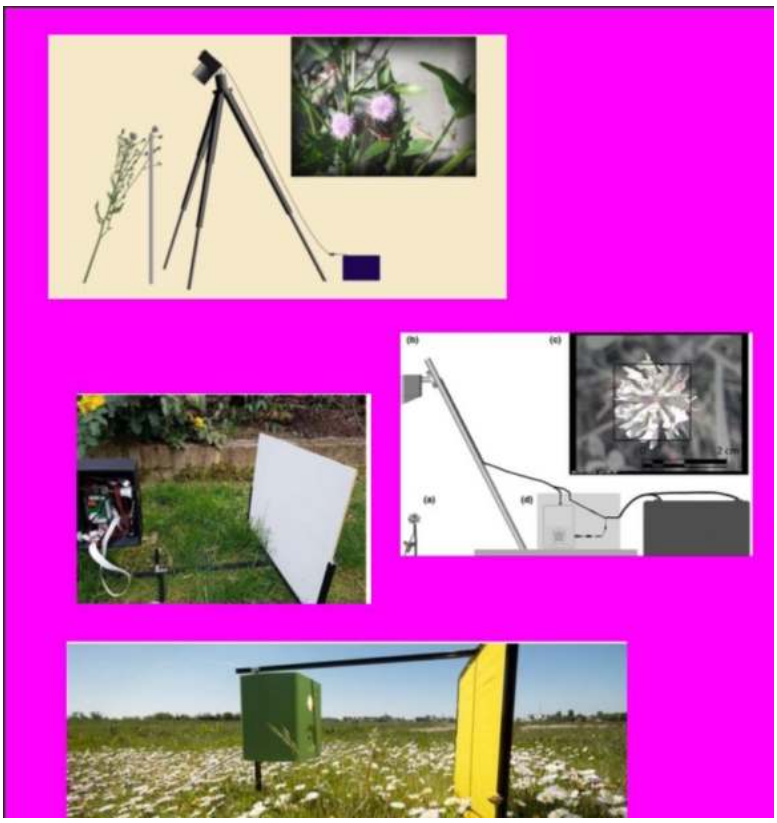
2. PERCEPTION : **USING AUGMENTED REALITY WITH POLLINATORS**

   I was interested in the user being able to place themselves in the picture alongside the pollinator, what this might look like and how this could potentially shift the viewers perception of the pollinator, to make them less alien. A significant difference in our perception of insects is simply scale. I hypothesised that humans would view insects differently if mammals and insects were a similar size. Use of AR to place a human face alongside a pollinator normalises the insect and places it within a scale we recognise.

3. RESOLUTION : **USING 3D SCANNING TO OBSERVE POLLINATORS**

   In discussion with some Diptera recording schemes, one comment when talking about the need for taking specimens (killing the insect to identify it) was that until there is a time when we can 3D scan it to create a realistic virtual replica, we will need the original specimen for identification.

   This was always intended to be a more speculative concept to pursue, as I knew portable technology to scan at this resolution is not readily available or easy to replicate. I imagined creating drawings or mock-ups of the product. But in the process this ended up leaning toward more practical solutions as well.



- Examples of camera traps from research papers

- Phone camera trap concept

1: POLLINATOR CAMERA TRAPS USING PHONES

INITIAL PROTOTYPES

Problems to overcome at first included :

- Poor weather limiting pollinator activity and ability to easily test the camera trap
- Limitations of readymade camera trap apps on Android phone
- Lack of macro lens for Android phone
- I was unable to find an existing app which worked for iPhones.

FINAL PROTOTYPING AND USER-TESTING

The final prototypes used a wireless connection from iPhone to computer. This made the software side more general in scope and enabled users to utilise the dedicated script in the software (Processing) with a range of hardware (any Android phones, iPhones, DSLRs or other external cameras which are capable of being linked to a laptop over a wireless network like a webcam).

Fine-tuning of the script was done on site : it was tested at a local wildlife organisation close to my summer base in the UK - the Shropshire Wildlife Trust.

The prototype was fully functional and able to operate independently for hours at a time. The image data was use-able, with clear camera images. As such, the insects were possible to identify at least to genus (as is often the case with photographic records). The main limitation was one of field of view. Focus on a single head of a single flower is limiting. But perhaps data could be extrapolated following benchmark tests, to build a bigger picture of what portion of pollinators would visit a single flower within a certain density of habitat.

OTHER CONSIDERATIONS

Use of a Raspberry Pi and camera were considered (and purchased) as a standard option relevant to makerspace environments, but they were deemed to be not something the average citizen scientist would have access to or ability to use so less of a priority to resolve than use of a standard phone as a camera trap.

Lasercut tripod designs were considered, but a broad range of these already exist on Instructables and the average citizen scientist might well have access to a tripod of some kind already. In addition, a small “gorilla” tripod of the sort one can use to stabilise a phone are so cheap to buy new that 3D printing is in any case a false economy to some extent.

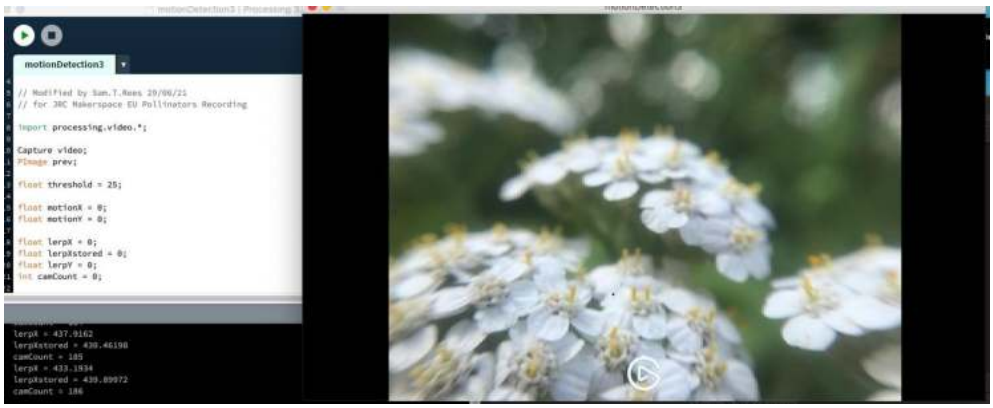
Design of an arm-like attachment to the tripod for stabilisation of the plant was drawn up. But deemed again, inconsequential, as a plant can be most easily stabilised just using typical bean-poles and twine, as used in most domestic gardens. This is simpler to get hold of for the average citizen scientist than anything one could fabricate in a maker-space.

FUTURE DEVELOPMENT

A GUI would be useful to introduce, to make the script simpler to engage with for users with no experience of code or Processing. A bespoke app which would negate the need for wireless connection would also be more practical. Longer term, one could imagine a solution which would further automate the processing and identification of the photographs as well.

CONNECTED RESOURCES

The final code can be viewed on Github.
https://github.com/samtreesandbushes/PollinatorProjects



- Screenshot of laptop with code running

- Camera trap setup with iPhone

- Final tweaks to code on site

- Successful screenshot from camera trap

2 : AUGMENTED REALITY SELFIES + POLLINATORS

INITIAL PROTOTYPES

This aspect of the project began with simple tests exploring proximity to insects. Photographing pollinators next to hands or actually walking on hands, exploring personal limitations around handling insects.

Following this, I started to add faces to the finger to see how this impacts the observation visually. The drawing was crude and the effect appeared somewhat child-like (perhaps a method with potential for children).

I then used the face on the finger as an anchor point to augment a 3D model within the field of view. I found this to be a curious alteration to reality and worthy of further investigation.

FINAL PROTOTYPING AND USER-TESTING

I took scans of my own head with the intention of enabling others to then use 3D scans. I realised this would be limiting for most users though, as a high-quality 3D scan of one's own head isn't so easy to create. So, I shifted to 2D images cut-out in photo-editing software. I then explored images of myself with pollinators, but decided this was of limited interest. I am not the type of person to take selfies much, so I decided to explore use of celebrity characters in combination instead. Results from this were interesting and I found some juxtapositions rather humorous.

OTHER CONSIDERATIONS

I was unsure initially how this project should be shared. I was wary of making light of the pollinators or invading the habitat carelessly in the pursuit of humorous personal images. Although I feel augmented reality remains a fascinating intervention into the space, it seemed problematic as the chase to get the image or video in question interrupted the pollinator. It was also distracting as a user in some ways.

On reflection, perhaps the most powerful approaches were the initial experiments simply holding the flower to photograph the pollinator and letting the pollinator walk across my hand. This tested my own relationship with insects (especially bees where I feared being stung) - it also gave me focus. It felt as if the one-to-one experience provided a genuine and questioning shift in my perception, more as intended.

FURTHER DEVELOPMENT

I think perhaps the optimal development of this project would not involve technology directly. It would simply be to encourage users to photograph themselves in proximity with or in direct contact with pollinators. This could be through a social media account such as Twitter, or for example through a collection project on iNaturalist.

CONNECTED RESOURCES

The final code can be viewed on Github.
https://github.com/samtreesandbushes/PollinatorProjects

- Original sketch

- Initial experiments with insect contact

- Anchor point for AR

- Images of self and celebrities captured with AR

3 : 3D SCANNING POLLINATORS

INITIAL PROTOTYPES

I started to explore this aspect by buying a newly released 3D scanner which I could connect directly to a smartphone. The limitations in resolution were so significant it seemed of little use to pursue to any extent, so following this, the use of 3D scanning remained a purely conceptual idea.

In parallel though, I continued to explore resolution in my records of pollinators from a more practical perspective. I talked to entomologists about possible ways to approach this and the option of using CO2 came up several times. (the idea being that this can be used as a knock-out gas to get the insect to remain still for a period whilst photographing). I bought a CO2 bike pump and modified a small plastic tub to test the method in reality.

FINAL PROTOTYPING AND USER-TESTING

The initial mock-up just used a sellotape flap to enable the user to connect the CO2 pump with the plastic tub when needed. This was not a long-term solution, so I used discarded inner tubes for bikes and cut out the valve to hot glue into the pot to create a more practical option.

FURTHER DEVELOPMENT

I experimented with ways to modify the airflow as initially it can be high pressure and difficult to control which has more potential to damage the insect. I didn't succeed in resolving this manually, but the simplest way to fix this would be to source a pressure regulator valve to add between the CO2 pump and the tube.

OTHER CONSIDERATIONS

The use of CO2 seemed controversial in some discussions. One dipterist questioned the ethics of using something which might damage or disable the pollinator longer term but not provide the recording resolution an actual specimen for a collection would. They felt it would be better to kill the insect than break its leg or damage its wing, as this was akin to torture without certain gain of a datapoint.

I felt this to be a little polarised. My experience seemed to indicate that for some genera, where a small detail is needed to record it at species level, this is a suitable, and I believe, an ethically sensible approach. But certainly, for genera where the chance of

taking it to species through this method are slim, such as Sarcophaga sp - this argument seemed fair and specimen-taking would seem the only approach in these circumstances.

With this in mind, I also took specimens to explore the difference in resolution possible, and understand the methods involved. I used ethyl acetate (nail polish remover) as a killing agent. Some specimens required dissection as well. Although there was a sense of achievement in being able to properly key out a specimen and record more species with certainty, it felt to me to be an approach with limited reach in citizen scientists. I felt like this pursuit is not something which the average hobbyist will want to engage with. A more pleasing version of this was simply to find dead flies on leaves and retain and key out. Removing the need to actively kill the specimen made for a more gratifying experience.

I felt that collection of dead specimens remains taboo though as well. It's taboo to some extent simply to be interested in flies and insects. But collecting dead flies and insects is really another level, socially-speaking to my mind. There are significant barriers here for citizen scientists to engage with such activity I think. So, finally, I explored other ways to display specimens and questioned possible routes this could take to engage citizen scientists more easily with the approach.

- making the knock-out pot

- version with secondary valve for drip-feed

- found specimen with superman figurine (alternative display method)

Evaluation

I think due to the highly unusual circumstances of this year, it's difficult to truly evaluate the programme itself, which was of course designed initially around the JRC makerspace and residency there. The adaptation was certainly excellent in overcoming the limitations as best as could be expected, through regular online meetings. And although it was sad not to be able to visit the site, I hope we can all remain in contact. Perhaps there can be a possible future collaboration between our makerspace in Iceland and the JRC makerspace in Italy.

With regard to my work itself, I wonder if I spread my time a little thin by attempting to develop three separate aspects rather than one. Perhaps it would have been better to focus entirely on a single option to go deeper into creating a more resolved share-able product. However, it was certainly very enriching to explore multiple facets of recording and I was pleased overall with the experiments.

I think they are a series of good starting points for others and I hope once shared that other designers and citizen scientists build on them to see how they can develop them themselves.
I think they are also useful tools for debate around citizen science - especially the knock-out pot and the connected ethical issues this leads to discussing.

Overall, it was a really enjoyable experience and I am very grateful for being included on the programme, so many thanks for having me JRC!

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