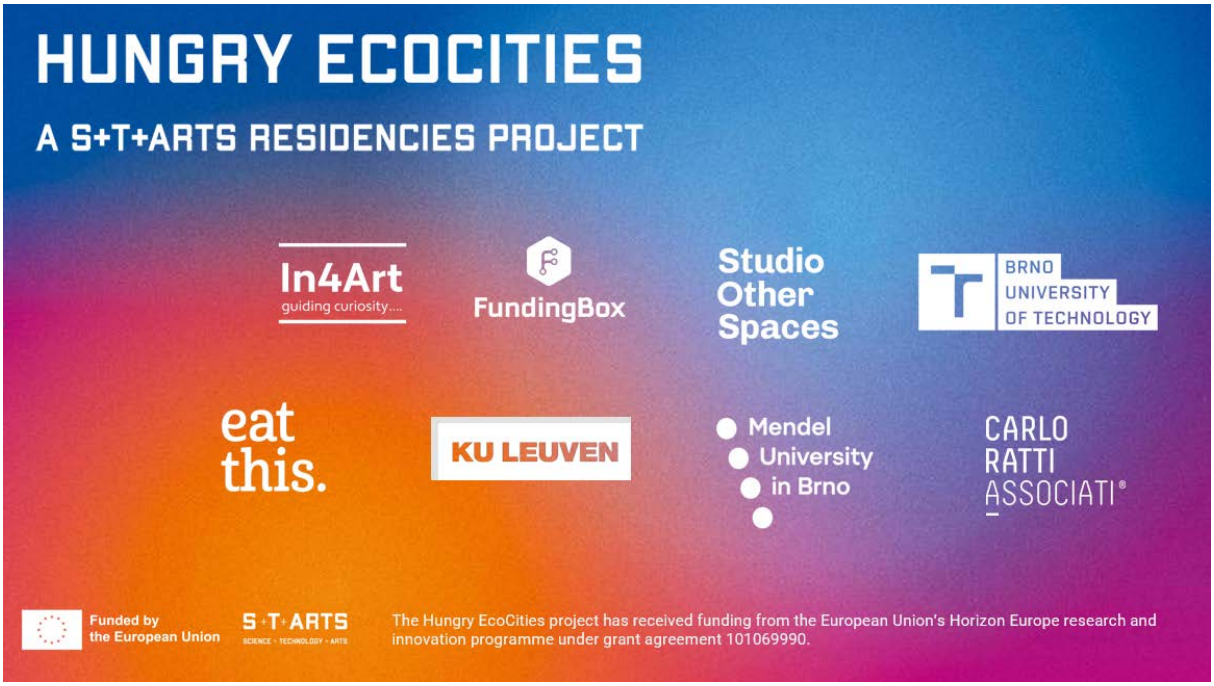

Deliverable 6.6 – IPR Report update 1

Version 1.0

Grant Agreement Number	101069990
Project title	Hungry EcoCities
Start date of the project	Sep 1st 2022
Duration of the project	42 months
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Workpackage No.	6

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Reviewers: Rodolfo Groenewoud, In4Art (In4Art)

Objective of the deliverable

The main objective of this deliverable is to provide an intermediate update of the report on the generated IPR and innovation management, especially relevant to the outcomes of the initial project artistic experiments.

History of changes

Date	Version	Author	Comment
13.06.24	0.1	Klara Kaluzikova	Setup of deliverable
24.06.24	0.2	Pavel Smrz	Initial version with the IPR of submitted HTEs
01.08.24	0.3	Pavel Smrz	Integration of comments and final description of HTE IPR results
24.08.24	0.4	Pavel Smrz	Final version for the internal review
28.08.24	1.0	Pavel Smrz	Version to be submitted, reflecting all the comments from the internal review

Table of Content

List of abbreviations

CC-BY-SA	Creative Commons Attribution-ShareAlike
D	Project Deliverable
EC	European Commission
EU	European Union
GA	Grant Agreement
HEC	Hungry EcoCities Project
HTE(s)	Humanising Technology Experiment(s) – corresponding to the first project call
IP	Intellectual Property
IPR	Intellectual Property Rights
M	Month
NDA	Non-Disclosure Agreement
PPE(s)	Path-to-Progress Experiment(s) – corresponding to the second project call, involving the cooperation of SMEs and artists
SME	Small or Medium Enterprise
S+T+ARTS	Science, Technology, and Arts Initiative of the EC
WP	Work Package

1. Abstract

This deliverable provides an update to the initial report on the generated IPR and innovation management, given in D6.3 (month 6). While the initial version contained primarily the plans for the IP protection and innovation management and a conceptual view on the field, this report summarizes the IPR situation relevant to nine HTEs, finalised and presented in May/June 2024. The final version of the IPR and innovation management will be delivered at the end of the project and it will reflect results of the coming PPEs, involving cooperation of SMEs and artists.

As also documented in D6.4 – Project Data Management Plan – Update 1 – the results of most of the HTEs correspond to a creative use of available GenAI models, adapted by newly collected data and instantiated by specific knowledge assets created by involved artists. The results are generally available in specific GitHub repositories and the licensing of all the outcomes, even for commercial use outside of the HEC project, follows straightforward rules (see Section 2 of this deliverable). The knowledge, expertise, and technologies provided by the consortium members followed appropriate approaches to the IPR and were provided freely and openly to the artists, which also significantly simplified the IPR management of the outcomes.

The coming phase of the project, which will focus on PPEs, will be more challenging from the IPR perspective, as involved SMEs will have to clearly define their commercial know-how and all relevant foreground brought to the joint work with the artists. It is also believed that PPEs will generate significant innovations. Last but not least, most of them will employ a form of the HTE prototypes and integrate them to their novel or extended products and services. IPR situation regarding these outcomes will be reported in the final version of the report.

The IPR and innovation management follows the Guidelines for this area valid in Horizon Europe, as well as specific PESETABS methodology, created by In4Art for monitoring responsible innovation from artistic experiments. The project will continue to identify the ways the consortium members, supported parties, innovative companies outside of the project, and general public can benefit from the created knowledge artefacts.

2. Routes to IPR protection resulting from HTEs

As expected in the previous instance of the Project IPR Report (D6.3), the GA, and other project deliverables, knowledge assets that were created within the project take various forms of intellectual properties (IPs), including software, data, technological expertise, artistic work results and their presentations, organization know-how, and other intellectual resources. This section discusses routes to IPR projection of HTEs that were finished and presented by the end of June 2024, focusing on the artistic-driven innovation work related to the explored areas.

In most cases, the final prototypes represent a collection of software artefacts, data collected to adapt existing or newly created ML models, to instantiate LLMs, initiate text2image and text2video models, etc., and web/video presentation of the results. However, the installations also involve a simple hardware setting, consisting of a camera and a desk sign recognition influencing the presented story, 100 experimental boxes for capturing plant communications, and other resources.

In general, the project rules specifically asked the IP owners to always grant the right to use of all the results without limitation and for non-commercial purposes within and during the Hungry EcoCities projects. Artists could specify limitations or decisions for usage of the copyright IP outside of the scope of this general project grant, in particular for commercial purposes and outside of the project.

The following list summarizes the IPR arrangements for all nine HTEs resulting from the artistic work of individuals and art groups selected in the first HEC call for artists:

Acoustic Agriculture

The copyright on the design of the hydroponic box with sensors to measure the conductivity of the nutrient solution is shared intellectual property between the artist – Helena Nikonole and Pavel Chaloupsky and his collaborators from the Mendel University in Brno. All other intellectual property embedded in the technical/digital prototype, including but not limited to computer programs, databases, technical drawings, and any other forms of original work created as part of this project, is under the copyright ownership of the artist. This encompasses all custom software developments, sound engineering methodologies, and any original content produced for the operation and functionality of the prototype. There is an agreement with Mendel University to continue the experiment beyond the HEC project.

There are critical innovations that necessitate robust intellectual property protection to safeguard the novel methodologies and technological advancements developed:

1. Innovation in Plant Sound Application:

Transducer Application: A pioneering technique where sound is applied directly to the

entire plant—from roots to stem—using vibrational speakers (transducers). This method represents a groundbreaking approach in agronomy, as it enables a holistic application of sound frequencies, potentially affecting plant growth more uniformly and effectively than previous methods that targeted only specific parts of plants. Protecting this innovation ensures that the unique methodology cannot be replicated or used without authorization.

2. Innovation in AI Technology:

AI Trained on Plant Responses: The development of an AI system that is trained specifically on the responses of plants to various sound stimuli is another novel aspect of this project. Unlike conventional AI applications in agriculture that may focus on environmental monitoring or predictive analytics, this AI system learns from direct biological feedback from plants, adjusting sound stimuli based on real-time data. This AI framework, which correlates specific sound applications with plant growth responses, represents a significant advancement in both artificial intelligence and biotechnology fields.

No commercial use of the results is allowed unless agreed with the IP owner. As the creator of these works, the artist retains all rights afforded under copyright law, ensuring that any utilization, reproduction, modification, or distribution of the prototype's components is subject to the artist's consent. This exclusive ownership guarantees that the integrity and originality of the Acoustic Agriculture project are preserved, allowing the artist to control how the intellectual properties are used and ensuring that any benefits derived are properly attributed to and managed by the artist.

Council of Food

All results of the experiments and all copyright IP artefacts created for the prototype within the Hungry EcoCities project should be credited to the Nonhuman Nonsense artistic studio. There are no limits to the non-commercial reuse of the results, all code and collected data is licensed under CC BY-NC-SA 4.0. The commercial use needs to be discussed with the studio.

Vegetable Vendetta

Parties interested in the use of the copyright IP outside of the Hungry EcoCities project need to contact the artist – Jeroen van der Most. It is also stressed that most used music and sound effects in the project were purchased on a stock material website. This would imply that they can’t be used freely in new project spinoffs without the involvement of the artist and are not free to use in new movies generated with the system when not made by the artist.

The critical innovations took place in several fields of creative AI and employed various forms and tools made available in the course of the prototype creation. These include:

- Image generation: At the start of the trajectory the idea was to use image generator Dalle3 or Stable Diffusion models to create images for the project. Which would then be converted to movies using other AI or algorithms. In December 2023 a new version of the image generator Midjourney was

launched. Midjourney 6 offered such a high quality, much better than other options, that the choice was made to use it.

- Video generation: In September 2023 the initial idea was to convert static images to movies using algorithms by moving or quickly switching between different images. Eventually was chosen to go for AI to turn static images into animations. The only option at first was to use Runway for that. Several new tools popped up during the trajectory, however. Think of Stable diffusion video API's, Kaiber, and Luma, which were used next to Runway. Unfortunately, the expected new tool Sora that might offer a next step in quality, didn't launch during the trajectory.
- Text generation AI: Several new large language models were launched during the project. Think of Chatgpt4o, but also new models by Claude. In the end, however the role of text-generation AI in the project was limited. Chatgpt4 was used though to create a rudimentary aggregative model of existing persuasive marketing models that formed inspiration for the different persuasion strategy 'baskets' users can choose from.
- Music generation: It was a few months into 2024 that new music generation tools launched, think of Udio, to create music of a quality impossible before. Udio was used to create some of the soundtracks in the project (for the retro vibes basket).

Ecoshrooms

Any material from the project should be credited to artist Ivan Henriques and any commercial use of the copyright IP or any of its use outside of the Hungry EcoCities project shall be discussed with the artist.

In particular, the IP protected project results include:

- Technical drawings
- Ecoshroom self-sustaining system
- hard & software system design
- electric sensor development (metal mesh), system integration
- Rhizome box (cultivation box – custom designed)
- experiment design (sensors and its attachment into the organisms, selection of external factors)
- all images, videos, data sets, and texts from the project Ecoshroom such as illustrations, graphics, texts, videos, presentations, research, amongst others materials.

Joint ownership and protection of specific Ecoshrooms results – Copyright Ivan Henriques in collaboration with scientist Pavel Chaloupsky (Mendel University, Brno, Czechia) and scientist Martina Janoušková (Botanical Institute, Czechia):

- selection of organisms
- schedule of events

Symposio

All results of the project are published under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International license. The realized software prototype take advantage of the following tools and languages (with there specific licenses that need to be reflected in the use of the artistic prototype results):

- Python Programming Language (Open source)
- YAMNET model (licensed under the Apache License 2.0)
- TensorFlow (licensed under the Apache License 2.0)
- PyAudio (MIT License)

SYMbiosis.ai

The right to use and licensing conditions for the IP which falls under copyright protection of Studio De Wilde bv is possible under the following conditions:

- The digital prototype doesn't break – case of force majeure.
- License Touchdesigner – Commercial or floating-point license required.
- Conditions of usage of the digital prototype copyright IP.
- Rent computer/sensors from Studio De Wilde bv (exclusive)
- Insurance computer (incl. installed software value) / sensors
- Setup and demount by Studio De Wilde bv
- Travel and hotel reimbursement, transport cost reimbursement
- Fee technical assistant + per diem (if needed), fee artist + per diem

Genomic Gastronomy

No limits to the commercial reuse of the results, all code and collected data is released under an AGPL open-source license, and is be available in the GitHub repository.

WTFood

The resulting copyright IP, especially the prototype's concept and code is licensed under HL3 license (https://firstdonoharm.dev/version/3/0/full.html). The Hippocratic License 3.0 (HL3) is an open-source license that empowers communities to establish ethical standards for their code, ensuring that licensees abide by these standards when adopting the code. It prohibits discrimination based on various factors and aligns with international human rights principles. Created by the Organization for Ethical Source, HL3 aims to address potential harms and abuses related to technology while protecting fundamental human rights.

Future Protein

All project IP results are available for non-commercial and commercial use with permissible licenses. In particular, the project outcomes include:

- The formula for computing the nutrition and CO_2/sustainability value of the proposed mussel farms and the design. The respective IP falls under the copyright of the artists – Nataly Khadziakova and Katya Bryskina. They apply CC BY-NC 4.0 Legal Code.
- The data from the users corresponding to generated farms during the sessions – the data is anonymous; no personal data is stored. The generated farm patterns and all computed values are available under request from the artists.

The artists will decide granting access to the implementation of the formula and the website background individually in each case, they will promote and support further exploration of the formula and the implemented web application.

3. Lessons learnt from HTEs and plan for IP protection in PPEs

The IP protection for the knowledge assets resulting from the HTE prototypes was relatively straightforward as most of the artists worked relatively independently under the lead and knowledge contribution of experts from consortium art studios, In4Art, and academic collaborators. Still, some of the prototype results needed more attention from the perspective of the IP ownership, involving not only the artists but also other consortium members who were significantly involved in the project. This demonstrated the need for strict identification of IP-related assets and processes in the second phase of the Hungry EcoCities project. For example, the involvement of the faculty members and plant communication measurement experts from the Mendel University in Brno – partners in the Acoustic Agriculture prototype – was significant. The clarification of their contributions and the ownership of each individual component of the resulting system, together with the added value of ideas, concepts, and realisation of the hydroponic system, needed time, several rounds of negotiations, and a specific agreement between the artist and the university team members.

Considering the fact, that the second set of PPEs will involve selected SMEs that will also contribute to and will co-own some of the outcomes, it is critical to follow the steps of IP asset identification and joint ownership management, identified in D6.3, and ask all involved parties to detail the IP creation steps in requested deliverables. As the initial communication with the selected SME use case/opportunity providers suggests, some of the companies have already gained experience from previous cooperation with artists/creative technologists and know exactly what aspects of their involvement in the coming experimentation phase need to be described and claimed as the foreground. However, other selected SMEs lack this experience and knowledge and will need help from the management team and involved legal experts.

The standard methods of protecting IPs, relevant to the results expected in the PPE phase of the HEC project, have been already identified in D6.3. It is expected, that all SMEs will initially stress confidentiality, which will involve signing a specific template-based NDA with the involved artist(s). It will primarily enable exchanging information safely, facilitating the project development and ensuring the non-disclosure of sensitive technology, business, or commercial confidential information regarding the SME current business and targeted market developments.

Depending on the opportunity definition, relevant knowledge assets that will be co-created by artists within the project will take various forms of IPs, especially software, data, technological expertise, artistic work results and their presentations, organization know-how, and other intellectual resources. Especially the established companies with a long history in the market will pay particular attention to the trademark use restrictions, corresponding to recognition of their sign (logo, name, etc.). If (a part of) the resulting IP will involve using the sign, they will insist on their exclusive right to use the result.

As most of the expected joined work will involve software artefact, a common IP protection method will the copyright which protects authors of the specific form of expression of ideas – not only software, but all forms of artistic works. Some initial descriptions of the potential opportunity for the PPE use case suggest that the result will also correspond to the category of industrial design and could be relevant for

protection of the tangible parts of the artistic or scientific inputs to the project. Considering the expected relevance of various generative AI models and the need for their adaptation based on particular datasets, the database protection, which provides special copyright-like protection to organized datasets generated during the project, also needs to be considered. For all three types of the artefacts, it is critical to describe the foreground brought by the SME and detail the restrictions on the licencing and involvement of the artist beyond the HEC project.

The current analysis of SME proposals (not yet their opportunity cards) does not suggest that utility models – “petty patents”, providing a cheaper alternative to patent protection, or even full patents, on the national, European, regional, or worldwide levels, would be necessary for the prototype development in the PPEs. Nevertheless, all project participants will be properly informed and the prototype building phases will be closely monitored to identify any potential patentable outcomes (see also the next section).

The project will take care of detailing the IPR and innovation-related situation for each individual selected and supported experiment. The IPR issues related to the technologies to be used will be specified in the presented (individual mentoring) plan and a detailed map of the IPR created and innovation potential will be provided in the final report by creative technologists (in cooperation with the SMEs in the experiments resulting from the second call).

As already suggested by the IPR guides in D6.3, the experiment documentation will identify:

- **Background** – information and knowledge held by the participants prior to their involvement with the experiment
- **Foreground** – the results including information, materials, and knowledge in the project
- **Ownership and protection** – answers to the questions who is the owner and what is the protection used or planned to be used for each particular IP, set up of the exercise of the co-owners´ rights, their mutual relation.
- **Access rights and conditions** – what are access rights for involved participants and formal conditions (for example, under written request/prior notification/without consent, conditions of the royalty-free use)

The project will take advantage of the vast experience of In4Art and the art studios and will use the initial phase of PPEs, in which only SMEs join the project and define the use cases in the form of work opportunities for the artists, to help the companies define the expected form and restrictions for the joint ownership that motivate them to openly share their knowledge with the artists, but also enable presenting and promoting the artistic value of individual contributions and the entire project.

This strategy and resulting recommendations will have consequences to the joint ownership. Indeed, joint owners must agree among themselves on the allocation and

the terms of exercising the ownership of the foreground. In the absence of such an agreement (or pending its conclusion), a default joint ownership regime will apply.

Considering the above, if during the experiment work foreground is generated by two or more parties contributing a specific work, and if the contributions form an indivisible part thereof, such that under applicable law it is not possible to separate them for the purpose of applying for, obtaining and/or maintaining and/or owning the relevant patent protection or any other IPR protecting or available to protect such foreground, the involved parties will have to agree that all registered IPRs issued thereon, and any other IPRs protecting such foreground, shall be jointly owned by the parties.

The general rules also stress that within a reasonable period following creation of any joint foreground (the soonest being the best), and not later than a month before the deadline for the approved experiment period, the parties shall enter into good faith discussions in order to agree on an appropriate course of action for appropriate IPR protection, including the decision as to which party is to be entrusted with the preparation and prosecution of the appropriate IPR protection means. Any application of IPR protection on joint Foreground shall require mutual agreement between the involved parties. All external costs for the protection and the fees for maintaining such protection shall be shared among the involved parties.

4. Innovation management

As already suggested by other project deliverables, the HEC project follows the PESETABS methodology[1], which involves a diffusion model developed by In4Art to support spill-overs for responsible innovation from artistic experiments. In general, we also follow the Innovation radar methodology[2] to manage and assess innovation resulting from the activities of the consortium members, as well as to the results of supported artistic projects. Various indicators of innovation and market potential of the created artistic solutions, especially their readiness, management, and disruption potential are regularly assessed. Innovation capacity will be also considered but more on a qualitative way, mostly by evaluating the feedback to the artistic result presentation. The final IPR report deliverable will summarise the innovation management findings relevant to all project outcomes.

[1] https://www.in4art.eu/news/developing-art-driven-innovation-spill-overs-with-pesetabs/
[2] https://innovation-radar.ec.europa.eu/methodology

5. Conclusions

This document provides an intermediate update to the initial IPR report (D6.3). It particularly focuses on the IPR protection status relevant to nine HTEs delivered by May/June 2024 and summarizes the IPR situation, as defined by the artists and supporting experts. It also briefly outlines the updated plan for the IP protection regarding new PPEs that will involve 10 SMEs and 20 new artists. The final findings and the complete mapping of the IPR protection and innovation management aspects related to all project outcomes will be reported in the final instance of the IPR report.

About Hungry EcoCities

Funded by the European Union

S+T+ARTS
SCIENCE + TECHNOLOGY + ARTS

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Hungry EcoCities aims to explore one of the most pressing challenges of our times: the need for a more healthy, sustainable, responsible, and affordable agri-food system for all enabled by AI. More info: starts.eu/hungryecocities.nl