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COLreg: The Tokenised Cross-Species Multicentred Regenerative Region Co-Creation

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Abstract: This article argues that whilst our recent economic models are dependent on the overall ecosystem, they do not reflect this fact. As a result of this, we are facing Anthropocene mass extinction. The paper presents a collaborative regenerative region (COLreg) co-creation and tokenisation, involving multiple human and non-human, living and non-living stakeholders. It unfolds different stages of multicentred, systemic co-design via collaborative gigamapping. In the first steps, certain stakeholders are present and certain are represented, whilst in the final stages of generative development, all stakeholders, even those who were previously just potential stakeholders, take an active role. The 'COLreg' project represents a holistic approach that reflects today's most burning issues, such as biodiversity decrease, unsustainable food production, unsustainable economic models, and social systems. It combines top-down and bottom-up approaches to co-create to achieve regional social and environmental justice for the coming symbiotic post-Anthropocene era.

Keywords: systemic approach to architectural performance; systems-oriented design; multicentred design; co-design; social and environmental justice; bioregion; urban ecosystem; edible landscape; token economy; post-Anthropocene

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1. Introduction

This article is an extension and development of the working conference paper 'COLreg: The Collective Regenerative Region' [1], presented at the plenary session of the Relating Systems Thinking and Design 9 Symposium, held online in October 2020 at the National Institute of Design, Ahmedabad [2]. It is a non-reductionist 'research by design' [3] paper that searches for the creation of various disciplines and stakeholders within the framework of 'Systemic Design' [4] and its multicentred methodologies [5]. Therefore, instead of focusing on a particular research gap definition, this work is searching for synergy across multiple perspectives, developing a methodology for collective regenerative design that can be adapted to various situations. The project is a case study grounded in the more extensive research of the author Dermott McMeel on the tokenisation of the ecosystem and its human and non-human communities [6]. This article refers to research by the co-design project 'COLreg' undertaken by the Collaborative Collective NGO for Prague 22 district (Uhříněves). The location to be redesigned covers an area of 1.3 ha (13,478 m^2) and is located in the peri-urban area of Prague, Czech Republic. During the 1980s and 1990s, the location was intensively used as an allotment colony, of which the remains and users are still present. At this time, the City Hall wishes to transform it into a natural park that will serve the district's residents. Prague 22 district is mainly a residential locality with ca. 15,000 citizens. It has the youngest population amongst all of Prague's districts. The City Hall wishes to address all of its citizens within the new locality redesign with both active and calm zones. This agenda automatically generates conflict with the current remaining allotment users. A lot of attention has been paid to sustainability during recent decades. The recent trend, however, is mainly to discuss regenerativity [7]. Over time, sustainability paradigms have evolved from meeting human

needs throughout time to improving human well-being and ecological systems' viability. Regenerative sustainability (RS), the next wave of sustainability, includes and transcends these goals, aiming for thriving living systems in which whole-system health and well-being increase continually. A key difference between sustainability paradigms is the thinking underlying them, with regenerative sustainability based on a holistic worldview and paradigm, integrating recent understandings from science and practice, different ways of knowing, and the inner and outer dimensions of sustainability necessary for systemic transformation (ibid). How things are interconnected needs to be better understood when working with sustainability goals, and increasingly, such links are being forged [8]. This thinking and working, however, requires a multicentred perspective. This can be co-created by multiple agents who exchange and relate their views and visions regarding the problem. Such exchange and relating often bring dialogue and synergy between the specific agencies and agendas. Such co-productive, local, and specific interaction can generate prototypical 'leverage points' [9] that rely on existing infrastructure. However, these can start up new regenerative models on local, regional, and global scales.

Sustainable urban development requires a long-term, sector-integrative approach [10]. Sanders and Stappers explain the shifts, connections, and reframing in almost every area of design we have witnessed over the past three decades: how design is done, who is doing it, with what goals, and what its results are. These changes show a move from the designing of things to interactions and systems, and from designing for people to designing with people and by people [11]. Participation in the creation of public spaces with regenerative services with and by local residents and other stakeholders is slowly entering common practice. For example, the Prague Institute of Planning and Development has its own participation department that has released a Participation Manual to help its city institutions and districts to understand the participatory processes and to improve their ability to involve residents in spatial and strategic planning [12]. The slight distinction in the terms 'participatory design' and 'co-design' was discussed by Sanders and Stappers, where participation relates somewhat to a situation where related stakeholders are invited to the discussion board, while co-design instead refers to hands-on 'co-creation' [13]. This paper argues that such processes should, however, in any way possible integrate and also serve non-humans. Spotswood et al., in their review, pointed out that several species benefit more from urban settings than from other environments. This may be attributed to the few adaptions necessary for their survival [14]. Urban spaces are to become the stage for conditions to be specialised for nature and producing food that is fit for the future, as well as becoming areas in which to experiment by staging and testing out solutions to contemporary environmental, climate, and structural crises [15]. In this case, Collaborative Collective NGO was invited by Prague 22 district, Uhříněves, to facilitate co-design workshops and conclude their systemic design proposal for communal land regeneration, targeting regional biodiversity support and communal spaces and food production. This experimental project covered the formal co-creation stages. However, the project is opening the site to time-based co-creation in real-time across multiple human and non-human, living and non-living stakeholders.

This project was approached as 'bioregioning—an activity that creates value' [16], connecting 'What is' with 'What if' (ibid). Following traditions of democracy, including equality of voice and inclusive participation, the project mediates between the city state of government and the individual citizen [17]. The work provides a broader view towards peri-urban research through the lens of social complex adaptive and systemic design approaches (requiring a range of different disciplines) [18]. This project specifically synergises both a biocorridor and a circular economy within the region through communal and community-based co-creation, combining bottom-up and top-down approaches that integrate a token economy. Whilst second-order cybernetics moved from the study of observed systems to observing systems [19], third-order cybernetics oscillates between the two [20,21]. This way, the first author also held the co-design processes to introduce a new economic model for the 21st century. In this model, there are multiple observers

who are also co-creators, and vice versa. This oscillation also involves the first and the second authors. Such active roles are specifically critical as the overall ecosystem involves all stakeholders, human and non-human, living and non-living; agents; and agencies.

In response to instability with different viewpoints and agendas, the model of COLreg is inspired by the project 'Artists Re:Thinking the Blockchain', where a coffee machine has a wallet and can operate with it [22]. It does so by also including non-human, living, and non-living agents. In the 21st century, rivers and other natural resources reclaim their legal personhood with social, cultural, economic, and environmental interests. The example that raised this discussion was the Whanganui River in New Zealand [23]. The recently published independent Dasgupta Review on the economics of biodiversity [24], ordered by the British government, points to our economy and ecosystems' interdependence. However, recent economic models seem not to reflect this fact. For this reason, i.e., due to the lack of pollinators, agricultural harvests are decreasing, leading to starvation in some countries. There are increasing natural disasters caused by damaged landscapes without trees, and civilisation diseases with their associated healthcare costs are increasing as well, etc. [25]. The planetary Boundaries report demonstrates that the current biodiversity is beyond the alarming conditions [26]. At the same time, the World Economic Forum has identified blockchain technology as having the potential to better support circular economies and finance projects for environmental change [27]. Therefore, this project is aiming at biodiversity agency tokenisation, synergising the economy with the ecosystem.

Recently, many species are adapting for life within cities [28]. If we are not to lose all our biodiversity, we need to adapt our cities to this condition [29]. This statement also applies to peri-urban areas [30], such as the discussed region. Rewilding areas in cities has become a powerful strategy to bring back butterflies, insects, birds, and wildlife [31]. Integration of species' habitats in anthropocentric developed settlements has been appearing in many other architectural proposals, such as designs by Andrew Kudless [32], Terreform I [33], Ferdinand Ludwig's BAUMBOTANIK [34], Community Gateway [35], or Rewild my Street [36]. Integration of natural systems with human nature was investigated by Zavoleas [37]. However, acknowledging the personhood, rights, and agency value is a step forward from the typical simple protection of the environment that this project follows. The preoccupation with defining the legal person in anthropocentric terms highlights what is of value to society. The fact that most legal systems' environment does not have legal personhood entity status (and therefore the wallet), but corporations do, indicates how contemporary Western societies see the natural world as a source for profit. As a result, the natural world is seen as property to be used and controlled [38]. Such an attitude of uncritical exploitation has led us destroy biodiversity, creating the environmental, social, and related economic crises we are facing today. The COLreg project tries to integrate an environment into the communal co-creation of a regenerative economy in the region, considering all ecosystemic agency across multiple scales.

The municipality of Prague 22 (Uhříněves) bought land within its district centre to enable cross-species connectivity within itself and the larger region and to provide communal activities and opportunities to its residents. However, at present, the land is rented out for a historical gated gardeners' colony, where a small group of local residents have small allotments with fruit trees, small vegetable fields, glasshouses, and huts. This community did not wish this situation to change and became very negative to whatever proposal should come. Therefore, conflicts across the City Hall, ecologists, gardeners, and other community members arose. Therefore, Collaborative Collective NGO was invited to search for synergy across the different stakeholders, such as the City Hall representatives, ecologists and the ecosystem, gardeners, and the other district residents eager to obtain public recreational space. This article exemplifies how the combination of bottom-up and top-down approaches can be achieved through minimapping and collaborative gigamapping across various interests and how this can be implemented within a 'real-life co-design laboratory' [39]. This laboratory is to be co-generated through real life by all present stakeholders, agents, and agencies.

2. Methodology

Within the context of Systemic Design, Jones states that in less than a decade, the promise of participatory design as a sustained practice has diffused into mainstream practice as design co-creation. Co-creation has emerged as a normative mode of participatory engagement for design ideation, creative problem solving, and decision making. While contemporary practitioners may regard these practices as accepted methods, they have evolved over a 50-year period or more, from earlier forms of co-creation based on social systems and democratic practice theory [40]. Many studies have managed to unpack crucial research questions in climate science knowledge production within complex city policy and governance contexts. However, they have focused more on analysis and detail complexity units and less on the dynamic complexity of complex socio-technical systems' emergent properties [41]. Integrating real-life active agency by reacting and adapting to real-life situations and interactions is the necessity considered in this article. The knowledge central in learning and teaching often starts with factual knowledge of agents, objects, events, and how they are related [42]. Here, it is approached by 'learning by doing' [43] as a 'reflective practitioner' [44] through real-life interaction. This project covered the region's ecological analysis, conducted by the second author, and the first author led co-design gigamapping workshops relating the visions of agents, objects, and events across the stakeholders (integrating the second author—the ecologist). The above findings were synergised by the first author into a systemic design pilot proposal to start the 'real-life co-design laboratory' on-site in real life and real-time.

In addition to the archive and literature review, the project integrated its own ecological analysis. This investigation was critical to generate a relevant discussion in the co-design workshops discussed below. This is because the research on land-use changes has concentrated on the development of spatial models based on mechanistic reductionist approaches. Reductionist science has been applied in the field of agriculture for the creation of technologies and solutions directed towards increasing agricultural production and economic growth [45]. The ecologist's role in this systemic co-design project and its workshops was, therefore, to act on behalf of the ecosystem. It has to defend and represent its existing and potential stakeholders, their habitats, migrations, and edible landscape. The ecological analysis was approached through terrain mapping of the area of interest and the entire adjoining corridor. During the mapping, game migration routes were monitored, mainly by recognising tracks on the surface. Additionally, traces of dung, fur, nests, and food scraps were identified. The mapping nesting districts method was performed based on the Czech Ornithological Society's methodology to identify bird species. This methodology covers quadrant and subquadrant network mapping with an app, two seasonal one-hour lasting controls, and monitoring of selected quadrants [46]. A thermal camera and an inspection camera were used to detect insect species (see Figure 1). All species found were recorded. The main corridors were also drawn, leading mainly along watercourses and through forest stands. During the mapping, various barriers were found, such as fences, watercourses, and roads. All these data were used in gigamapping workshops to act on behalf of the identified existing and potential stakeholders and the ecosystem's performance. This was discussed in the context of a local and larger scale of the region with a variety of timeframes.

The co-design workshops were joined by the ecologist who performed the above study. She was acting on behalf of the ecosystem, its agents and stakeholders, and their potentials and needs. For the co-design workshops, a combination of tools from Systems Oriented Design [47], namely the minimapping and the gigamapping, were used. It is critical for such mapping that the maps are visual, as this generates associative and design thinking. In this case, the minimap is a small diagram to start the project [48]; the gigamaps are complex and cover at least 300 items. While mapping, in general, is a way of ordering and simplifying issues—in other words, to 'tame' the problems—gigamapping is not a problem-taming methodology. Wicked problems are not resolved through 'taming' and framing. Gigamaps try to grasp, embrace, and mirror the complexity and wickedness of real-life

networks of interrelated problems (problematiques) [49]. For any given tame problem, an exhaustive formulation can be stated containing all the information the problem-solver needs for understanding and solving the problem—provided they know their 'art', of course. This is not possible with wicked problems. The information needed to understand the problem depends on the one's idea of solving it. That is to say, in order to describe a wicked problem in sufficient detail, one has to develop an exhaustive inventory of all conceivable solutions ahead of time [50]. This multicentred perspective is targeted through gigamapping co-design workshops where each stakeholder generates their own centre within the initial minimap to understand her/his agendas and imaginary worlds. Relating those centres across the gigamap with other stakeholders generates the multicentred design through hands-on empathy.

Figure 1. Insect habitat monitoring (Photo: Zímová, 2019).

In the case of the first author's projects, minimaps serve as personal maps that enable the stakeholder to map her/his personal universe within the discussed area [51]. Such minimaps are later cross-related across the stakeholders into a synergetic gigamap. The multicentred gigamap here has to involve multiple stakeholders with their agendas that were described in their initial minimaps. Thus, the gigamap is created from multiple minimaps with their own centre points, make it multicentred. Gigamapping does not aim to collect any quantitative data. The main point of the gigamapping here is to search for synergetic design by finding relations across the multiple agendas of the involved stakeholders. Sevaldson states that gigamapping is a technique for facilitating mapping, contextualisation, and relating of complex systems by groups, revealing their environment and landscapes (of interaction) and their current states, as well as preferred future states. It has been a central tool for co-inquiry where experts, users, and other stakeholders

are brought together and are immersed in dialogue across their specialised cultures and terminologies [49]. Typically, a multi-disciplinary and multi-stakeholder team also involves representatives of those who cannot be present [5], such as when dendrologists talk on behalf of trees [29]. In this case, it was namely the local ecologist (the second author) acting on behalf of the ecosystem and parents acting on behalf of the future generations. That is not an ideal situation. It would be better if the stakeholders could act directly. However, it is a crucial starting point for integrating or even reaching specific existing, declining, or potential stakeholders for the next design stages.

A critical part of the COLreg project is the 'real-life co-design laboratory' developed by the first author [52]. Rittel and Weber made it clear that the planning problem is a wicked problem. Many barriers keep us from perfecting such a planning/governing system: theory is inadequate for decent forecasting; our intelligence is insufficient for our tasks; the plurality of objectives held by pluralities of politics makes it impossible to pursue uniform aims, etc. [50]. This situation occurs because there are multiple stakeholders, some of which are not yet present as they appear or potentially appear over time. Therefore, the 'real-life co-design laboratory' is a real-time co-creation process with the community executed through real life in real-time. This stage is already integrating the true agency and interaction of all stakeholders and agents across the ecosystem in time, primarily without the previously necessary secondary representation of those who 'cannot be heard'. Such a synergetic proposal that results from gigamapping is not and never will be final. It is a real-life prototype constantly tested and redesigned whilst co-performing within the real-life environment and its situations, integrating all living and non-living, human and non-human agents. Such a project is therefore co-created by all actors through acting in real life and real-time.

3. The Regional Regenerative Ecosystem

For this project, it was essential to analyse and study the ecosystem of the area and the region. Traditionally, ecologists avoided the study of urban places, preferring locations far beyond the city limits. These locations influenced the evolution of the field [53]. Therefore, there is little existing data for peri-urban areas, such as Prague 22. However, ecology is an evolving discipline with an increasing focus on landscapes and urban regions (ibid). More and more attention is being paid to urban and peri-urban ecosystems that play one of the most critical roles in human and non-human social and cohabitational interactions across the biosphere. As human activities create several habitats and edible landscapes for other species, so do the other species for humans. This symbiosis occurs because we all are part of the co-performing biosphere, the 'Gaia' [54].

The site was recently used as a place for gardening allotments. It used to be a pheasantry, which was part of the Uhříněves Game Reserve. According to nature protection agencies, the park is a popular natural monument. The game reserve was declared a natural monument on 27 May 1982, by the Prague Municipality. The fact that the area became a natural monument also secured it more care and attention, given it was declared 'A valuable set of natural forest communities (hornbeam oak, bird ash) with old oaks and a rich herbaceous and shrub layer.' Under this designation, one can imagine mainly forest stands in the park's central part around Říčanka stream. These stands are in a state in which local forests would grow without any human intervention. The long-term goal of protecting this area is to preserve (at least in the current state) the forest stands and plant communities. At first glance, it might seem that the ideal procedure is to not do anything. However, this is not the case. Although these protected trees are natural and would grow in the location without our intervention, human activities have changed the surrounding nature and landscape. Therefore, other species of woody plants and plants that do not correspond to the 'natural' state are gradually entering the locality. Thus, the species composition of the stands is being monitored, and so-called management interventions are being carried out. These actions aim to adjust the condition of the location to as 'natural' a form as possible.

To understand the current state of the forest, it is essential to know its history. The natural forests around Říčany (today Prague 22) lived their own lives until almost the 19th century. At that time, a pheasant house was established in the territory. Its most significant part was farmed as a stump with a twenty-year wash. This means that the young trees were cut down about 1 m above the ground, and their wood was used for heating. After such an intervention, tall stumps would form. These formed several branches very quickly. Such components would then be cut off in the same place after around ten years. This method has been used in the region for many centuries. It was a very convenient and simple way to obtain wood for heating without the need to fell the whole trees. In addition, the trees grow back very fast after this type of intervention. Even today, one can find several sromas in the location. These have multiple strains growing from one place. These sromas are just witnessing the formerly farmed stumps. This type of farming is suitable for many species of animals. In one place, there are both old and young trees. There are enough light and shadow places in the region. Age, species, and habitat diversity are always the most important factors in nature protection, which is what this ecosystem provides. Therefore, it is ideal for keeping the vegetation as diverse as possible regarding the age of trees and their species representation. The presence of a gardening allotment colony also benefits from and give benefits to it. Thanks to this, there are also many fruit trees. These provide nutrients and habitats to other species.

There are protected species habitats currently present in the area. From the plant species, there is a European ochmet, which is a semi-parasitic deciduous shrub similar to mistletoe. Birds such as little owls (see Figure 2), which love the forest stands adjacent to meadows, and fields are striking in the location. There is the common sparrowhawk that nests in forest stands and hunts in the surrounding fields and around Podleský pond. This species likes old trees with cavities and shrub edges of the forest stands. Similar localities are also inhabited by the eared owl, the grey flycatcher, or the green woodpecker. The woodpecker is also a representative of date birds that like older trees with cavities. If the vegetation does not provide enough habitats, nesting boxes that these species like to inhabit are placed for them. From amphibians and reptiles, in the past (the year 1988), in the vicinity of Říčanka stream, there are species of brown frog, green toad, and common lizard (see Figure 3), and brittle hen. Among other animals, attractive inhabitants are, for example, red fallow deer, dark polecat, ermine weasel, and kolchava weasel [55].

Figure 2. Little owl (Photo: Ash, 2016–published under creative commons licence [56]).

Figure 3. Common lizard (Photo: Ocrdu, 2015–published under creative commons licence [57]).

At the same time, the forestry management had been active on the location. While nature protection is governed by the aforementioned care plan [55], forest management is based on a forest management plan. The forest management plan has changed a lot over time. After 1868, the care consisted of an awning of acorns and an oak undergrowth that prevailed in the 1950s. From the 1890s, oak was planted in a mixture with spruce. Later, spruce, larch, and pine predominated. In the period 1905–1932, modern farming methods were spread according to the forest council of J. Wiehl, whose aim was to grow small-scale mixed stands with the support of natural rejuvenation and with the use of exhibitions. Exhibitions are selected trees that are left to stand in the middle of a clearing, and their seeds ensure natural regeneration. In addition to habitat conditions, the composition of the stand mixture was also determined by sales conditions. In the Říčany region, in the first years of the 20th century, deciduous and coniferous exotics were used locally. To this day, we can still find them individually in the location. The economic guidelines for the decennium 1950–1959 prescribed mainly artificial regeneration of stands. Pine and oak were the main supported tree species. Spruce was suggested to be limited to appropriate habitats. Attention was also paid to the cultivation of larch, fir, and domestic deciduous trees—maple, ash, and beech. Subsequently, the game reserve in Uhříněves was included in forests of a particular purpose, requiring a different management method. The situation is similar in the current plan, where functions of specific-purpose forests and recreational functions for forests protected under nature protection regulations are overlapping [58].

The long-term goal of the current nature protection programme is to focus interventions in the stand on the adjustment of species composition, support of sub-level individuals (shrub layer), and support of natural rejuvenation and growths, only in the form of individual selection. In general, only the most necessary educational interventions in the shortest possible timeframe will be used to gradually switch to a selective method of farming. Such a method requires marking individual trees in the stand that will be felled. Keeping of old individuals of oaks, ash trees, and other trees is established. The area supports natural

regeneration. It uses possible areas after health-selective clearing of non-native woody plants to free up places with prospective rejuvenation. Invertebrates are supported, and upheavals and deadwood are left to disintegrate spontaneously as an environment for some species' development. In the case of a small amount of decaying wood, measures to secure the intervention are taken. When intervening over ten trees, 10% of individuals from the total number of felled trees are left to decay in suitable places—stumps with a minimum height of 30–40 cm [55].

The above knowledge and agendas are critical to include in gigamapping co-design processes to act on behalf of the discussed ecosystem and bioregion.

4. The Gigamapping Co-Design Process

In the case of multiple stakeholders with different or even conflicting agendas, planning covers multiple wicked problems. Rittel and Weber state that for wicked planning problems, there are no true or false answers. Normally, many parties are equally equipped, interested, and/or entitled to judge the solutions, although none has the power to set formal decisive rules to determinate correctness. Their judgements are likely to differ greatly according to their group or personal interests, their special value sets, and their ideological predilections. Their assessments of proposed solutions are expressed as 'good' or 'bad' or, more likely, as 'better' or 'worse' or 'satisfying' or 'good enough' [50]. To co-develop a relative synergy of the starting prototype across the variety of stakeholders, the project covered two initial co-design workshops. The first one engaged only stakeholders' representatives, and the second one was open to the (human) public. Following Sevaldson's research in Systems Oriented Design [49], gigamapping (visual diagramming of complexity) was selected as a tool for the co-creative processes. These processes only develop the first prototype through a synergetic systemic design proposal that is to be further co-created in real life with all human and non-human, living and non-living stakeholders.

4.1. The First Gigamapping Workshop

At the first stage, we agreed to invite only the critical expert stakeholders and critical community representatives to engage the larger audience through their network (see Figure 4). The workshop covered eight participants who were selected based on their direct interest in the locality. The lower representation was chosen because there was a significant conflict of interests between different stakeholders and stakeholders' representatives. The former allotment renters were not happy that the City Hall bought the land and had plans for its regeneration for community use and biodiversity connectivity, therefore terminating their contracts in the currently gated land. The discussion was too sensitive for a large group, which would probably turn into argumentation without any conclusion. There were, thus, crucial representatives of the gardening allotment colony, the community, ecologists and other species, and the City Hall at the first meeting. The local ecologist, the second author, was selected based on her long-term monitoring of the area. She was also acting on behalf of the non-human species present or potentially present in the area. The representatives were seeking synergy across the main agendas of their represented groups. They were presenting and relating their visions of the possible futures and the current stage.

All representatives were first asked to develop their own 'minimap' [48]. They were asked to map their own 'universe' concerning the location, mapping 'what is' and 'what if'. These minimaps were created from the perspective of the stakeholders representing each group. Each of the representatives presented their stakeholder map to the team. After that, all participants received scissors, and they had to organise the items from each minimap into a gigamap, finding relations and commonality amongst each other's 'universes'.

Interestingly, many of the items were repeated, and it was easy to find synergy across the conflicting sides as they often imagined similar visions. Such a fact was also a big surprise to the conflicting sides themselves. Learning about each other's universes generates empathy and understanding [51]. This involves the willingness to search for

synergetic agendas and the co-creation of a collective 'universe' that would integrate all participants and increase their participation willingness.

Figure 4. First co-design workshop with critical community representatives and stakeholders at the City Hall of Prague 22 (Photo: Davidová 2019).

Simultaneously, the second author performed an ecosystem mapping with the first author's students (see Figure 5). During this mapping, they searched for migration routes and their barriers, existing shelters for wild animals, etc. Furthermore, they mapped a variety of tinkered architectural and agricultural objects suitable and interesting for conservation. This team registered many human- and non-human-made habitats for various species, edible landscapes, glasshouses, and huts or landscape barriers.

Figure 5. Ecosystem mapping (Photo: Zímová, 2019).

The survey showed that the area has migration barriers between the forest, deer park, and the watercourse due to the gardening allotment colony's fences. This barrier is impenetrable to all larger animals, such as deer. Therefore, deer had to be represented as an

important stakeholder. It was also found that most of the existing areas can be maintained for the regenerative park design. The second author also performed a basic mapping of the ecosystem. It showed that the area is very attractive for a variety of insects, such as honeybees, another group of stakeholders. These attract birds and hedgehogs, other critical stakeholders groups. Such species have enough food and nesting possibilities thanks to the ecosystems of old gardens with fruit trees.

The session was finalised with a presentation and discussion of both groups in search of synergy amongst the mapped human and non-human communities and stakeholders (see Figure 6). The agendas of the non-human stakeholders were represented by the ecologists. In the example, a need for differentiation of more and fewer private areas was requested by both humans and non-humans. The same appeared with the request for keeping the existing fruit trees and specific parts for the growth of vegetables. Similarly attractive to both were ideas on larger areas for honey blooming meadows. However, there were some conflicts of interest, such as the need to remove fences for deer and other larger non-flying species and the need for security of the area requested by several humans.

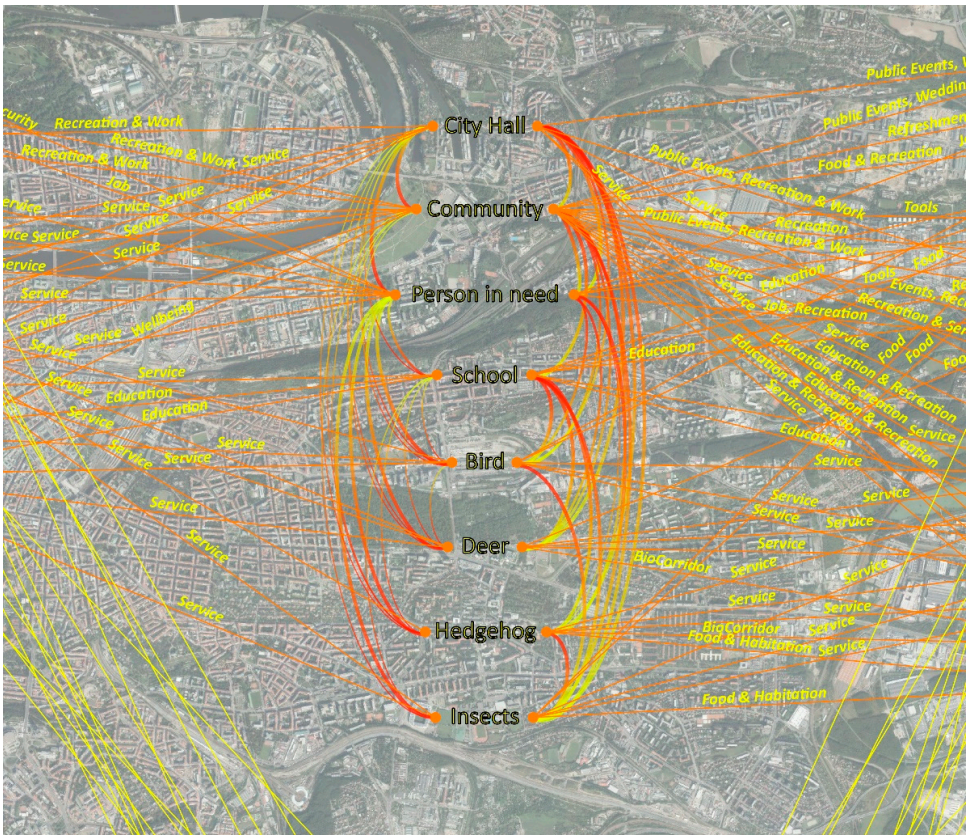

Figure 6. Detail from the Systemic Design gigamap, showing mapped human and non-human stakeholders (Davidová 2020).

4.2. The Second Gigamapping Workshop

The above workshop helped to shape and formulate the discussion for the second gigamapping workshop. This one was fully open to the public (see Figure 7) and covered fifteen participants. It was necessary that the issues were synergised before such action, and critical conflicts were already avoided. This synergy happened because different stakeholder groups' needs were already communicated by their representatives and they were aware that their points had been heard and integrated. The representatives informed their groups how they were represented and their claims considered for a larger synergetic proposal that needs to also integrate other perspectives.

Figure 7. Second co-design workshop with community representatives and stakeholders in a local museum (Photo: Davidová 2019).

The workshop followed the same methodology of combining mini- and gigamapping with presenting minimaps to others, providing scissors and reorganising the items, and relating them in the gigamap, with a final presentation at the end of the workshop. It involved all age groups and developed further interests. An elderly lady informed us on how the ecosystem and the community performed in the past and suggested the features that can be restored. A child showed a vision for the future and the school involvement. The productive-age representatives were interested in spaces for cultural events and relaxation with enough entertainment for their kids. This part of the process focused a lot on ecological literacy for the current and future generations through real-life experience opportunities and engagement. The Czech Republic has not released any document such as, for example, the 'Future Generations Act' released by the Welsh government [59]. Therefore, future generations' well-being has to be considered by the public from the bottom up as there is no legislation securing it. The increasing interest in the rise of local authorities' co-design processes is therefore significant and beneficial for the current generations to feel secure about their children's future.

All of these sessions were later concluded in the systemic design proposal interpreted by the first author (see Figure 8) to be discussed with the public. The original plan was to print out the map and collaboratively draw over it on transparent paper for public discussion. However, due to the COVID-19 pandemic, this part was cancelled, and even online events were not possible as the City Hall was busy securing the community. At the same time, the project had to follow its timeframe with its deadlines. Therefore, the further co-design process will be developed, tested, and redesigned through real life by tokenisation through assigning value to different actions and things (see Section 5) within the 'real-life co-design laboratory', as discussed in Section 6.

Figure 8. The project proposal for public discussion (Davidová, 2020).

5. The Systemic Design Proposal

The systemic design proposal integrates and synergises all results from the two gigamapping workshops (see Figure 8). While some authors suggest that intervention and observation are opposites, Midgley argued that observation (as undertaken in science) should be viewed as just one type of intervention [60]. This statement is true in this case where the roles of the facilitator and the creator are oscillating in feedback loops. The same appears across the stakeholders, as discussed in the Introduction. The current stage of regenerative co-design output that generated several collectively targeted systemic interventions and agencies proposed a token-based regenerative economy where everything existing from the former gardening allotment colony except its fences would be left on site and upcycled. This 'doing nothing' strategy, which this year's Pritzker Architecture Prize well recognised for Anne Lacaton and Jean-Philippe Vassal (48), covers existing huts, greenhouses, and animal species and vegetation. The locality will use rainwater purely for public and private showers, laundry, and taps for animals, and it will provide composting toilets. The possibility of filtering rainwater for drinking water will be investigated by the director. The locality site-use plan graduates from a more private part in the west towards a very collective part in the east (see Figures 9 and 10). Such diversity was a critical wish across all stakeholders, that the park offers both 'introvert' and 'extrovert' spaces for relaxation and events. This differentiation secures a variety of opportunities for use by both humans and non-humans of different ages.

The private and open part in the middle of the two differentiated locations is a kiosk located in an old greenhouse built of PET bottles (see Figure 11). The project will keep its existing genius locus whilst upgrading it with the opportunity to grow herbs in those PET bottles that need to create shade. The kiosk, which sells both its own and local gardeners' products, will keep being a greenhouse for its own vegetable growing. The typical products will include locally produced cider and fruit wines, lemonades and syrups, fruits, vegetables, and other self-grown food. Local people will be able to exchange their products that will be kept on site for tokens. Prague City Chairs and Tables will accompany this, a project from the Prague Institute of Planning and Development that offers free tables and chairs to all of the city's public spaces [61]. Those together with decking chairs are also placed in co-working spaces and playground areas. The co-working spaces enable schools and workspaces in nature. Such meeting spots will secure fruitful interactions as

well as opportunities for individual recreation in more secret spaces, covering all beneficial services. This service will be secured through social-justice-focused work with and by the people in need from the location.

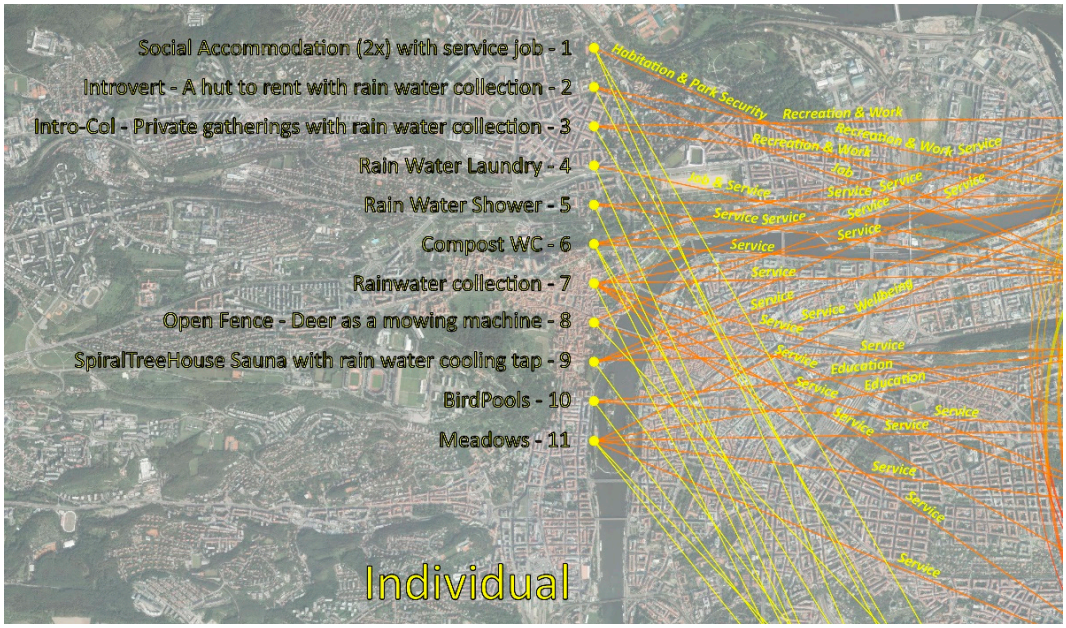

Figure 9. Individual parts of the region (Davidová, 2020).

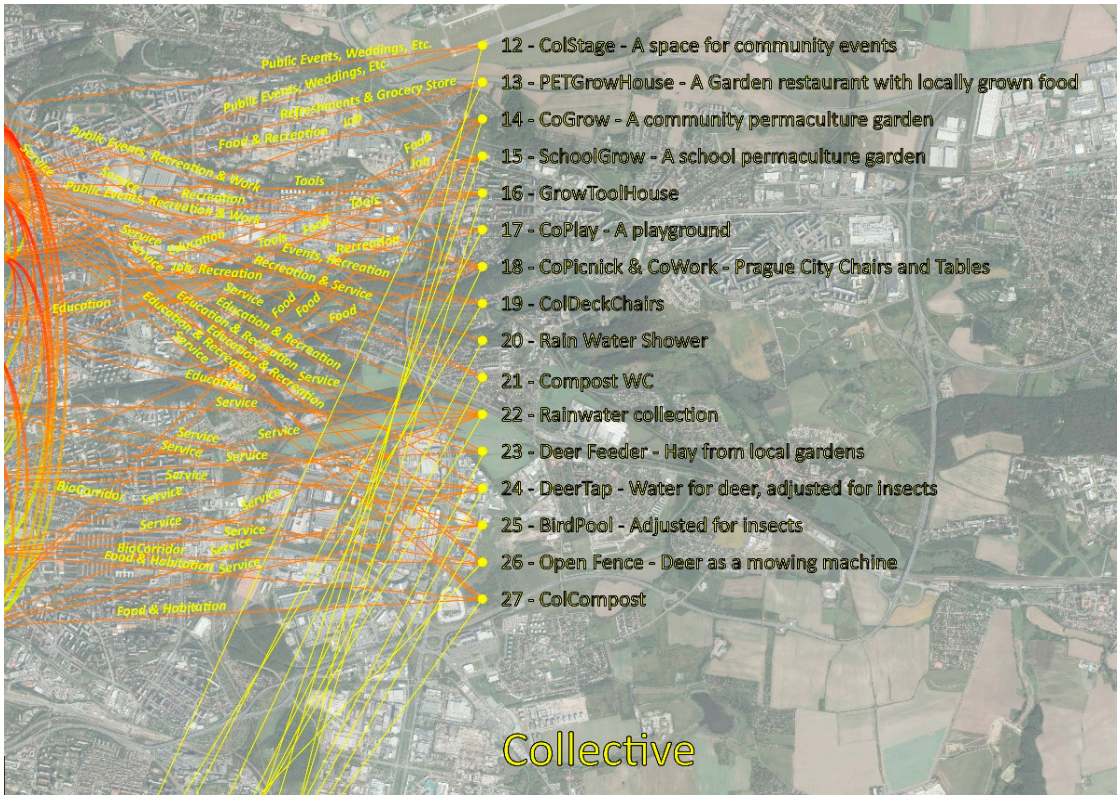

Figure 10. Collective parts of the region (Davidová, 2020).

Figure 11. PET bottle greenhouse (Photo: Kappel, 2020).

Two of the existing huts (see Figure 12) and one greenhouse of the gardening allotment colony will offer dwellings and food production to two people in need to start a new life as service administrators and service providers for the location. They will be gardening, taking care of the kiosk and its food production, renting the other existing huts, and managing the park's maintenance. Such action will secure control and the systemic regenerative performance of the park. Security is important as the existing fences will be removed to enable biocorridors with access to water streams from the forest and the deer park. Opening the park to the neighbouring forests will secure the restoration of the biocorridor function and mow by the deer in the locations that would otherwise require treatment. The location's biodiversity will increase through meadows with honey plants and water collectors, keeping its existing fruit trees and extending new plantings. With these opportunities, the site will offer even more excellent bird nesting opportunities and the occurrence of small mammals, including protected species. It will provide an edible and habitable landscape for a variety of species, including humans, non-humans, and living and non-living beings and things. Such spots will also serve the two local schools' educational purposes for which the ecologists and gardeners can provide excursions and workshops.

The details of the gigamap (see Figures 10 and 11) show the different arrangements of the individual (see Figure 10) and the collective parts (see Figure 11). They also show the services they provide to various stakeholders and actors that interact in feedback loops (see Figure 6). This agency is integrated into the token system. Therefore, the deer will gain tokens by grass mowing. The butterflies can be paid for the pollination of the school and community gardens. Both can be paid for the educational programs they provide by themselves via observation opportunities. For these tokens, they can gain a meadow with honey blooming species, feeders, or water pots. The children and the gardeners will earn their tokens on their tomatoes in the kiosk. The children can pay for their wildlife excursion to a hedgehog or a deer and a butterfly. Therefore, the overall community can

start being integrated into an economy that integrates the ecosystem as an active part of the global performance, the biosphere, or the 'Gaia' [54].

Figure 12. The territory with existing huts and greenhouses (Photo: Zímová, 2019).

All services will be accessible either through payment or through communal tokens. Tokens can be gained for supporting the services or spent on them. One can rent the remaining huts, a greenhouse, a deck chair, or a spot for gardening, and can exchange her/his vegetables in the kiosk or trade bio-trash for compost or hay for deer feeder for tokens, or earn them by watering someone else's garden or by running an educational program for a school. The school will have its own garden for gardening classes and will be able to run outdoor classes in the co-working area. It will be able to have biological and ecological excursions in the meadow, by the water and food spots for animals, and dendrological classes with the trees. Children will also be able to learn the basic principles of the cross-species circular economy with the tokens within this regenerative community. These lessons are particularly important as there are certain dimensions of food (and other things and events) that cannot be monetised and valued in market terms [62].

6. The Real-Life Co-Design Laboratory

The most important part of the discussed co-design process is the real-life co-creation. As stated, the planning problem is a wicked problem [50]. Therefore, the above synergetic systemic design proposal is just a prototype that is to be further developed through real life in real-time. In the hands of the human and non-human, living and non-living community, ecologists, gardeners, City Hall, and other stakeholders, the project will keep co-creating its systems of values and will constantly be redesigned. This performance means that if the pollinators support the garden's harvest well, they might receive more water sources and food opportunities paid by their gained tokens. If one earns enough tokens on tomatoes, s/he can extend her/his garden. Realising the benefits brought by the pollinators to her/his garden, s/he will be happy to pay them to expand their habitats. Therefore, this project is regenerative and 'time-based' [63].

Recently, the value of nature and the environment is largely (if not solely) instrumentalised, being measured in terms of the benefit accrued to present and future generations of human beings [64]. The 'real-life co-design laboratory' integrates nature and human beings into one co-performing ecosystem, as there is nothing unnatural about humans. Therefore, it considers both present and future generations of non-human and human beings. This necessity appears because humans cannot exist without the non-humans [64]. Gigamapping workshops where ecologists and the systemic design project represent non-human beings just serve as 'leverage points' [9] for the evolving social and environmental changes

in real-life and real-time processes performed by all agents present in the location. It is therefore essential to notice that the non-humans here merely act on themselves in this stage. However, they still need to be represented in the token system the same way that the Maori community represents the Whanganui River. More research towards direct actions is needed in this area.

7. Discussion

Land use provides many economic and social benefits but often comes at a substantial cost to the environment [45]. Sage et al. asked themselves questions on how and by whom the food systems transformation will be undertaken; whether Big Food will remain hegemonic in guiding a transition through the technologies of the bioeconomy, or whether we will witness a more rhizomic spread of grassroots initiatives effectively performing this transformation that will birth a food system that works within planetary boundaries to deliver healthy food for all [65]. The 'all' also integrates food for non-humans, as there is an explicit dependency across the ecosystem's food web, as discussed above. Such ecosystem metabolism in food production in systemic design relation was discussed in depth by Snow [66]. Different (local, specific) organisational and technical abilities of regional actors can make the difference in local development, because of the application of practical and technical know-how with the available regional resources [67].

This is because new events are interpreted through the filter of what was learned previously [68].

All stakeholders were relating to sustainability and sustainable development. This is, however, tricky. A pervasive quibble would be that the notions of sustainability and sustainable development remain uninterrogated in the majority of essays investigated by Horsthemke. An initial concern is their inherent vagueness: 'sustainability' could be interpreted in economic, environmental, ecological, and demographic terms, and also in terms of cultural, social, and political status quo. Sustainability as such is not a value, or rather, it is value-free and does not contain in itself any reference to environmental ethics and values. It follows that what is considered 'sustainable' in terms of use or development differs widely depending on whether it is examined from an ecological, economic, social, or political perspective [64]. Systemic design disciplines can effectively integrate systems thinking and its methods with design to address this multi-stakeholder complexity by creating new resilient systems moving towards sustainability on environmental, social, and economic levels. Systemic design adapts from known design competencies to frame, understand, explore, propose, and design complex services and systems, acting in the context of the indeterminacy of wicked problems [69].

We are all dependent on the overall ecosystem, biosphere, the 'Gaia' [54]. There is no harvest without pollinators, compost, worms, etc. However, our recent economic models do not seem to reflect this fact [24]. That is, pollinators are being killed by insecticides, which has an effect on the bird population, etc. As a result of this, the world is facing an Anthropocene extinction. This extinction means that a large number of living species are threatened with extinction or are becoming extinct because of environmentally destructive human activities [70]. The planetary boundaries model clearly shows that the biosphere integrity is beyond the zone of uncertainty (high risk), one of the two riskiest parameters on planet Earth [26]. However, currently, the World Economic Forum has recognised that blockchains, cryptocurrency, and the 'token economy' could provide a means for 21st-century communities and distributed organisations to reclaim power and enact their values in a way not possible through the 20th-century centralised banking, industrial, and commerce models [71]. A blockchain is a distributed technology that can support small and scalable 'bottom-up' innovation and does not necessarily require the large-scale investment associated with 'top-down' innovation associated with significant costs and structural changes [27]. This low-scale investment might be taken advantage of when combining the bottom-up and top-down approaches. Furthermore, the term 'community' in our work is extended from how it has been traditionally understood in an anthropocentric cultural

context [6], integrating non-humans. According to Haraway, disciplined representation in such conditions is a flawed but often noble calling. Advocacy is not just representation; there is a sensual tension and rasping, noisy friction here [72]. Though there is emerging research on the interaction of humans and other species [73], there needed to be a mapping point when ecologists and others talked on behalf of others that could not be heard to start the intervention.

8. Conclusions

COLreg is focused on developing an edible and habitable landscape for all by combining bottom-up and top-down approaches across various scales and stakeholders. Though COLreg is a very local project, it is crossing many scales through ecosystem connectivity across a large region. Here, fence removal is the most crucial intervention both environmentally and socially. COLreg is also enabling local food production instead of the provision of the Big Food services so common for the peri-urban areas of Prague.

The COLreg project is combining top-down and bottom-up approaches to envision a possible future, crossing the various needs in the community, environment, and municipality governance for co-operation and co-performance. Here, the systemic designer has a facilitator, an interpreter, and a co-creator synergising role between various needs, interests, and knowledge. Purely community-based projects often fail to interact with the larger systems. At the same time, the top-down authorities fail to address the communities' needs. The same appears with purely expert projects not addressing the communities and/or the governance. Therefore, the systemic designer's role operates well across different scales and systems and is critical to relate and connect them all into a synergetic collaboration. Therefore, it is crucial that the different representatives map their own universe. The individual assimilates their experience in terms of what has already been experienced and remembered and accommodates new experiences by noticing differences between what was learned previously and the present. This needs to be presented to individuals and to the group visually for this learning and understanding process. This has both a collaborative meaning as well as an individual and special meaning for the representatives. As the ecosystem itself cannot map its universe, the ecologist had to create its minimap instead and learn about the ecosystem herself. She had to perform an analysis and act on behalf of its different stakeholders as valuable members of the co-design group, the same way that some parents were acting on behalf of their kids or their non-present parents, relatives, neighbours, and friends. Therefore, the project's multicentred perspective is even more multiple, though it can be less precise for the agents being represented.

It was crucial to find synergies across the multiple perspectives of the stakeholders (present or not) with relatively different agendas and aims, engaging systems thinking in a design-oriented way through visual diagramming. To achieve these synergies, it is important to understand and reflect on one's own 'universe'. Mapping a universe generates empathy amongst the participants as they realise that there are multiple perspectives. Therefore, it is easier to relate these perspectives across the table and find collective agendas, even across the people with initially conflicting visions and agendas. The fact that authorities have recently realised the need for such co-creation with various communities and representatives, combining bottom-up with top-down approaches, suggests a more circular and regenerative future where everyone is involved in one open-ended project with real-life ecosystemic performance—the biosphere, or the 'Gaia' [54].

However, it is never possible to include all perspectives of an unlimited number of stakeholders. The weakness of such co-design processes is that no one can force all the community groups or their representatives to participate. Therefore, specific interaction design is necessary to engage the community. In this case, specific human and non-human target groups were preselected, though anyone wanting to be represented or to represent could join the second workshop. The events were widely publicised. We suppose that there is an explicit dependency on larger-than-human agency within our systems, and all humans should be represented as well as others. Therefore, we need to integrate the

participation of non-human members and various social groups of communities' within our economic models and world models in general. In COLreg, we propose leverage points to this that could act as inclusive opportunities for those who have not yet been heard, as the system is relatively open to all in its real-life co-performance.

At this moment, there seems to be no other way than to create prototypes and test and develop such integration in real life. These first events will then evolve in real life with the real-life participation of all, even those who were previously just potential stakeholders. That is the moment when the real co-design starts. However, the first actions are needed because we would not generate the appearance of 'all' without the initial human actions, and therefore, no interaction would occur in the first place. Much more research in this field is necessary, and it is a burning topic of today's world. Such research will require a lot of real-life experimentation and full-scale prototyping with generative interaction as well as fully transdisciplinary research and locality-specific participation. At present, the prototype is in the process of initial implementation to be in generative co-creation with all. It should never stop being constantly co-designed and redesigned in real life as a post-Anthropocene-era prototype. It is evident that such a project is not directly replicable as with reductionist lab research that, on the other hand, often does not correspond to real life. This situation occurs because the 'real-life co-design laboratory' is complex, adaptive, time-based, multicentred, and generative. It is constantly adapting to real-life situations and interactions. COLreg is a systemic research-by-design project whose methodology can be transferred and adapted to specific local conditions and problematiques, and can be developed further by new experimentations.

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