

CoCreative Roles, Agencies and Relations in Post-Anthropocene: The Real Life Gigamaps and Full-Scale Prototypes of SAAP

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ABSTRACT

The gigamaps relating full-scale prototypes series in this article are synthesising a work developed within the framework of Systemic Approach to Architectural Performance (SAAP) research by design field. Gigamapping serves as a tool for complexity codesigning through relations mapping and has no strict recipe (Sevaldson, 2018b). It is project and participation specific. The particularity of SAAP is that it develops theories and methods through experimental practice. SAAP involves Time-Based Eco-Systemic Co-Design that is performed by both living and non-living agents. Gigamapping maps and generates their relations, meaning environmental, societal and cultural aspects and processes across past, current and future habitats and edible landscapes. SAAP's ambition is to co- and re- design these complexities. Thus, SAAP is based in full-scale prototyping related with gigamapping, both placed into 'real life' environments, the "real life codesign laboratories" (Davidová, Pánek, & Pánková, 2018). SAAP is therefore considering gigamaps as well as the full-scale prototypes as "prototypical urban interventions" that can drive extensive generative agencies across various communities (Doherty, 2005) and agents; and while doing that, across much larger systems, introducing the necessary transition towards Post-Anthropocene of bio-climatic layers of cultural landscapes, their territories and life-cycles.

Keywords: Post-Anthropocene, Cross-Species, CoDesign, Prototyping, Gigamapping, SAAP

INTRODUCTION

The notion of designing with nature appears in 60ties and 70ties in the work of Scottish / American architect Ian McHarg. His 'Environmental Analysis' of territories has been composed of visual transparency layering of various eco-systemic agents maps of physical and social factors (Thompson, 1991). His student Pliny Fisk III develops this concept towards systems thinking metabolism, focusing on life cycles (Fisk, 1987), leading towards what we call today circular economy. Such complexity diagramming is already combined with full scale prototyping, focusing on rather small scale (Fisk, 1987) 'life support systems'

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at the Center for Maximum Potential Building Systems (Thompson, 1991) (see Figure 1 and Figure 2).

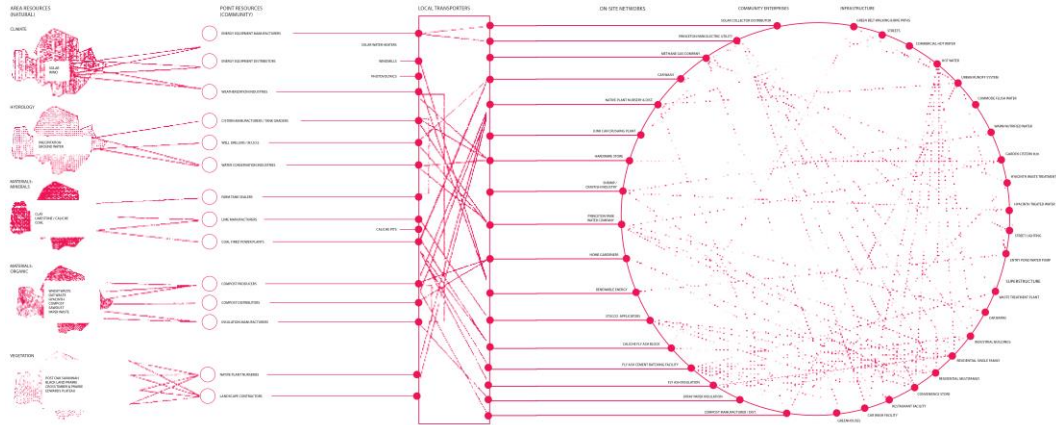


Figure 1: Network Recourses 'Pre-Gigamap' (Fisk, 1987) (diagram: Fisk III 1987, with the courtesy of Fisk and CMPBS)



Figure 2: Center for Maximum Potential Building Systems being a prototype of its own, Austin, Texas (photo: Davidová 2016)

The discussion presented in this article originates from “Systems Oriented Design (SOD)” methodology (Sevaldson, 2013) that started to evolve around 2006 in Complexity and Systems Thinking studio held by Birger Sevaldson, Per Kartvedt and Geir Øxseth at the Oslo School of Architecture and Design. The field emerged from project-based experimenting with various types of visual relating of virtual or physical items into complexity maps, later called gigamaps. Gigamaps are extensive systems maps that combine and relate large amounts of different kinds of data and data representations, to be used and related in a design processes (Sevaldson, 2011, 2013, 2015) (see Figure 3). Gigamaps are therefore a generative design

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tools and knowledge generators for processes of designing within complexity, not purely information graphics or complexity visualisations presenting certain evidence. Similar way, it was suspected about data and processes visualising by Edward R. Tufte already in eighties and further on (Tufte, 1991, 1997, 2006, 2013).

For achieving these processes, such work requires a trans-disciplinary social and physical environment, a latter called “Rich Design Research Space” (Sevaldson, 2008). Already from the time of SOD start, this particular environment motivated the relating of speculative full-scale prototyping experimentation and time-based mapping, analysing and design processes and scenarios (see Figure 4 and Figure 5).

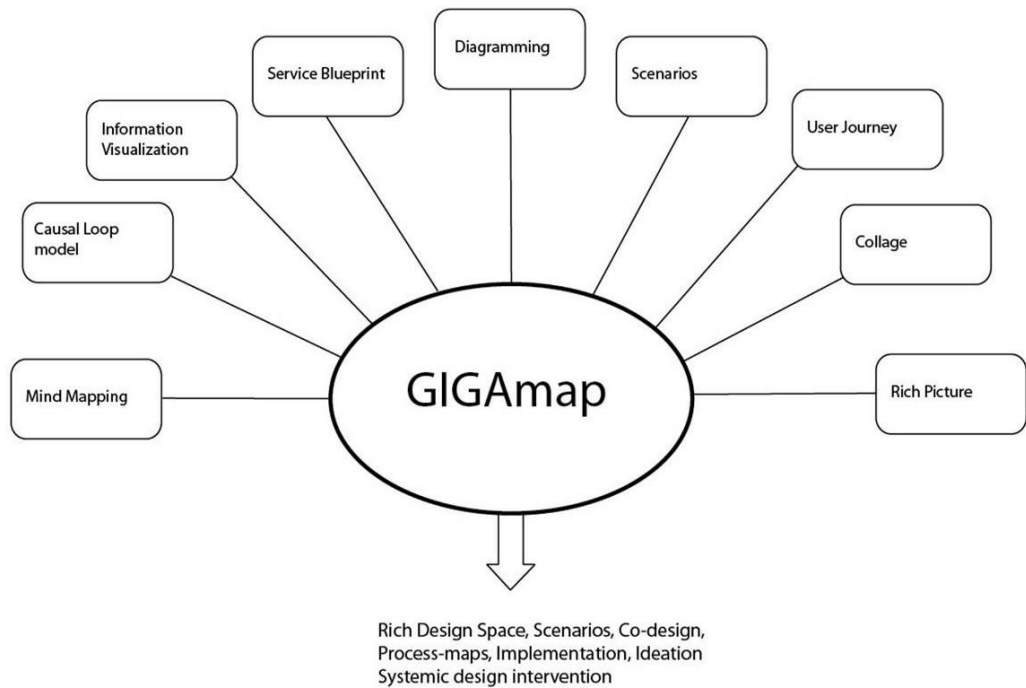


Figure 3: Types of visual relating often integrated in GIGA-Maps (Sevaldson 2014 – with the courtesy of Sevaldson)

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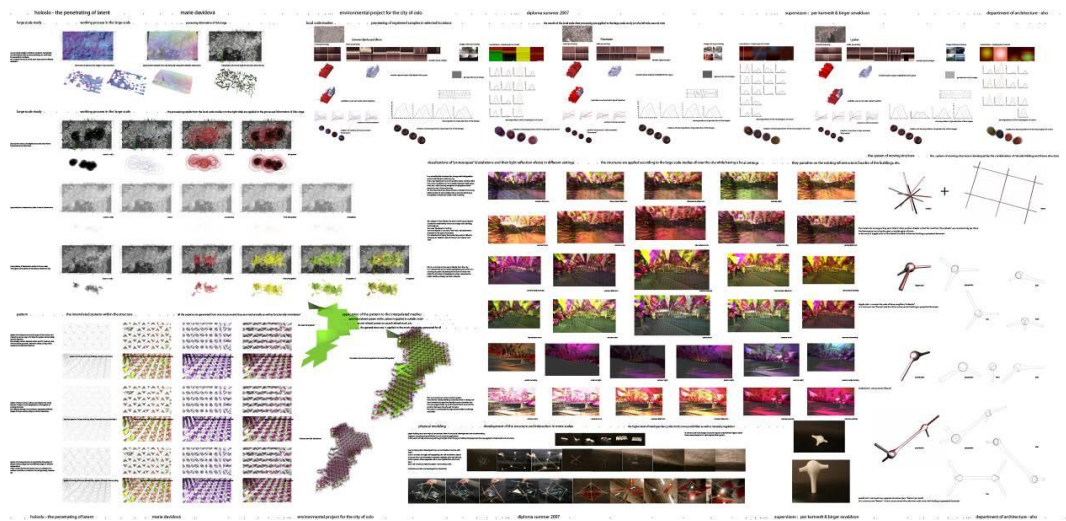


Figure 4: Gigamap of the HOLOSLO – The Penetrating of Latent diploma project (Davidová, 2007) that emerged from the Complexity and Systems Thinking studio. The map is relating digital and prototyping analyses and design processes with scenarios of design’s performances to be codesigned with the ambient environment. (gigamap: Davidová 2006 – 07) – please, zoom in on SAAP blog (Davidová, 2020)



Figure 5: Detail of the Gigamap of the HOLOSLO – The Penetrating of Latent project (Davidová, 2007) that emerged from the Complexity and Systems Thinking studio, showing prototyping design processes that was exhibited next to the prototypes themselves. (Davidová 2006 – 07)

The concept of ‘Time-Based Design’, that is crucial to this framework, was established by Birger Sevaldson, mainly in the means of relating time to design processes, analyses and scenarios in reference to generative diagrams (Sevaldson, 2004, 2005). SAAP mainly relates these design processes with the codesign of its prototypes placed into physical environment. To SAAP the eco-systemic codesign of the prototypes’ generative performance in public or other accessible space with territorial relations is central.

The tradition of prototyping re-emerged at the start of millennium when for example Michel Hensel and Achim Menges or Bob Sheil argued for relating time-based digital processes experimentations and design for performance with full-scale prototyping (Hensel & Menges, 2006; Sheil, 2008). This prototyping, however, was understood as a design process for final products, not for the process of the performance itself. This part was investigated by London

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based urban office CHORA that questioned the master plan approach and introduced 'urban prototypical interventions that were placed into randomly chosen locations. These were generating the design through interaction with the local community (Doherty, 2005).

SAAP originates from the fusion of such process-based approaches, while it is considering the copformance of prototypes and mapping placed into real life environments. These are cogenerative time-based codesign processes proceeded together with their local territory eco-systems, including humans and non-humans. SAAP therefore also investigates indigenous, traditional or natural prototypes as a reference study material that has been tested and co-re-designed with its adjacent environment over many generations. Such shift to real-life codesigning approaches therefore stimulates true "reflection in action" (Schön, 1983) or inter-action processes that are in the same time 'design results'.

1. INTERRELATED GIGAMAPPING PROTOTYPING STUDIES

The gigamapping in SAAP has, due to its nature, several interrelated layers, and agencies. Its necessity of media and agency richness has been discussed in separate paper (Davidová, 2017b). Gigamaps and full-scale prototypes serve as codesigning tool for integrating and synergising such rich complexities, addressing ambient agents and processes. This is taking place in public and other accessible spaces with territorial relations in order to engage the public and environment participation. Both the gigamaps as well as the full-scale prototypes are therefore considered as prototypes of its special kind, acting for public interaction and discussions resulting in generative codesign. Therefore, SAAP is both methodology and a 'generative design result'. The author argues that this approach addresses the question on how the local territory related architectural performance can be met in time-based systemic way.

1.1. Ray Project

A responsive solid wood envelope Ray project (Davidová, 2014b, 2014c, 2016b, 2017a) focus has been initially placed in performance codesigned by relative humidity and temperature with solid pine wood panels (see Figure 6). When the system is closed (moist), it is not allowing humid and cold air passage through its boundary. When dry, the boundary is penetrable for air, light, organisms and social interaction. Figure 7 shows the photos shot after five and four years of being exposed to weather and biotic conditions, respectively. Such micro-climate driven copformance and coliving is meant to have both, social and environmental dimensions. This is due to the interaction with surrounding environment and

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public space in a similar way as it can be observed on indigenous and traditional architectures (see Figure 10, Figure 11, Figure 12 and Figure 13).

The extensive gigamapping of data and long-lasting ongoing exposure to natural environment of the screen prototypes, resulted in interaction and codesign with both biotic and abiotic agency for its hygroscopicity and other performances (see Figure 6). The prototype got inhabited by blue stein fungi, algae and lichen. These, namely the algae, are moderating the moisture content of wood, thus co-causing its warping. Please, note also the territorial organisation of algae habitation caused by the material's fibre direction and position towards rain within the design that is affected by material performance and form. It is thus organised through its moisture and the organism's abundance and distribution interaction (Davidová, 2017a). Such agencies cogenerate the prototype's collective biotic and abiotic codesign and cocreation.

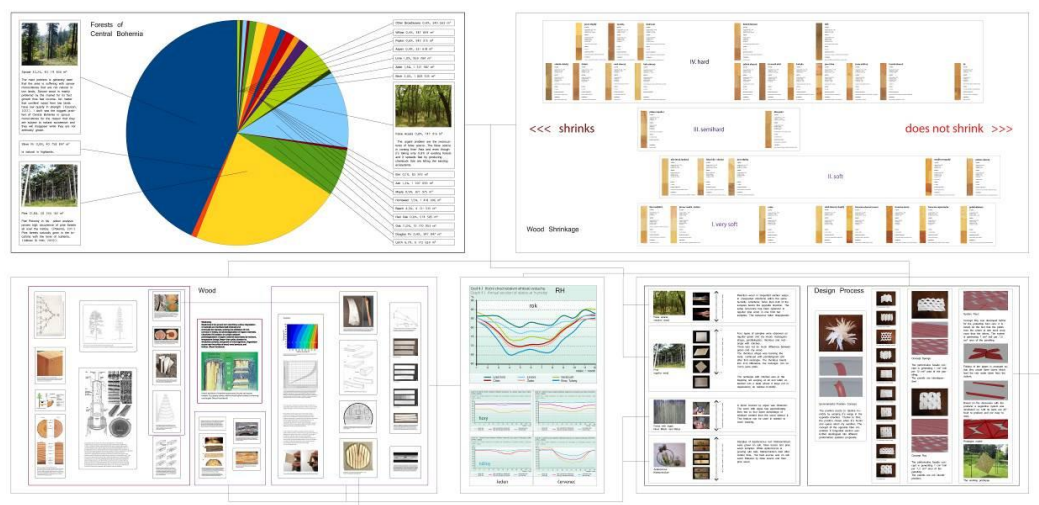


Figure 6: The Ray gigamap showing trans-disciplinary and trans-agency relations, observations and speculations within the project. (gigamap: Davidová 2013 – images from Forest Products Laboratory, 2010; Hoadley, 1980; Menges, 2009; Němec, 2005; Tolasz & Coll., 2007 or photographed by the author, used with the courtesy of USDA Forest Products Laboratory, Taunton Press, Achim Menges, Grada and Tolasz) – please, zoom in on SAAP blog (Davidová, 2020)

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Figure 7: Ray 2 Responsive Wood Envelope Prototype a) in Semi-Dry April Weather When the Screen is Partly Open for Boundary Exchange between Exterior and Semi-Interior; b) After April Light Rain (photos: Davidová 2018 and 2017 respectively)

The preceding, ongoing and further gigamapping within the project was initiated by the author's research in responsive solid wood speculation on such copformance and its systemic relations (see Figure 6). The research first investigates which wood specie to grow and harvest in relation to local eco-system and circular economy related to it. Following that, it investigates an interaction of the species related material properties in relation with micro-climatic and possible living forces that can codesign the performance. Therefore, codesigning and coliving situation might be sought for through such, first purely speculated, agency (see Figure 7) (Davidová, 2017a). This trans-disciplinary gigamap was used as a starting tool for all the following projects' investigations. It was either integrated into them or it informed the other maps for taking part in rapid learning and rapid communication in collaborative processes.

1.2. LOOP Project

LOOP – The Environmental Summer Pavilion II was a transdisciplinary studio course (Davidová, 2014a; Davidová & Prokop, 2016) that resulted in a full-scale responsive wood pavilion (see Figure 9). The pavilion was bettering an urban heated city island through its hygroscopicity, therefore through its moist air circulation. The prototype's opening was followed by EnviroCity multi-genre festival organised by the author's NGO, Collaborative Collective.

The studio's collaborative design processes, where each team member covered her/his specific role, responsibility and time frame, were investigated in better depth in separate paper for RSD 3 Symposium: "Generating the Design Process with GIGA-map: The Development of the Loop Pavilion" (Davidová, 2014a). The design and building

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processes however did not imply the end of the project, rather its beginning. The pavilion was opened to public with EnviroCity festival that in fact advances the concept of the Rich Design Research Space to generative public space. This allows extensive public and other living and non-living participants to engage and participate in the dialogical enactment of the performance and discussion on other issues regarding the initial concept of responsive wood. The performance here has therefore three major cross-related layers: a) The responsive solid wood copformance of the pavilion, b) The copformance of its opportunistic us, c) The copformance of the exhibited printed digital gigamap (see Figure 8) (Davidová, 2017b). Such dialogues become part of a continuous codesign of the project and its agendas on two layers. It has been bringing new inputs to the designers. In the same time, it is generating and testing collaborative performance of the research and involving new participants and issues into play in real time.

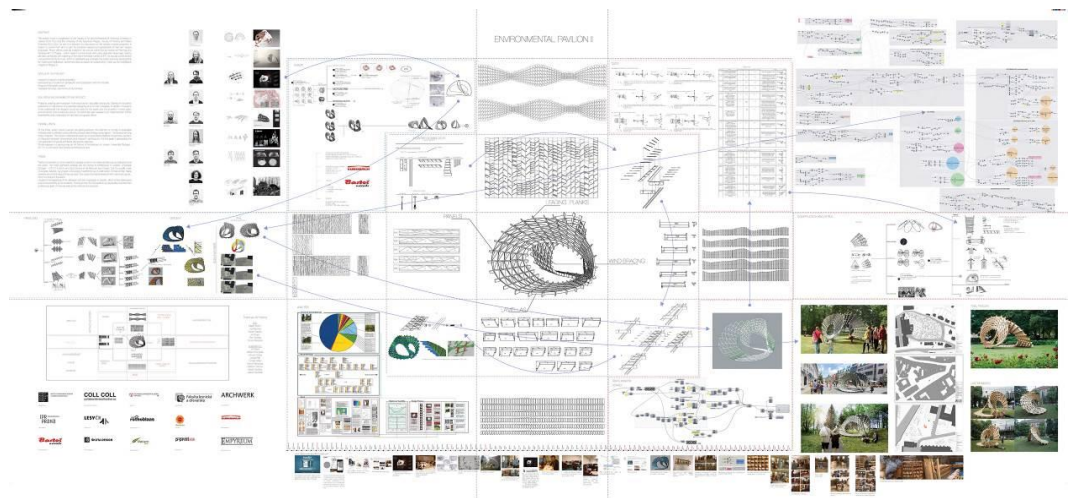


Figure 8: The digital re-designed gigamap serving for exhibition and public debate purposes in reference to the performing prototype (gigamap responsibility: Hrušová & Pokorný 2014) – please, zoom in on SAAP blog (Davidová, 2020)

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Figure 9: LOOP: The Environmental Summer Pavilion II (photo: Okamura 2014)

2. BIO-CLIMATIC LAYERS IN INDIGENOUS AND TRADITIONAL PROTOTYPES GIGAMAPPING

The research that resulted in the ratification of SAAP field originates from the need of practice to adapt to recent climate change and biodiversity loss. It claims that such adapted architectures have to consist of gradient of heterogeneous bio-climactic layers with diverse levels of their boundaries' penetrations, similarly, as shown on the above prototypes. This concept is present in traditional architectures from extreme climate territories such as north, ocean open shores or inland deserts. Today, we experience mix of such climate extremes even in formerly mild climates, such as in Czechia, the Central Europe (Czech Republic Ministry of the Environment & Czech Hydrometeorological Institute, 2015) or elsewhere. The latitudinal analysis revealed that species have moved away from the Equator at a median rate of 16.9 km decade due to the climate change (Chen, Hill, Ohlemüller, Roy, & Thomas, 2011). This is widely registered as well in Europe (European Environment Agency, 2016). Therefore, the research proposes, that we need to learn from the traditionally extreme climates' architectures, because our traditional architectures from the formerly mild climates were not adapted for such situations (Davidová, 2016a). The following gigamaps

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offer a walk across these over time co-re-designed bio-climatic layers. They are often discussed and exhibited through events such Relating Systems Thinking and Design conferences (Jones, 2017). This is to engage professional audience for discussion and motivation of implementation of such findings in practice.

2.1. Gigamapping Breathing Walls, Envelopes and Screens

The rise of a discussion on an architecture's interaction with its environment started around the start of this millennium. It involved architecture's penetrability by biotic and abiotic agency through its boundaries, the 'breathing walls' (Addington, 2009; Addington & Schodek, 2005; Leatherbarrow, 2009). This field is investigated here with direct relation to the responsive screen Ray (see Figure 7) and to the responsive pavilions (see Figure 9) in terms of their codesign of socio-environmental performance (Davidová, 2016c). The below mapping focuses on different kinds, performances and layers they serve to. The penetrable boundaries are present in various, often extreme, territories, in very different layers and scales of bio-climates. The boundaries cover fences, balconies separations, airlocks of buildings or other semi-spaces or facades. They provide climate comforts, social interactions and different levels of privacies, edible and habitable landscapes across variety of species. This study is presented in better depth in the RSD 8 paper 'Breathing Walls, Envelopes and Screens for Cross-Species Co-Living Adaptation of Built Environment: The Bio-Climatic Layers in Systemic Approach to Architectural Performance' (Davidová, 2019a).

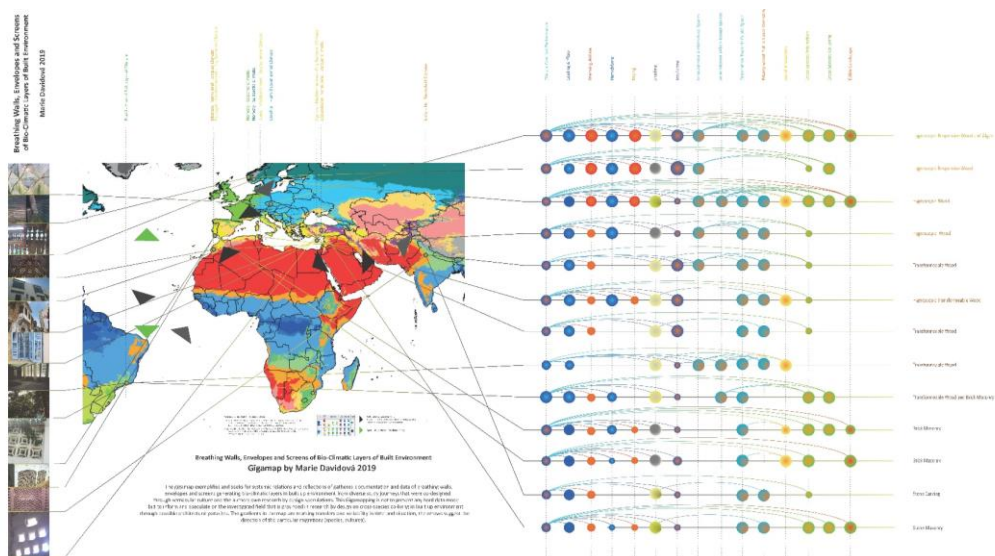


Figure 10: Breathing Walls, Envelopes and Screens Gigamap (gigamap: Davidová 2019, Köppen-Geiger Climate Classification Map: Beck et al. under a creative commons licence (Beck et al., 2018)) – please, zoom in on SAAP blog (Davidová, 2020)

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Figure 11: Breathing Envelope covering a *svalgang* of a store house from Nes in Hallingdal dated 1700-1797, now in Oslo Open Air Museum (photo: Raková 2017)

The gigamap (see Figure 10) exemplifies and seeks for systemic relations and reflections on and across the gathered documentation and data of breathing walls, envelopes and screens that are generating bio-climatic layers in built up environment. These were codesigned through vernacular cultures of climate extremes. The author relates them to her own research by codesign speculations. The map relates these schools of thoughts that have moved over centuries and over territories and Chen's data on how species recently migrate in relation to the migration of climates (Chen et al., 2011). However, this gigamap is not meant to present any hard data model or proposal. It is designed to inform and speculate on the investigated field that is grounded in research by codesign on cross-species coliving in built environment through possible architectural parasites discussed in section 3.

2.2. Gigamapping *Svalgangs* and *Skuts*

Closely related to the above study on enveloping such spaces, the study on semi-interior spaces, the architectural 'parasites', called *svalgangs* (see Figure 13) and *skuts* in Norwegian traditional architecture investigates how human dwellings adapted to extreme climates. It is looking at how such spaces were offering coliving shelters to other species and various opportunities of use to sustain life in territories of otherwise harsh conditions. The study notices that such performance is built of several non-discrete, 'breathing' layers. It is offering layered boundary penetration for biotic and abiotic agency (see Figure 11 and Figure 13). These layers are interacting in the means of climate and privacy control, mediating opportunities for climate and spatial comfort. Thus, they are offering co-dwelling, shelter, work, relaxation, social interaction, etc. Therefore, they are also supporting edible cultural landscapes in the region.

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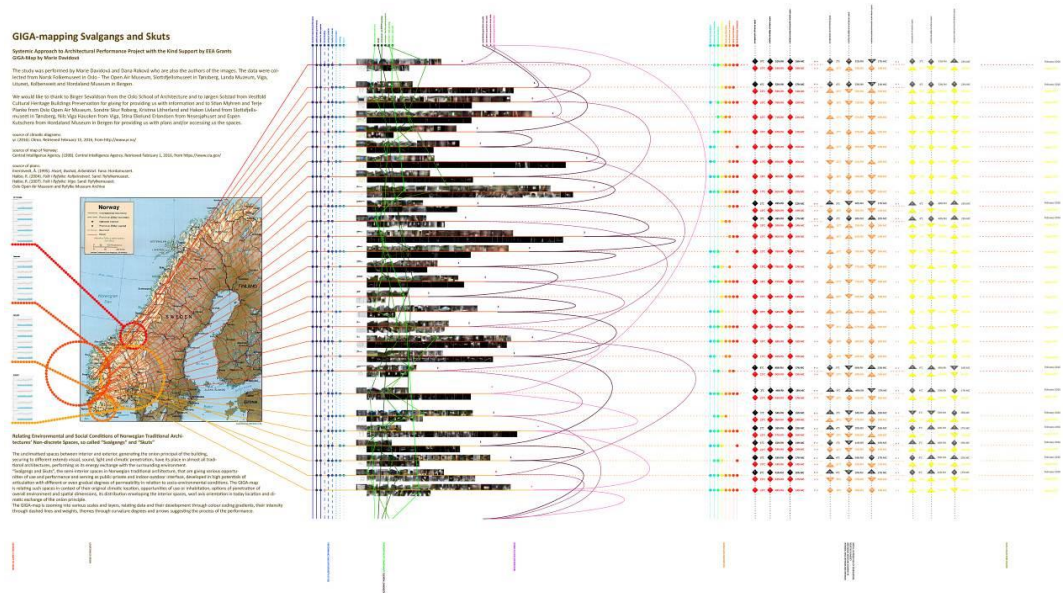


Figure 12: Gigamapping Svalgangs and Skuts (gigamap: Davidová 2017, photos: Davidová and Raková 2016 and 2017; map of Norway: Central Intelligence Agency - public source (Central Intelligence Agency, 1998); macro climates diagrams (yr, 2016), with the courtesy of yr.no – please, zoom in on SAAP blog (Davidová, 2020)

The gigamap of *svalgangs* and *skuts* maps the discussed spaces, their coliving performances and opportunities of use in relation to environmental winter and summer micro- and macro-climatic data, material, biotic and abiotic agency, penetrability and local and macro geo-territorial distribution (see Figure 12). Such complex relations and coperformances codesign real life coliving through its architectural and urban design. The gigamap serves as various levels of conscious data relations of the observed prototypes and their environmental performance interactions and adjustments to feed the research by codesign. Please, note the bio-climatic coliving layer of grass roofs at Figure 13.



Figure 13: The 'Transformer' Store House from Tjaldaj, Åseral, Vest Agder 1650, today placed in Oslo Open Air Museum (photo: Davidová 2016)

There are different concepts of boundary penetrations in these parasitic architectures. The discussed concept of the responsive solid wood panelling that reacts to relative humidity and temperature similar way as the performance of the Ray prototypes appears here as well. The tangentially cut solid wood planks in peering structure air the space when the relative humidity is low whilst they are disabling the circulation of the humid air into the (semi)interior in environment of high humidity (Larsen & Marstein, 2000). Another concept of the semi-interior responsive boundary is what the author calls the 'Transformer'. It can be fully unfolded or enclosed based on the use and climatic preferences, therefore co-re-designed by the inhabitants (see Figure 13). These two envelopes' performances types, with the physical openings kinds' and sizes' agencies were considered for further investigation for architectural applications (see Figure 23). This variety of penetrations offer i.e. different levels of privacy, storing, working, cross-species social, sheltering, and habitual opportunities. In the same time, they are moderating the micro-climate of the enclosed parts of the houses. The series of speculative mapping started with a pure question on climatic distribution from the exterior through the semi-interior to the interior. However, it raised several more related investigations and speculations that fed future design processes. One of the conclusions there is that the more extreme climate, the more opportunities of coliving with other species these traditional architectures offer (Davidová & Raková, 2018).

2.3. Gigamapping Cave Dwellings

The investigation from the extreme political situation settlements in semi-arid, low fertile land of Cappadocia can well support a route to adaptation to our similarly envisioned

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futures. The cave dwellings can be found all over the continents (Vegas, Mileto, Cristini, & Checa, 2014). However, they seem to be most extensively developed in desert and semi-desert climate areas. The following mapping represents an onsite investigation of caves and underground cities from the surrounding area of the city of Göreme, Cappadocia, Turkey. These dwellings have developed over time and cultures through layering non-discrete, heterogeneous spaces of cross-species bio-climatic layers, whilst combining additive and subtractive building techniques (see Figure 15).

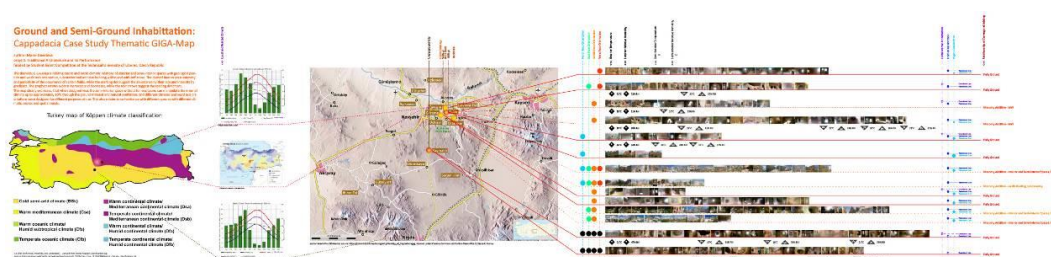


Figure 14: Ground and Semi-Ground Inhabitation: Cappadocia Case Study Thematic Gigamap. (gigamap and images of caves: Davidová 2016 – Turkey map of Köppen climate classification has been used under creative common licence (Zifan, 2016). The Map of Cappadocia has been used under creative common licence (Dörrbecker, 2009). The Climate and Temperature Diagrams are used from Climatemps.com with expired copyright in 2015 (Climatemps.com, 2015b, 2015a), Climate Zones Rainfall in Turkey map used with the courtesy of Fanack (Fanack, 2016)) – please, zoom in on SAAP blog (Davidová, 2020)

The gigamap (see Figure 14) concludes, that for the climatic transition across the bio-climatic layers, the size of the openings and their world axis orientation is not as critical as the ventilation stream cogenerated by cross-species habitation and/or water (Davidová & Uygan, 2017). The ventilation stream is codesigned by biotic and abiotic agency, such as coliving with pigeons in upper levels (see Figure 15) or by the underground water. The heat of the air that is generated by the pigeons or the cooled air that is cocreated by the underground water at the lowest levels of the underground cities are pushing the ventilation stream. This cross-species coliving habitation was crucial for life cycles of food production and energy for all, as it was also generating fertilizers, agriculture and then again food for human and non-human animals such as we know it from today circular economy models.

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Figure 15: Combination of Subtractive and Additive Building Layers that were codesigned by variety of users for variety of seasonal use over time and cultures with different preferences in still inhabited city of Göreme by both pigeons (in front) and people (in back) (photo: Davidová 2016)

2.4. Wine Cellars

Similar coliving situation to Cappadocian caves appears in traditional wine cellars in South Moravia, Czechia. The precious wine production climate is generated by additive vaulting with grass roof, not unlike in traditional Norwegian architectures (see Figure 13 and Figure 16). The interior of these cellars uses biotic algae habitation to produce targeted micro-climatic conditions for nutrients production, in this case wine (see Figure 17).



Figure 16: Combination of Subtractive and Additive Technique on Traditional Wine Cellar in Znojmo, South Moravia, Czechia. The architecture is combining such techniques with grass on the roofing and algae on the inside to generate constant climate for white wine fermentation in about 7-15°C (photo: Davidová 2014)

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Figure 17: Traditional Wine Cellar in Znojmo, South Moravia, Czechia; Largely inhabited by Algae - according to the wine grower the algae help to generate the targeted climate and algae-less cellars don't perform well (photo: Davidová 2014) (Davidová & Uygan, 2017)

3. INTEGRATION OF ABOVE STUDIES TO PROTOTYPICAL ARCHITECTURAL AND URBAN DESIGN PRACTICE

The above investigative studies, and specifically their relational speculative and evaluative mappings, led to systemic experimental architectural and urban design proposals. These are layering, integrating and synergising non-discrete, bio-climatic, heterogeneous spaces of built environment and other cultural landscapes and their territories. In the same time, they also led to practice based new speculative evaluative re-investigations, reflecting and generating new findings and applications in following projects (see Figure 18). The intervening applications engage many design-researches trans-disciplinary systemic interactions and actors across of variety of layers, scales, agencies and impacts. Therefore, the interventions co-re-design with- and are co-re-design of- their ambient environments and eco-systems, whilst synthesizing across their materials, energy, nutrients, genetic information, transitions opportunities and habitats. The projects' missions thus also include several DIY modifications, extensions and iterations by the stimulated actors and audience. The projects are not designed to introduce new species but to support the present ones. This, however, means also those that are migrating and searching for new territories due to the climate change. Such large migration is already evident (European Environment Agency, 2016).

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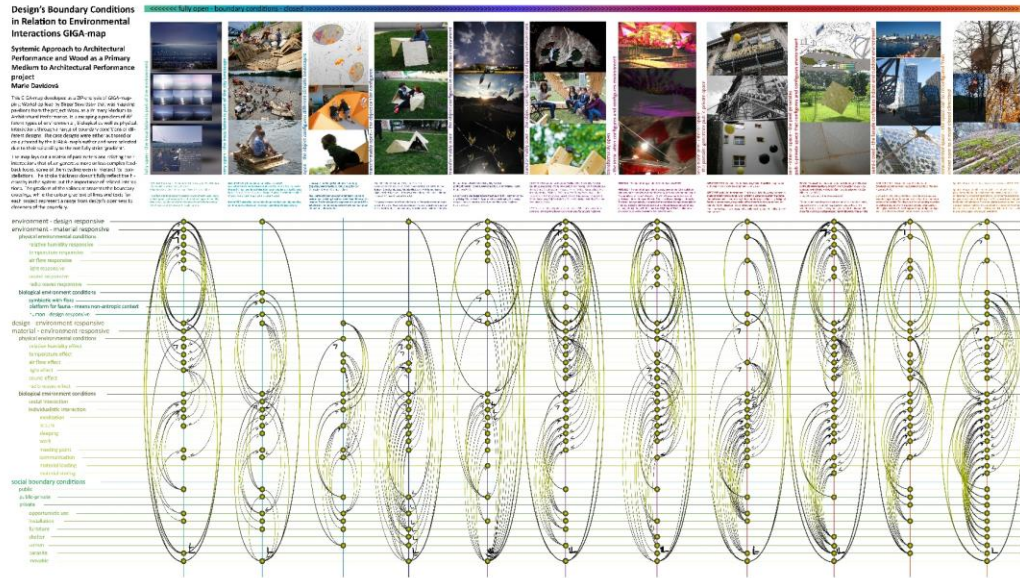


Figure 18: Gigamap of Prototypical Architectural and Urban Design Practice Projects' Boundary Conditions in Relation to Both, Physical and Biotic, Including Social, Environmental Interactions, Mapping the Spaces Organized from Fully Open to Almost Closed (Davidová, 2016c) (gigamap: Davidová 2016) – please, zoom in on SAAP blog (Davidová, 2020)

3.1. COLridor Eco-Systemic Prototypical Interventions

The COLridor projects stimulate eco-systemic generative agencies across urban and other cultural landscapes' territories (Davidová, 2019b). These trans-disciplinary community based codesign projects that are using gigamapping (see Figure 19) and full-scale prototyping (see Figure 20) co-operate and co-implement the gathered data and knowledge into an experiment with eco-systemic interventions. These are to cogenerate urban socio-cultural, eco-systemic, bio-climatic layers and bio-corridors in built environment and other cultural landscapes. The interventions are covering events as well as built prototypes. They range from TreeHugger (see Figure 20), a responsive wood insect and algae hotel that is also birds' and bats' fast-food restaurant (Davidová & Prokop, 2018); to actions such as seed bombing for interaction with food web (Davidová & Zímová, 2017, 2018) (see project's gigamap at Figure 19). The project also covers larger impact layer when offering the prototypes' parametric code for downloading to stimulate DIY. The prototypes are marked with qr code that leads to link with recipe and code download.

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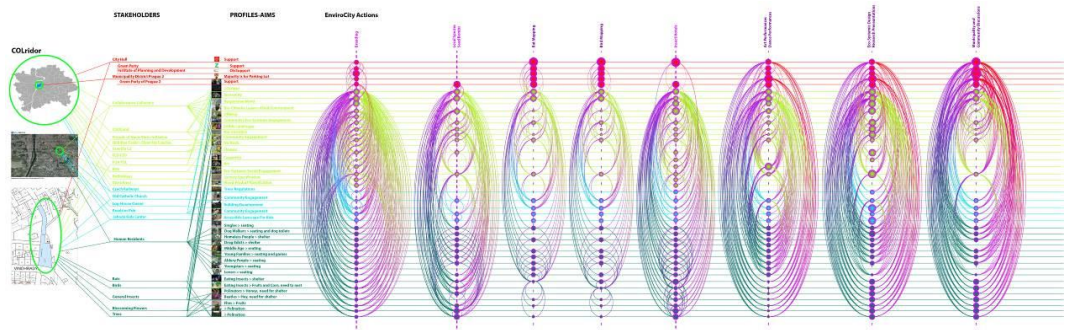


Figure 19: COLridor and EnviroCity Gigamap showing different scales, stakeholders and their agency speculation on planned actions that is still exhibited at the location to generate public and specifically stakeholders' discussion and motivation (gigamap: Davidová 2017) – please, zoom in on SAAP blog (Davidová, 2020)

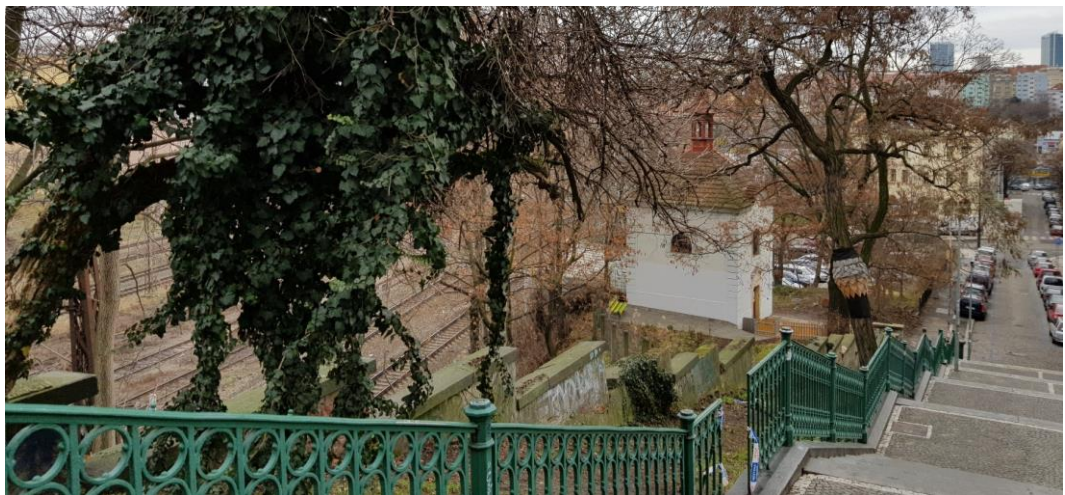


Figure 20: TreeHugger CZ insect hotel after one and half year of explosion to abiotic and biotic agency and co-habitation. (photo: Davidová 2018)

3.2. Spiralling Slope: Villa Sophia

Villa Sophia (see Figure 21) is a sweeping helix that is extending habitable and edible landscape on its roof top. About half of its volume covers underground spaces built within the sloping terrain. Following the terrain by the helix organization, the house, though south oriented, generates high standard climate comfort. It is enabling the ventilation flow through its semi-interior atrium, airing from its lowest towards its top spaces. In the winter, it is heated by ground heat pump and low sun from the south. The building and its adjacent landscape are designed to hold the today precious water, supporting the eco-system across the local species' habitats. The house is in constant codesign process with the clients, the local community, and the environment through their reflected and speculative gigamapping

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and interaction of the house via AI, being a prototype. User-wise, the environment is cocreated via use, consumption and compostation and habitation as well as by the artificial intelligence co-organising it (Davidová et al., 2018). Therefore, it is an allopoietic system that aims to be circular and self-sustainable, though it is still in a generative exchange and learning with its actors, surrounding environment, community and the territory.



Figure 21 from left to right: Collaborative Collective: Villa Sophia a) Orthophoto and south front (photos: Boys Play Nice 2019) b) Sloping Atrium generating spatial and ventilation distribution (photo: Birke 2018)

3.3. Responsive Transformer: The Bio-Robotic Adaptive Architecture

Responsive Transformer (see Figure 22 and Figure 23) is a competition entry for ecosystemic circular settlement and administration centre for the Forests of the Czech Republic. This project is synergising the above research. It is integrating the concepts of bio-climatic layers, applying responsive envelope Ray, that is bounding semi-interior space, offering biotic and abiotic exchange in a similar way as *svalgangs*. It obtains ground tempering and collects ground water. The ground water provides cooling ventilation flows such as we know it from the Cappadocian underground cities. The additive green roof insulating layer is offering “edible landscape” (Creasy, 2004) for variety of species, including humans. It is extending the adjacent forests’ landscape and the local territory. This bio-built up environment is to be heated by the adjacent forests wood waste. These structures can robotically re-transform based on the social or environmental settings through codesign of its biotic and abiotic users (Davidová, Zatloukal, & Zímová, 2017) in a similar way as the concept of ‘transformer’ (see Figure 13 and Figure 22). The work was concluded from the above preceding gigamapping studies on coliving coperformance of the prototypes from different times and cultures.

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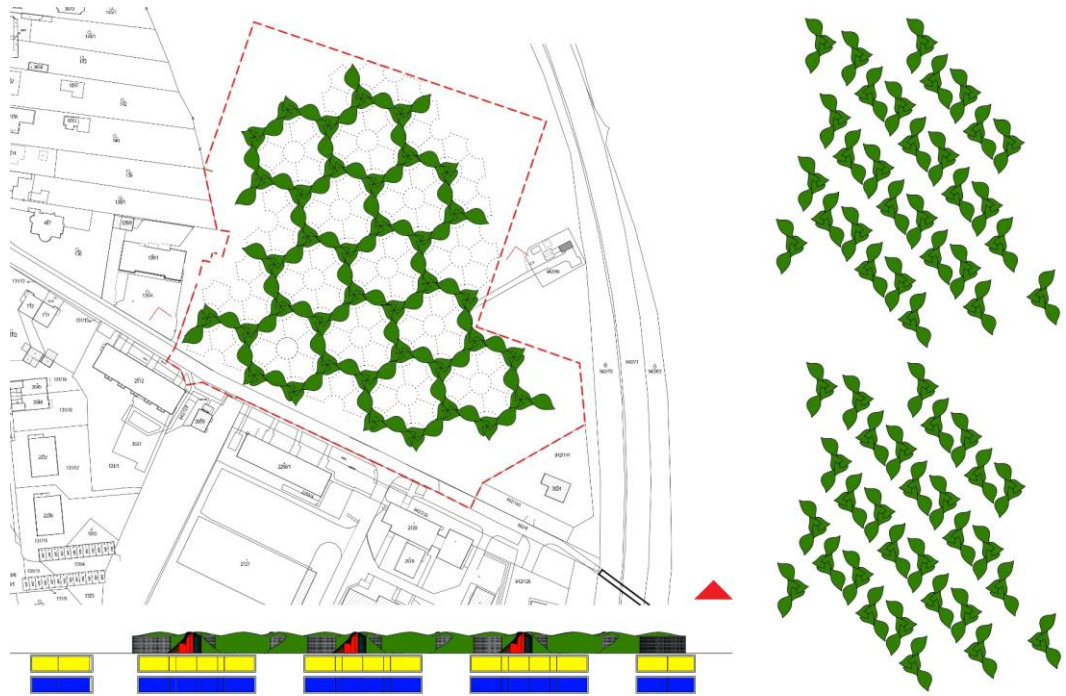


Figure 22 from left to right: Responsive Transformer in a) enclosed; b) open compositions, that can be reorganized based on the environmental and social settings (plan and section: Collaborative Collective 2016)

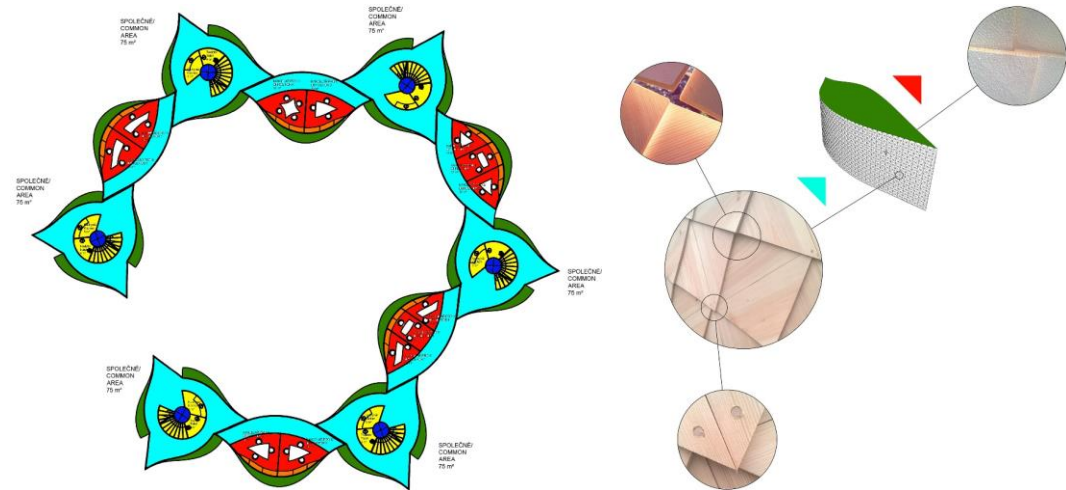


Figure 23 from left to right: A detail of Bio-Climatic Layers within the project a) a plan of cluster; b) a single cell: The layers in the cells show green surface roofing, tempering storage space, climatised office space and blue semi-interior space, moderated by Ray envelope. The joints are equipped with natural ventilation system from the underground layers of a water reservoir and tempered unfrequently used rooms (Davidová, 2017a; Davidová et al., 2017) (drawing: Collaborative Collective 2016)

4. DISCUSSION AND CONCLUSIONS

The discussed cross- and inter-related eco-systemic codesigning actors and agents within the bio-climatic layers are initiated through the full-scale prototypes and the gigamaps in order to co-re-generate the real-life territory. This in fact means architectural, urban design and other adaptations to new climates. This is involving introductions of new biodiversities if we are not to face full extinction due to the facts that the former species, as well as the architectures, struggle to sustain new environmental conditions. The cross- and inter-relations between these layers and scales seem to be crucial for the practice projects' generative real time coperformance as well as for this field's design-research development. The territory or better, the multi-scalar territories, in SAAP are the 'Rich Design Research Spaces' that are discussed Systems Oriented Design. Therefore, they are 'real life codesign laboratories' (Davidová et al., 2018). Those are being local specific and local based. They are, however, also life related to global territories. On the local level, the extended item of the gigamap participating in the eco-systemic prototypical interventions and enables larger eco-systemic codesign. It is coperforming with a 'real life' generative agency – being a time-based over-evolving 'design result'. The gigamaps are therefore prototypes of their kind. It appears that in SAAP, the gigamaps are inseparable from the biotic and abiotic coperformance of their prototypes. Both the gigamaps and the prototypes are being constantly codesigned in various iterations. Exhibiting of these also extends the projects' systems towards richness of others' inspirations and DIY iterations by both, professional and lay public makers. Therefore, there are several feedback loops circulating within these rather complex design processes. This research argues, exemplifies, and proposes paths to processes that are addressing that with today climate extremes and biodiversity loss, we need to transit our cultural landscapes' territories towards Post-Anthropocene. This needs to be done on multiple scales and layers in order to develop planetary health in its holistic concept. However, this also means that the humanity can no longer dominate over its self-created and self-appointed hierarchic systems but has to be multiple and multi-centred (Sevaldson, 2018a).

This transition cannot, however, happen directly as a revolution. It has to arrive in similar manner as natural succession, through metabolic time-based adaptations by generative interventions, evolving over time through for- and not for- profit practice and education. The biggest challenge cities face may not be solved by policies and innovative technology (in the sense of today practice). Cities require the capability to design for unpredictable and rapidly changing futures, in a citizen-centred way (Mulder, 2018). In SAAP the citizens are understood as whatever actors of biological or non-biological basis. Such transition to this

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rich design involving new ways of policy making needs to be codesigned from the bottom up (Barbero & Bicocca, 2017; Mulder, 2018) and needs to involve Systemic Design (Barbero & Pallaro, 2018). This again also needs to generate human communities' engagement, acceptance, belonging and possession where trans-disciplinary collective codesigning on cogigamapping, coprototyping and DIY, therefore also on coliving and cohabiting of local and to it inter-related global territories, are cocreative and cogenerative driving forces.

The way forward in SAAP therefore seeks for more equal ways of participation. In the 21st century, rivers and others are reclaiming their legal personhood with social, cultural, economic and environmental interests. The example that has raised this discussion was the awarded personhood rights to the Whanganui River in New Zealand (Argyrou & Hummels, 2019). The new social, cultural, economic and environmental models offer better combination of- and participation within- bottom up and top down approaches. For example, token economies do not require banks. Therefore, the value can be assigned through the communities' appreciation. This means that a butterfly can be paid for pollinating your garden and that it can buy a meadow or an insect hotel for the earned tokens. This rises new opportunities for the colived urban environment where cross-species house and flat sharing might find its clients.

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The Ray Project research by design has been led by the author in collaboration with Defio, s.r.o. carpenters.

The Loop project was led by the author in collaboration with Šimon Prokop and Martin Kloda through Collaborative Collective and ARCHWERK at the Faculty of Art and Architecture at the Technical University of Liberec and the Faculty of Forestry and Wood Sciences at the Czech University of Life Sciences in Prague. Loop studio students were Alena Novotná, Anna Hrušová, Antonín Hůla, Barbora Slavíčková, Jakub Kopecký, Jiří Fáber, Jiří

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The Responsive Transformer project was designed by trans-disciplinary team of architects from Collaborative Collective, building and mechanical engineers from Experis SDKM and landscape ecologists from CoolAND. The project was led by the author.

The Villa Sophia – Spiralling Slope was codesigned between Collaborative Collective and the clients. The project was led by the author from sketch until the building permission submission.

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