



REGREEN

NATURE-BASED SOLUTIONS

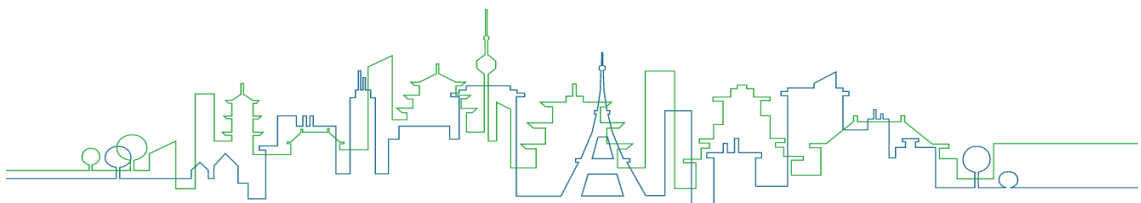
Fostering nature-based solutions for smart, green and healthy urban transitions in Europe and China

Deliverable N°5.7

WP N°5. Education, Participation, and Awareness

CHILDREN AND YOUTH PARTICIPATION AND LEARNING IN SCIENCE AND LOCAL GOVERNANCE RELATED TO NATURE BASED SOLUTIONS

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EXECUTIVE SUMMARY

Back in September 2020, researchers from REGREEN Work Package 5 on ‘Children, Education and Nature-based Solutions’ delivered a joint report on different approaches to children’s participation and learning on NBS (D5.1). The idea of Interactive Walkable Floor maps (IWF) was later on developed in dialogues crossing different Work Packages and led to collaboration between research members of WP3, WP5, WP6 and NBS planners from the three European ULLs in REGREEN. This report presents the outcome of the empirical study of potentials and barriers for teacher application of Interactive Walkable Floor maps (IWF) as platform for NBS learning in schools covering the deliverable planned.

The report is made as an academic paper planned to be submitted to the academic, peer-reviewed journal ‘Education, Sustainability and Society’ with the title “Interactive Walkable Floor maps: an educational platform for enhancing participation and learning about Nature-Based Solutions”.

Below follows the abstract:

The European Union (EU) is currently promoting Nature-based Solutions (NBS) as holistic approaches to climate change mitigation and biodiversity management in urban settings. With regard to NBS, the EU recognizes a need for education and awareness raising among children and youth. This paper explores how schoolteachers work with interactive walkable floor maps (IWF) in response to this need. We argue that IWF serve as action- and dialogue-oriented platforms that enable schoolchildren and youth to learn about issues related to NBS, while concurrently engaging in democratic processes surrounding local NBS. We also address some of the opportunities and roadblocks teachers experience in using walkable floor maps in school settings.

The paper draws on work carried out by an interdisciplinary research group in collaboration with urban planners, schools, and teachers in the context of REGREEN, an EU-H2020 funded research project. The aim was to explore and develop walkable floor maps as devices for enhancing democratic dialogue and action-oriented learning about NBS in different settings: schools, local communities and municipal governments. This co-creative research led to research-practitioner dialogues and concrete experiments in schools in three European countries. We present the theoretical ideas behind the IWF and the experimental processes and outcomes. Our findings suggest that working with IWF has the potential to promote local identity, enhance knowledge and awareness of nature in the local surroundings, facilitate the envisioning of future changes, and promote action competence among school children. Findings, however, also suggest that this usage develops slowly, unfolding step by step, over time.

The outcome of this IWF study will also be disseminated in two guidelines, one targeted urban planners, who would like to involve schools in the planning for NBS, and another targeted teachers who would like to design and apply IWF as part of their teaching.

We wish to thank the REGREEN partners from the three European Urban Living Labs – Velika Gorica, Aarhus and the Paris region – for their help and collaboration. Without that, it would have been impossible to design and produce the IWFs as well as to collaborate with schools and teachers about testing the IWF platforms.

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1 INTRODUCTION

While climate change and biodiversity loss are escalating, policy-making bodies are developing action plans to make us collectively inventing a diversity of sustainable trajectories. In the European Union (EU) one such policy for sustainable development focuses on climate change mitigation and biodiversity management in urban areas. Nature Based Solutions (NBS), a key concept in this policy effort, is defined by the EU as:

“Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.”

This definition reveals a holistic intention to integrate environmental, economic, and social needs in the development of NBS. To include citizens in these processes, the EU Horizon 2020 call for research required all proposals to address governance, education and awareness raising in order to receive economic support. Funded in 2019, REGREEN’s 22 partners have since been collaborating across cities, countries, academic disciplines and across research and urban planning to foster *“nature-based solutions for equitable, green and healthy urban transitions in Europe and China”* (<https://www.regreen-project.eu/>). REGREEN’s research on education and awareness raising included 1) explorations of children’s relation to nature in different cultural settings, 2) the development of ICT tools for NBS learning, 3) co-designing urban habitats that enhance both biodiversity and children’s play, 4) engaging with schools and children as citizen scientists and 5) developing action-oriented approaches to NBS education (Læssøe et al., 2020).

During the early days of REGREEN, researchers working with remote sensing and geoinformation presented their idea of making large walkable floor maps that could be publicly displayed in city halls to facilitate dialogue and development of urban NBS. This idea was met with curiosity by REGREEN’s urban planners, governance researchers, and researchers interested in participatory approaches to NBS education. Joining forces, we began to further develop the idea of, what we later chose to name, Interactive Walkable Floor Maps (IWF).

Box 1: What are Interactive Walkable Floor Maps (IWF)?

An Interactive walkable floor map (IWF) is a large map (e.g. 4 x 5 meter) depicting a local district, neighborhood or an entire municipality. The map is made using a satellite photo and printed on a plastic material. The size of the map invites people to experience the area depicted in its totality, and to engage with others while walking on the map. Participants locate and point out specific features, discuss what they see, know and think, and share ideas about where and how NBS could make a difference. Although the floor map is a static spatial depiction, it can be made interactive and dynamic by adding information, using QR codes, drawings, transparencies, small sticky notes, flags, etc. Urban planners can for example add QR-codes linking to materials that contain further information about problems, current projects and plans for NBS in the municipality. Other users, such as pupils and teachers, may add QR-codes or small notes, linking to their own suggestions and contributions, thus making these available to the public and the municipality. Future visions and plans for specific areas can also be drawn on transparencies and added to the map. The map thus serves as a platform for knowledge sharing and dialogue regarding status quo and envisioned futures.

While some researchers focused on experimenting with IWF as platforms to enhance processes of local governance, a small group of educational researchers and urban planners interacted with teachers to further explore and develop the potential of IWF as a platform for NBS learning in schools.

Figure 1 depicts an overview of the working structure.

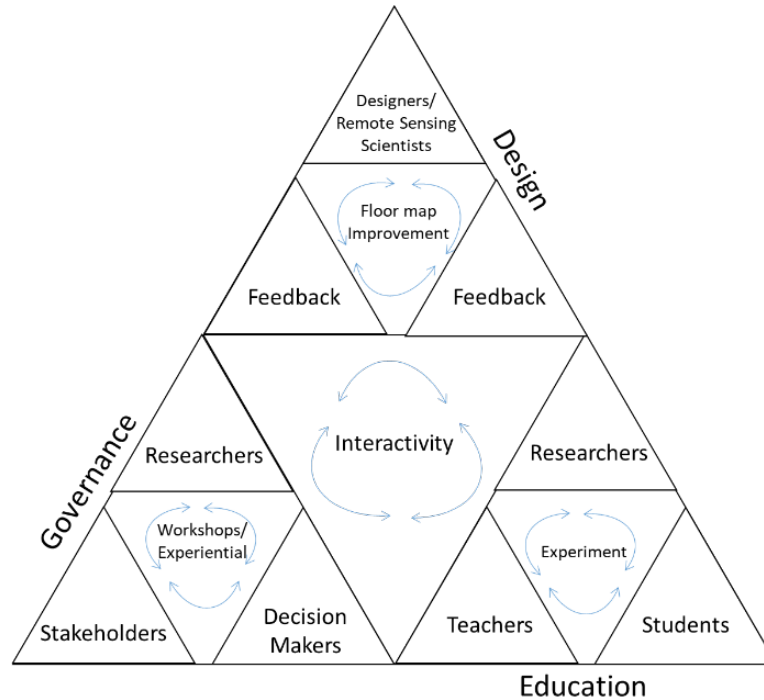


Figure 1: Interactive workflow triangle

From an educational perspective, IWF make good sense because of their potential to serve as platforms for action-oriented, explorative and empowering forms of teaching. This is attractive to teachers, as it helps overcome some weaknesses of more conventional fact- and norm-based forms of environmental education that, by ‘blaming the victims’ (Ryan, 1971), risk increasing environmental stress among children and young people (Ruff, 1990), which in turn, may lead to ill-informed responses or denial.

From a democratic perspective, walkable floor maps make sense because of their potential to empower children and young people, to encourage them to engage and make their voices heard. This is important because while NBS in urban areas affect the daily lives of all citizens, including children and youth, their daily practices in turn influence the effects of NBS. As a policy issue, this interrelation should ideally be handled through processes of democratic governance with the participation of all affected stakeholders. However, despite the fact that children and youth are present and future citizens, governance processes typically ignore their participation, perspectives, and interests. Using IWF to enhance links between school teaching and urban planning has the potential to strengthen NBS learning as well as incorporate the voices and interests of children and youth in NBS governance of sustainable transitions.

Fully aware of the ideal nature of these assumptions, we asked ourselves what might happen if schools and teachers actually applied IWF in their educational practices related to development of local NBS. In this paper, we present the outcomes of our experiments with IWF conducted in collaboration with schools in Croatia, France and Denmark. The purpose of the experimental process was not to investigate children’s learning outcome but to explore the following three research questions: 1) how

do schools and teachers respond to the idea of IWF; 2) how do teachers appropriate and adapt IWF when using them in their teaching; and 3) which insights from these experiments and dialogues with teachers can help us understand potentials and barriers to the educational use of IWF. We aim to use these responses, appropriations and insights to revise our ideas behind IWF as platforms for action-oriented NBS learning, and thus to minimize potential gaps between theory and practice.

In the next sections, we present different points of departure for exploring and answering these questions. First, we discuss theoretical concepts and inspiration and provide a review of related empirical research. We will clarify our methodological approach and empirical design, and then unfold the outcomes of our study. In conclusion, we suggest that our collaboration with teachers using IWF in school settings shows that IWF are not simple, technical ‘quick fixes.’ While IWF are quite easily adapted to different pedagogies and learning goals with regard to raising knowledge and awareness of NBS in local settings, teachers need time to discover and explore different ways of using the maps that fit with their syllabi, curricula, school bureaucracy and logistics.

2 THEORETICAL INSPIRATION

Nature-based Solutions (NBS) is an environmental planning concept. At first glance, adding education to this concept appears quite straightforward. ‘Educating for NBS’ is just a matter of providing factual information about NBS and normative guidance regarding good NBS practices. In REGREEN, however, we have approached education and NBS in a more comprehensive manner. Overall, our work has emphasized active, explorative, experiential and sensory forms of learning that allow children to engage with nature in their schools and neighborhoods, to discover particular problems and to reflect and act on solutions that nature might provide. As seen above, our approach to education and NBS was eclectic. While some researchers focused on citizen science and schoolyard species inventories, others explored children’s everyday cultural learning regarding local nature. Some worked with preschool children to develop ‘play biotopes,’ i.e., natural habitats that promote biodiversity as well as children’s outdoor play. Yet others developed digital and analogue platforms for mediating the idea of NBS to children and encouraging children to explore their own towns and neighborhoods.

A guiding idea behind this work is that educational approaches should provide learners with knowledge, sensory experiences and social competences that enable them to better understand and work with NBS (Læssøe et al., 2020). Such educational approaches involve children as learning participants, by encouraging them to discover problems, big or small, and to reflect and act on these. The experimental work with IWF was motivated primarily by this participatory, action-oriented approach. The aim was to explore whether and how it was possible to engage children in action-oriented projects related to NBS design and governance (ibid). As open-ended platforms for NBS learning, IWF may be embellished with factual information from citizen science projects, suggestions based on digitally supported explorations of local neighborhoods, and reflections on good practices and the value of nature.

This participatory, action-oriented approach to NBS education draws on theories from the field of environmental and sustainability education research³. Danish educators, Bjarne Bruun Jensen and Karsten Schnack, have developed an action competence approach to environmental and health pedagogy. It was developed in explicit opposition to the behavioral modification approach. Rather

³ For further introduction to this approach, cf. Læssøe, J.: Action-oriented environmental education, citizen science and NBS, chapter 7 in Læssøe, J., Anderson, S., Prevot, A.-C., Esbensen, G. L., Martin, L., Bénateau, S., Wiström, B. (2020). Children, Education and Nature based Solutions.

than modifying children's behavior by teaching them about what is right and what they have to do, they argued for a school pedagogy that would allow children to develop action competence as democratic citizens by genuine participation in change-oriented processes on environmental and health issues both in school and in the local community (Jensen & Schnack, 1997; Jensen, 2004). Inspired by the German pedagogical theorist, Wolfgang Klafki, they suggested supporting children's development of action competence by taking the point of departure in key epochal issues of the society, like peace, health and environment. In accordance with Klafki, they made the point that development of action competence aims at strengthening children's engagement and participation in developing concrete solutions in their own settings, so that they develop their capacity as critical and constructive citizens. Another source of inspiration for this approach was the pedagogy of Paolo Freire. His approach is quite similar to Klafki's although with a stronger emphasis of building critical and emancipatory consciousness among oppressed people by means of collective studies of reasons behind their own life conditions (Freire, 1970). Action was regarded as a key source of learning by both Klafki and Freire. However, when it comes to learning theory, Jensen and Schnack were furthermore strongly inspired by the American philosopher, John Dewey. Dewey is well-known for his phrase 'learning by doing' and for his work on education as a matter of supporting learners experience making (Dewey, 1939). In Dewey's theoretical work, this is in a similar way connected to development of the competence to participate as citizens in democracy (Dewey, 2007).

While this approach emphasized *action* as the vehicle of learning, others lay stress on *dialogue*, i.e., methods that foreground learning stemming from participation in democratic deliberation on values and decision making (Öhman, 2008; Wals, 2007). Participatory approaches to environmental education view local communities as learning arenas. A similar emphasis on learning outside of school may be found in other approaches such as place-based education and the City Study approach. In the tradition of place-based education pupils enables to leave the rooms of formal schooling and experience the environment at first hand. It creates opportunities to explore the surroundings (e.g., the landscape) in concrete ways through observation, apprehension and experimentation. As Gruenewegen emphasize, this tradition may easily be combined with the critical pedagogy of Paolo Freire with its focus on understanding the social and historical issues of the place (Gruenewegen, 2003). This comes close to the idea of the Swedish city studies, where students are studying current planning issues and the city as an organism. While doing this, they learn math, art and other kinds of knowledge needed to cope with the issues they meet in their city (Hansson 1989).

Approaching environmental education by focusing on participatory, action- and dialogue-oriented learning in local society is, thus, already well-known ideas. By drawing on these approaches in developing IWF, we aim to advance their ideas into ordinary teaching practices. IWF have the potential to serve as a platform that supports and animates teachers to practice participatory, open school pedagogy in relation to NBS and other local issues.

3 STEVENSON'S GAP

One key question, as always, is whether and how pedagogical ideas grounded in theory actually work in everyday school settings. Environmental and sustainability education (ESE), as a field, is characterized by ambitions to re-think and revamp conventional pedagogies of knowledge transmission, in which knowledge, splintered by disciplines, is taught by single teachers in indoor classrooms. This is, however, as a rather radical ambition, one that risks producing a gap between environmental pedagogical philosophies and practice. Understandings of this gap, also known as 'Stevenson's gap (Hacking, Scott and Barratt, 2007),' derive from the work of Australian professor in

ESE, Robert Stevenson, who has been studying the relationships among theory, policy and practice in ESE. Back in 1987, he noticed that there is a gap between the radical theories on ESE in the international research community and its marginalized status in educational policy and practice. (Stevenson, 1987). According to Stevenson, the gap between theory and practice is a key barrier to the ambitions of changing school pedagogical practices towards ESE. Teachers get stuck in the gap between high ideals and harsh realities. Barriers to change that constitute Stevenson's gap have since been addressed by several international studies of state of the art of ESE (Cf. e.g., Læssøe, Schnack, Breiting, & Rolls, 2009; Tilbury, 2011; Wals, 2009). These identify several barriers. In general, educational policies do not include aims and supportive structures for ESE. Rather they reduce teachers time and freedom to plan their teaching by overcrowded curriculum as well as by examination and test-systems with performance indicators that put pressure on the teachers to give priority to acquisition of factual knowledge and labor market skills on the expense of generic competence development like the competences promoted by UNESCO as key for ESE (UNESCO 2017). Another barrier, adding to Stevensons gap, are the structural division of educations in subjects and lessons, which makes it difficult to apply interdisciplinary projects outside the schools. Teachers' lack of competence to work with environmental and sustainability issues, due to the lack of ESE in pre- as well as in-service training is another important barrier. A fourth general challenge comes from teachers who are resistant to change the ways they are used to teach. In addition, a study on ESE in Germany by J. Grund and A. Brock in 2020 found that teachers were hesitant to apply participatory, action-oriented learning approaches on environmental issue, because they feared accusations of politicizing their teaching (Grund & Brock, 2020).

The question is whether these barriers can be moved or even overcome. Or to apply the metaphor of a gap, is it in any way possible to bridge the gap between the visions of action-oriented, participatory, and place-based pedagogy and the educational structures and practices in schools today? Is it an utopia or realistic in one way or another?

This paper explores the question of whether IWF, and the pedagogical ideas behind this platform, under the current conditions in schools today are impossible, or whether IWF may, by providing a stable and flexible platform for initiating action- and dialogue-oriented NBS participation and learning, serve to bridge Stevenson's gap between theory and practice.

Before we address this issue based on our empirical work, we will review the relevance of existing empirical research.

4 EMPIRICAL STUDIES

In our search for literature, we have found two strands of research on geography education that have relevance for our work with IWF. The first one is about the application of giant maps in school teaching, the other one is about participatory learning in relation to maps.

4.1 Giant maps and spatial enskilling:

In 2016, the National Geographic Society in USA launched a State Giant Traveling Map program. Over the years, the Society provided the Network of Alliances for Geographic Education with a giant vinyl floor map of States for use in classrooms. These "giant topographic maps" gave rise to a research project in Colorado aiming at studying how teachers and pupils were responding to the giant maps. They used surveys, observations as well as small essays made by pupils. The study had several findings. Of relevance for our study it that they found that "Giant maps provide an opportunity for students to

gain a sense of the world that they might not encounter from a map on their phone, on paper, on a placemat, or online” (Theobald et al., 2017, p. 27). Furthermore, they found that “Giant playground and floor maps capture students’ attention and inspire teachers to develop new ways to explain geographical features and phenomena”. (Theobald, 2021, p. 55).

There are several other studies of the development and use of giant maps. However, the value of them for our study is limited. One reason for this is that there is a difference between these giant maps and IWF. Unlike IWF, giant maps are not delimited to local areas. They may, for example, cover the entire United States, whereas IWF depict a local school district and the many familiar places where children’s everyday lives unfold. Secondly, and more important, our study focuses on how schools and teachers respond to and contextualize IWF, while the giant map studies focus on how to teach children basic geography, including spatial thinking (Downs (2017) and geospatial thinking (Zizi et al, 2021) as well as an ability to read and understand basic geographical concepts and symbols (Mohan, 2013). Thirdly, while IWF may also function as platform for teaching spatial skills, our focus is on exploring and evaluating how large maps facilitate the application of multiple interactive tools for exploring and reflecting on NBS in local areas. To facilitate this form of place-based learning, we used remote sensing images rather than topographic maps, to show local areas as realistically as possible. Although our own focus is more on how IWF facilitate dialogue and action, children obviously need to develop these basic skills to understand and work with NBS. This could be seen as yet another good reason for applying IWF as part of NBS teaching.

To sum up, empirical studies of giant maps used to teach geography point to the importance of enhancing children’s spatial thinking, stimulating basic geographical knowledge and imparting skills for understanding and working with maps. As Sierra (2020) notes, the cartography taught in history and geography classes at school generally favors the reproduction of geopolitical, geomorphological and institutional information about a country. It is not, or only rarely, used to develop the integration of the point of view or imagination of students or territorial actors.

4.2 Participatory mapping

The idea of participation with regard to maps is well-known from geographical research on ‘participatory mapping.’ While maps typically are developed by geographers, planners or other types of professionals, participatory mapping invites people into a collaborative design process, including collection and selection of data as well as how these data should be visualized on the map. The aim of participatory mapping is to make participants more actively aware of the places in which they live and of political choices and decisions made with reference to these places (Langran & DeWitt, 2020). Studies suggest that participatory mapping helps strengthen citizens’ abilities to reclaim the power to define and represent themselves. As such, it is a process of emancipation and empowerment (Harley, 1989; Crampton, 2001; Crampton & Krygier, 2006; Sierra, 2020). In participatory mapping, learners are not viewed as mere recipients of objective information from teachers and maps, but rather as actors capable of observing, understanding, identifying and proposing information. In addition, maps are conceived as *selective interpretations* of the areas they cover, and as *selectively interpreted* by participants using the maps. Based on this, some argue for the need to produce and work with multiple maps of the same areas (Langran & DeWill, 2020).

Participatory mapping may be used in schools to raise students’ awareness of map construction, for example, by letting them explore what might be missing on a map they are using and allowing them to participate in map making (ibid). Langran & DeWill describes, with reference to Emmels (2008), participatory mapping as an interactive “research method used to uncover local knowledge and

provide an understanding of the relationships between people, place, and community over time. By generating maps, participants must focus their attention on features of a specific place. This resulting map serves as a tangible reference point for discussing abstract concepts that emerge from concrete descriptions. Using the same process, students move from concrete descriptions to abstract conceptualization as they portray their understandings of the subject being studied” (Langran & DeWitt, 2020, p. 12)

While this idea aligns with our ambitions for IWF, participatory mapping does not tend to use IWF as platforms for learning and map-making. However, empirical studies of participatory mapping in schools point to potential barriers that are relevant for our work with IWF. One problem, identified in a review paper by Brown and Kytä (2018), is that students can be defined as ‘outsiders’ of the area and community where they are mapping and thus be met with distrust or encounter language and communication barriers. Another problem, addressed by the study a study in USA by Langran & DeWitt, is the diversity of student. Students can be disabled, some become easier nervous, when they are outside in certain areas, some have an autism spectrum diagnosis and feel anxious outside the classroom (Langran & DeWitt, 2020. p. 110-113). Langran and DeWitt suggest several strategies that can help teachers to take the point of departure in their pupils when planning outdoor activities.

To summarize, our IWF approach to NBS education is different from map-use approaches that focus on enskilling and participation, although these could easily be combined. Having drawn theoretical inspiration from environmental and sustainability education in viewing IWF as platforms for place-based, participatory, action-, and dialogue-oriented NBS-education, we are also acutely aware of gaps between theory and practice, and of the potential for teacher resistance to these approaches.

From the field of geography, we acknowledge the action-oriented learning connected with participatory mapping as a valuable supplement to the ESE-approaches. While geographical studies of giant maps as teaching tools did not add to our understanding of how schoolteachers might respond to IWF, they did point to the importance of taking spatial thinking and basic geographical knowledge into account as integral to IWF as learning platforms.

None of the theoretical and empirical references reviewed provide answers to our question of the gap between inspirational pedagogical ideas and actual school and teacher practices. We are still interested in exploring whether IWF and the pedagogical ideas behind these fall in to the gap, so to speak, or help teachers bridge the gap. We are, hence, still interested in the following questions. Does the IWF platform facilitate a complementary interchange between out-of-school projects and in-school teaching? Do IWF enable learning by affording the ongoing addition of new information and perspectives? Do IWF open for mutual learning between school children and external agents such as city planners, parents, NGOs or community officials? Does the platform motivate teachers to invite such external agents to visit and dialogue with children on the map? Does this indicate a potential for network- and trust-building with external agents that may support further collaboration? Finally, we are curious as to whether teacher responses are similar to those that Stevenson and others identified more than a decade ago, or whether they have changed due to the escalating climate and bio-diversity crisis.

5 METHODOLOGICAL APPROACH AND EMPIRICAL DESIGN

Our approach to the study of teacher responses to IWF has been explorative, interactive, and experimental. Because the idea to provide schools with IWF occurred first among researchers and urban planners, we wanted to *explore* how teachers responded to this idea in the three European

cities taking part in REGREEN as Urban Living Labs (ULLS). We contacted schools in the three cities and held workshops with them, to present our ideas and listen to their immediate responses. This initiated an interactive process with researcher-practitioner dialogues focused on how the teachers might apply IWF in their teaching. The exploration involved data collection through participant observation and interviews, plus collaborative exchanges with teachers to share ideas and concerns related to applying IWF in practice (Nielsen & Svensson, 2006). In this, we did not focus on issue teachers were immediately concerned with, but on the idea of using IWF as an educational platform. In two of the three ULLs, this led to experiments with IWF where teachers carried out didactic planning and facilitation, while we engaged as interactive partners on the sidelines and after lessons. Teachers did not simply ‘buy’ and apply our ideas but adapted and embellished these. They were, all in all, extremely creative in figuring out ways to apply IWF in their teaching.

The experiments we not carried out with the aim of testing a particular hypothesis. They were more inductive like technical experiments (Rauner, 1984) that draw on a learning-by-doing approach. We conducted ‘trial runs’ to explore specific problems and new ideas that might advance the design and pedagogical use of IWF. This is also action research in the sense that we experimented with what might happen if we took the role of city planners who invited schools, teachers, and children to apply an IWF as a platform for NBS learning and participation.

Although we experimented with IWF in all three ULLS (in France, Denmark and Croatia), we did not carry out stringent comparisons. Rather, we explored similar issues in three different contexts, taking into consideration the historical and cultural embeddedness of school organization and governance, teaching styles and social interaction in each context. Whereas we cannot generalize our findings to all schools and teachers in the respective countries, we can gain new insight into the general relevance of our findings. As such, the creative outcome of our collaborative experimenting with teachers can bring insight and suggest new and creative ways of using IWF in different age-grades, school subjects and sociocultural and political settings. These insights may potentially contribute to or challenge existing theories of participatory planning and ways of approaching children’s participation and learning in environmental and sustainability education.

Box 2: Empirical design:

- Inquiry sent to schools in the three ULLs with background information and invitation for workshops on IWF.
- Meetings or workshops with stakeholders and/or teachers from the three ULLs – presentation of our ideas of IWF as an educational platform and responses from the participants
- Post-workshop interviews with interested teachers regarding how they would like the IWF to be designed, their ideas for testing the IWF in their teaching and challenges they envision in this work.
- Design and print of IWFs in collaboration with the ULLs and contact persons from the involved schools.
- Period with experiments at the schools and virtual dialogue with the contact persons.
- Visits to the schools – in three of them with school assemblies /celebrations, where they presented the outcome of their work with IWFs.
- Post-experiment interviews with the involved teachers.

Six schools responded with interest to our inquiries: three from the Croatian ULL, two from the Danish ULL and one from the French ULL. The two Danish schools dropped out after the workshops, while the

schools from Croatia and France decided to continue the collaboration to design IWFs and test them in their teaching.

Developing and testing the IWF in schools was slow-going. Although the REGREEN project started in 2019, the work was heavily impeded by the corona pandemic. IWF were developed during the pandemic, but as schools were hard hit by corona-restrictions, we were first able to visit and collaborate with teachers on IWFs in October 2021 (Denmark) and May 2022 (Croatia). The French school, which had been involved in another REGREEN task, showed interest in using IWF and became a test school from November 2022. The IWF design and production phase for this French school took several months. For this reason, the test period was limited to the spring of 2023 with presentation of the outcomes and post-interviews in May and June. This short time frame restricted testing in the French school to first step experiments. We gained impressions of more long-term perspectives from post-experiment interviews. Despite these restrictions, there are findings from these first step experiments.

Box 3: Empirical material collection

- Observations and recordings from 7 seminars with presentations and dialogues
- Observations and recordings from 3 workshops
- 13 interviews
- 4 written responses from teachers
- Email correspondence with key contact persons from the schools.

6 FINDINGS

6.1 Barriers

As indicated in the introduction, teachers responded to the idea of IWF with curiosity but also with some hesitation. Although we were aware of Stevenson's gap and impediments to implementing new pedagogical ideas, we hoped teachers would see IWF as an open platform they could easily integrate into their lessons and pedagogical practices. First responses from teachers in all three countries dealt with the obstacles they envisioned. One reason for this could be that we invited schools to try out IWFs just after the Covid-19 pandemic had caused chaos in society and, not least, in schools, leaving teachers longing for normal school days without disruptions.

Interestingly, teacher across the board described regular school days as full to the brim with time-consuming teaching and administrative duties, leaving little time, inspiration or energy for innovation. Problems with a lack of time were, perhaps, in part caused by structural conditions, for example the ways school days are organized. Due to the shortage of schools in the Croatian municipality, some children attended morning classes while others attended afternoon and early evening classes. Problems might also stem from national curricula, which we found influenced teachers' responses to IWF. A Croatian geography teacher, who wanted to use IWF with his 8th grade class, felt duty-bound to follow the national curriculum for 8th grade geography, which required him to teach 'foreign continents' and not 'local society'. This pushed him to test the IWF as an optional extra-curricular activity in competition with sports and other leisure activities.

In the French school, teachers complained about cumbersome administrative procedures they had to carry out upstream of any outdoor field trips (transport, entertainment, safety, accompaniment), as

well as the time they had to spend negotiating, managing and raising awareness among parents who were afraid of letting their children participate in outdoor nature activities (safety, cleanliness, time).

In Denmark, teachers also described the national curricula as ‘over-crowded’, making it difficult to find space for topics like NBS. While the Danish national curricula include objectives for both interdisciplinary projects and subject learning, a science teacher found that trying to squeeze both in often resulted in treating both superficially. He also felt pressure to prioritize subject matter, to prepare students for their leaving exams and fulfill expectations from upper secondary schools. Exploring local areas with his students and teaching science by means of outdoor projects inevitably ‘stole’ time from teaching subject knowledge. The municipal science education coordinator acknowledged this dilemma, adding that while out-of-school projects made good sense from a pedagogical standpoint, they were problematic because teachers lacked time to organize and carry out fieldtrips, and transportation was expensive. In combination with the corona turbulence, these difficulties with time for field trips, were two of the reasons for the two Danish schools to decline experiments with IWFs.

In sum, teachers from all countries impressed on us the problem of not having enough time, money or support for field projects.

A second impeding factor had to do with teacher competence in relation to interdisciplinary collaboration. IWFs may be used for teaching several separate subjects but they also invite for exploring cases and making projects in holistic, cross disciplinary manners. However, teachers from both Croatia and Denmark related that because they are trained to teach specific subject, they are not used to working across subjects. Used to teaching only the subjects for which they are trained, these teachers are skeptical toward interdisciplinary collaboration. Time was also a factor here, for as two geography teachers noted, working across subjects takes too much time. The time factor appeared less of a problem in primary schools than in secondary levels, perhaps because in French and Croatian schools, primary teachers taught all subjects in one class.

A third factor had to do with competing issues and projects. Two Danish schools that showed an initial interest in working with IWF, eventually also pulled out as they were already collaborating with another research project on sustainability. In another vein, the French elementary school we worked with was challenged by social problems. It was located in a working-class, multicultural neighborhood where living conditions for children and their families were not always optimal, due to immigration, unemployment, single-parent families, and domestic violence. In addition, local residential areas, as well as the school grounds could be characterized as ‘overloaded’ with asphalt, making field trips and projects on NBS important, but also difficult to carry out.

All teachers do not respond in the same way. As a Danish school leader mentioned, some teachers just want to be allowed to do what they normally do, while others love to pick up and work with new ideas. One Croatian teacher noted that other teachers called him a yes-person, because he almost always agrees to engage with new ideas. He implied that some older teachers were not interested, because changing their teaching would involve extra time and energy. In France, a kindergarten and primary school teacher, one of the few who taught nature classes in the school's sparse green space, noted that for some colleagues, running nature classes, or taking part in new projects, meant taking on greater responsibility and workload, which was not an attractive option given their salary and working conditions.

For three teachers, who became very involved with IWF and REGREEN in general, the biggest obstacles were lack of backing from school leaders and town mayors. They felt a significant lack of support and

encouragement from leaders and local councils for ongoing projects and innovative pedagogical initiatives proposed by their schools' pedagogical teams. Lack of support can limit teachers' commitment to new projects and foster a strong sense of frustration and injustice among strongly committed teachers.

Beyond the barriers mentioned above there were also logistic problems with the maps themselves. Being quite large – 7x 5 m, 3x4 m – the original idea was that they should be placed in a public building like the town hall or the library, where there was room for such a large map. Teachers, however, felt it would be too time-consuming to teach classes on floor maps located outside schools. For this reason, we proposed floor maps that could be rolled out before a lesson and rolled up again afterwards. Teachers did not find this option attractive as their classrooms were small and crowded and all the rolling out and in would steal time from the lesson. The solution was to find space in the schools where the floor map could stay at the floor. One Croatian school already had a huge floor map glued to the floor in the school's aula. Finding permanent spaces for the map proved doable in both Croatian and French schools. The two Danish schools did not find suitable spaces for the floor map and dropped out of the collaboration. An important point here is that the size and configuration of school buildings, and the space available for displaying a large floor map must be taken into account to understand the level of acceptance of IWF and their placement in locations for all school users, including cleaning and maintenance staff, principals, teachers, and students.

6.2 Potentials: Teacher ideas for how to use IWF

Despite the barriers noted above, teachers from all six schools were curious about the idea of IWF as an educational platform. They provided us with many creative didactic ideas about how they might ideally apply an IWF in their teaching.

The list overleaf includes ideas that came up during our first meetings and workshops with teachers from the six schools. Ideas, not on the list, that we used for experimenting with IWF are presented in the next section.

Box 4: Ideas for teaching on the floor map:

- Teach the history of the local area, compare present map with earlier maps and discuss urban development and NBS.
- Teach basic geographic concepts and spatial skills
- Encourage curiosity by helping students identify places they know: parks, secondary schools, swimming pools, routes to school, skating rinks, railway stations, town halls, woods, etc.

Ideas for using IWF to present outcome of school projects:

- Develop QR codes, linking to student work and their suggestions for changes; invite parents and/or local council.
- Conduct field studies and make field e-books with student drawings, photos and stories about particular issues in their local areas. Add to map using QR codes.
- Teach students to use drones to take aerial photos of local sites and add these to the IWF.
- Use IWF to teach about bio-topes, bio-diversity and/or climate change. Start by exploring the IWF, then make excursions to chosen sites, and add information to the IWF using QR-codes.
- Carry out a project on coastal restoration at the beach near school. Combine teaching about coast protection with envisioning playscapes for children in the same area.
- Explore how farming and urban development have changed or are changing the spatial layout of the town.
- Explore both on the map and in the community - tensions between urban development plans and nature conservation in the local area.
- Carry out a project on local natural and cultural history. Compare old paintings photos and maps with the current IWF and add new information using QR-codes. Possibly attach testimonies from grandparents as well. Invite families, grandparents and local officials – to view and explore.
- Explore local archeological sites, buildings and myths. Visit the areas involved, write stories and add these to the IWF.

Ideas for using the IWF for dialogue:

- Ask students to take photos of outdoor sites where they play/used to play. Add these to the IWF, and show to municipal planners and employees, to create dialogue on playscapes for children.
- Draw the new bike path proposed by parents on a transparency. Add this to the IWF and then invite parents, local citizens, council members and municipal planners to a dialogue about the proposed bike path. They may be invited separately or all together.

7 THE EXPERIMENTS

We collaborated with teachers on four experiments with IWF in school teaching during the spring of 2023. Experiments were carried out in three primary and lower secondary schools in a Croatian municipality, and one in a Paris Region primary school.

7.1 School 1, Croatia:

The preparation phase – including designing, producing, and getting floor maps place in schools – took much longer than expected. This Croatian school thus received its IWF only one month before an annual Earth Day celebration, where teachers were to present the results of their work with IWF. Although time was short, one teacher used the IWF to teach his pupils about the local environment in places already familiar to children. He had his students observe the effects of deforestation and afforestation from a bird-eye perspective and study places and parts of the environment that require rehabilitating interventions. His pedagogical ambition was to encourage curiosity, exploration, reasoning and orientation in space. In an interview, he spoke of linking this geographic perspective with biology and history, to encourage students to look at a problem from multiple angles. As he noted in an email: *“Figuratively speaking, just as in war, every general plans an action using a detailed map from which he concludes the course of operations, so here in the fight for a greener environment there are no proper actions without a clear picture of the problems that need to be solved”*. Evaluating the process, he emphasized that whereas students were attracted to and stimulated by the IWF, the smaller size of the map he received was problematic due to the number of students in his class. Either the map should be larger or it should be used by smaller groups of children.

7.2 School 2, Croatia:

This school borrowed a floor map covering the entire municipality given to town planners by REGREEN. Teachers located the map in a wide part of the second floor corridor and placed a small handmade fence around it for protection. Only pupils working on the map were allowed in this area. Two geography teachers collaborated on a project they had done earlier – to explore what using the map might add to the children’s learning. The project involved a competition, where students used an app to calculate how many kilometers they bicycled during the project period. Those who accumulated the most kilometers received recognition and a prize. Because the app also showed the routes they had chosen, these could be added to the floor map. Teachers asked students to note areas where they did not feel safe on their bicycles and mark them with stickers on the IWF. The information gathered could then be used to enter into dialogue with municipal planners.

This project did not encounter the problem of ‘stealing’ teaching time, or getting permission from parents for a fieldtrip, as the children bicycled in their leisure time. Teachers reported that students were very engaged with this project and would like to continue working on it. Teachers felt the project demanded more of them - planning, organizing, coordinating - than normal classroom teaching. To address this, they agreed to develop the project step-wise – in stages. This year, they presented the results of the children’s study to parents. Next year, they planned to present and discuss the students’ results with municipal traffic planners. They felt this step-by-step strategy was necessary because constraints of school organization and time schedules, made it difficult to free up time for a project like this. To be able to continue this project in coming years, they have asked to municipality to provide them with a permanent floor map.

7.3 School 3, Croatia:

This school already had a huge floor map donated by the National Geodetic Administration. Although it covered the entire floor of the school's main aula, it had not been used for teaching. When we suggested teachers could use this map to experiment with IWF-teaching, the school leader was very supportive, as it fit well with her ambition of greening the school. Despite our offer of facilitation, only one geography teacher chose to use the IWF with his 8th grade class. As noted earlier, he carried out the experiment as an extra-curricular activity, as the 8th grade curriculum required him to teach the geography of 'foreign continents' and not "local society". Three student volunteered to take part in the project. Their task was to identify places in the city where they like to go or hang out and add these to the aula floor map using sticky notes. The teacher also asked them to come up with ideas for improving the city in which they lived. Students suggested a wide array of improvements – a hospital, more kindergartens, new sport facilities – and discussed where these should be located. Students then placed their suggestions on the map as well. When done, they took photos of the floor map and added letters and numbers to the areas with stickers referring to explanatory texts. In this way, the project became a joint learning process for the teacher and students.

Although the project was limited, it showed how teachers could work with IWF to discover and promote young people's perspectives regarding local facilities and area use. While learning spatial skills, the students also practiced action competence with regard to their local environment. The project also had an indirect effect of generating interest and curiosity among other teachers and students because the map and their work with the map was visible to all. Other students asked to be allowed to participate later in the next project of this kind.

An obvious next step might be to ask a municipal official to visit the IWF and respond to the suggestions in a dialogue with students. This step was realistic in that an urban planner affiliated with REGREEN expressed interest in participating in such a dialogue. The involved teacher was also positive, explaining that his motivation to continue working with the IWF grew from his own concerns with local development, and his interest in didactic innovation and participation in knowledge-sharing networks with other geography teachers.

7.4 School 4, France:

This school began to work with waste and recycling in 2018, supported by the French Eco-School program and the local municipality's nature coordinators. Two years later, they received the Eco-School label and joined REGREEN, selected to participate in testing a citizen science project, Vigie Nature Ecole (VNE), affiliated with the French National Museum of Natural History. Teachers worked with schoolyard species inventory protocols provided and facilitated by the museum and extended this work to creating artistic mosaics of the different species on the school wall and animating short videos that explored animals' feelings and adventures. In the fall of 2022, while working on these projects, teachers were introduced to the idea of IWF and invited to be involved in testing the platform. Once again, our preparation – finding funding, designing, and printing the map and installing it in the school – took longer than expected. This left only two months for testing and experimenting before presenting the results at an open green celebration, arranged by the school to present the children's work to the local community and municipal administrators.

A team of seven teachers interested in the IWF, collaborated on testing the IWF, developing and exploring their own ideas of how to use the map. Buying a roll of cheap transparent film, similar to that used by florist shops, they cut the film to cover areas they were interested in and added this to

the floor map. The film allowed teachers and students to draw on these parts of the map and place colored stickers for each of the selected themes: nature, daily life and culture, and art and history. They then cut and fit larger film pieces for each of the three themes. After working on a theme, they removed the film and hung it on the wall next to the IWF. This allowed them to shift between theme transparencies and to refit a theme transparency to continue their work.

On the day of the green celebration, parents, residents, the mayor and other municipal contacts were invited to view the results. Teachers had drawn streets and buildings on the film to which students added stickers and small QR-codes, linking to their photos, drawings and texts on each theme. Speaking to the audience on the theme of daily life and culture, a teacher noted: *“Our students are learning to find their bearings on the map and to situate the places they visit in relation to each other. New avenues are opening up, to pool the discoveries of each class, and consider ways of improving children’s daily lives with regard to opportunities for bicycle riding and creating shared outdoor areas where they can play. Once again, from the very first weeks, parents have been by our side, reflecting and making suggestions”*. Attached to the history theme map were, among other things, a painting by Monet showing green areas of the past in the same suburb. The transparency on local nature dealt with biodiversity. This related to their earlier work with VNE citizen science protocols and collaboration with a local artist to create mosaics for the school wall, depicting the various species students had identified in their schoolyard by using the citizen science protocols. Some students had created small, animated films about the same species and classes had developed posters to be hung on a low retaining wall, providing scientific information about animals living on the school ground.

The IWF became thus an integral extension of the school’s Eco-school activities. The city mayor, who was invited to make the opening speech, was expected to leave immediately thereafter as he normally did. Teachers were thus both surprised and pleased when he stayed for more than one hour, walking around and viewing the children’s work. Perhaps the impression he gained was similar to ours, i.e., that green school projects like this can create an atmosphere of local identity and engagement, contributing to both social integration and green commitment. A teacher expressed this aspiration with regard to the IWF:

“It’s then up to us [the teachers] to explore this new tool with the pupils, so that they can take more conscious ownership of their living space and realize that they are an integral part of an area rich in history and resources. They need to discover it, understand it, and realize that they too can take action to help it evolve”.

A combination of several factors were crucial to the teachers’ success in appropriating and applying the IWF – to actually explore three themes and present the results at an open event only two months after receiving the floor map. First, the school had already been working with green issues for some years. Second, a well-functioning team of dedicated teachers were already collaborating to develop innovative teaching that could lead to a greener school. Third, one teacher in particular played a key role in creating, guiding, supporting and strengthening the team’s collaboration, both while participating in the citizen science program (VNE) and developing ideas of how to work the IWF.

An important point here is that collaborative work carried out by the team drew on one teacher’s success in finding funding and developing partnerships with local actors to bring the school’s projects to fruition. It is common knowledge that ambitious and inspiring teachers, willing to take up the torch, generate momentum devise new paths and inspire colleagues, do not hang on trees. Nor do they always choose to stay in teaching. Difficulties in recruiting dedicated teachers willing to spend extra time and energy on projects like these can easily lead to the gradual dismantling of flourishing projects and committed teams. As this teacher noted: *“You need to create an ecosystem of projects, to make*

networks permanent, and avoid the impression of imposing something. You also need to know how to connect people by identifying their skills to create and nurture the project. For students, working with nature helps them to dream, to be curious and creative”.

The school’s green ambitions dovetailed with local ambitions for social integration and community-building. Teachers collaborated with municipality employees, local nature advisors, an artist, and, not least, the parents. Whereas this group of teachers also experienced difficulties such as limited funding, social problems, and time constraints, perhaps even more so than in the other cases, they allowed these problems to drive their search for new ways forward. Rather than limiting, lack of economic resources animated creativity in finding alternative ways of carrying out projects. The successful year-end green celebration showcased this creativity. Even teachers who helped with preparations and or just participated in the event experienced the many positive response from parents and municipal officials and shared the feeling of ‘Yes, we did it!’.

8 RESULTS

Our work with IWF was interactive and explorative. We kept a close eye on possible gaps between our idealistic pedagogical ideas and actual school contexts and practices. We also focused on teachers’ experiences of obstacles to applying IWF as well as their ideas for overcoming these. In this final section, we summarize what we have learned from the interactive design and development process in general and specifically from our experiments in the four schools.

Perhaps unsurprisingly, we found gaps between theoretical ideas for possible environmental and sustainability education, and current educational practices. Whereas we met teachers in all schools who were concerned with climate change, bio-diversity loss and unsustainable development in general, the teachers involved with IWF were not always well-versed in participatory, action- and dialogue-oriented approaches to NBS education. Often, they found this approach challenging to implement in their teaching practices.

Teachers who chose to work with the IWF noted lack of time as the greatest impediment to pedagogical innovation. They also spoke of the logistic need for easy and quick access to IWF. Their preference for maps permanently located in easily accessible school space was not always easy for schools to provide. Involving teachers in designing the maps worked well but they still needed help from professional map designers. The slow process of designing, producing, transporting and finding school space for IWF was a challenge for teachers, who did not want to waste time planning lessons and projects involving IWF when it was uncertain when the maps would be available. The slow process also reduced the amount of time available for experimentation. We are thus not able to answer questions about how the use of IWF took root in a school and evolved pedagogically over time.

Another issue that was limited by the amount of time was the interaction between, on the one hand, teachers and children and, on the other hand, NBS planners in the municipalities. We were collaborating with NBS planners from the three REGREEN ULLs in the process of designing IWFs for the school. They expressed curiosity and a positive attitude to the idea of IWF as a platform for dialogue with the children about the future of the city and NBS as an important part of that. However, we only reached the point where contact between schools and planners were established with promising intentions on both sides to collaborate on in the near future.

As noted earlier, our experiments were explorative and oriented towards exposing what has shown to be possible under certain conditions. All teachers involved in the experiments were able to apply IWF in their teaching, despite working in quite different contexts with regard to governance, school

culture and organization, and pedagogical starting points. Contextual differences were visible in the different ways teachers chose to apply IWF. Given such contextual differences, it makes little sense to speak of universal ‘best practices’ or to view the IWF as a generic educational tool that can be similarly applied in all schools. As a learning platform, IWF must be adapted to the specific needs of teachers working under particular conditions in particular school contexts. Examples provided by the four schools may however serve as inspiration for other teachers who would like to apply IWF in their own work.

Different possibilities for using IWF revealed by the experiments include the following.

- Use the IWF in geography lessons as a platform for initiating discussions and developing knowledge of local environmental issues and NBS (school 1)
- Drawing on a previous project aimed at encouraging children to get outside and ride bicycles, integrate the IWF to explore where it feels safe/unsafe to ride bikes and bring this information to the attention of city planners. (school 2)
- Use extra-curricular opportunities to involve students in working with IWF to map out and display how they use particular areas in the community and where they envision a need for changes and improvement. This can be expanded to inviting others – students, teachers, city planners – to join them on the map to discuss their suggestions for change (school 3)
- Integrate work with the IWF into ongoing efforts to create sustainable transitions at school. Use the IWF to explore social issues, local history and nature, and document this on transparencies that can be removed from and replaced on the IWF. Present the results at an open school event with participation of parents, residents, local council representatives and other external parties. (school 4)

Although our experiments with IWF met with various time restrictions, through workshops and informal conversation, we received many ideas from teachers for further developing the IWF platform. They often mentioned combining IWF with the use of GPS-maps or adding various ICT applications to the IWF. This included visionary ideas of applying holograms and augmenting reality with avatars and pop-ups that open when you move around on the IWF with a smartphone. Others suggested connecting Google Street View to the IWF, to get a street view of the places people point out on the map or using 360-degree photo boot apps to take, find and use 360 photos and videos of specific localities.

These ideas underline that IWF as educational platform still is a prototype. It works as we have shown but there is great potential for further development.

9 CONCLUSION

Educational training and policies, school structures and pedagogical practices in the different countries and specific schools framed how teachers approached working with IWF. As noted, training and working conditions were not always conducive to using the IWF platform for participatory, action- and dialogue-oriented pedagogy aimed to enhance children’s participation and NBS-learning. Rather than viewing the IWF platform as a way of overcoming Stevenson’s gap between pedagogical ideas and practice, we might see it rather as making such gaps visible. Fashioning a realistic pedagogy for the use of IWF is not just a local pedagogical issue but also an issue for educational policy writ large. In the broader context, pedagogical ideas connected with IWF ideas are intertwined with ongoing struggles for educational policy innovation. International bodies like UNESCO, UNECE and EU as well

as NGOs are currently pushing national governments to transform educational policies to advance sustainable societal transition (UNESCO, 2017; UNECE, 2005; European Commission, 2022).

Although policy transitions are necessary, any traditional top-down regulation of educational practices risks fueling resistance among school leaders and teachers. A more feasible path for policymakers would be to support the engagement with sustainable education already escalating within educational systems. When viewing IWF from this larger perspective, our study is of interest in that it shows that IWF can quite easily be applied within existing educational frameworks. It also shows that IWF inspire teachers to be creative and take small innovative steps in their teaching. While there is no guarantee that new 'sprouts' will continue to grow, there is evidence of 'first step successes' and growing curiosity. It may, however, prove difficult to anchor and develop IWF under impeding conditions.

We suggest that teacher engagement with IWF might have been influenced by collaborative support from REGREEN researchers. This points to the importance of external support, guidance and collaboration for sustainable transitions in schools. School 4 has been working five years with greening the school with support from the Eco-school network. They have received resource support from a VNE citizen science facilitator, a local nature advisor, a local artist and other sources affiliated the municipality. We find that the process of exploring and appropriating a new educational tool is variable and diachronic. Thus, it is important to support teachers during the first year, or session, of tool exploration. For many teachers, follow-up and support are fundamental in this first stage, to reassure them, encourage them, and give them the time, "to take the time" to learn how to use the tool. Progressive support during the second and third years of exploration would be an advantage for teachers. Several of them explain that, for their part, the importance of the pedagogical tool also lies in the creation of links with players outside the school (local, national, international), as this enriches the pedagogical experience for all those involved in the school (teachers, students, parents, principals, mayors, etc.).

Specifically focusing on IWF as a platform for NBS participation and learning, the relationship between municipalities and schools has obvious potential. Urban planners from REGREEN's three urban living labs have been excited and supportive of the idea of providing schools with IWF to be used as platforms for learning about possible NBS in the local area and participating in developing NBS in collaboration with the municipality. Planners have also been interested in the outcome of our experiments and open for continuing dialogue with students and teachers.

While urban planners or others working with NBS are professional when it comes to environmental planning, they are not always very familiar with school conditions and pedagogy. Thus, we hope they may find the outcome of our study helpful, while remaining aware of the challenges and opportunities described in this paper. If urban planners, environmental NGO's or other organizations would like to offer IWF to schools, they should be aware that IWF are not tools that may be expected to always work as intended. They are open-ended tools that encourage teachers to be creative and explorative in using them. The process of appropriating, adapting and applying IWF to specific teaching goals and contexts, while overcoming obstacles, is possible but takes time.

Because NBS like sustainability is a holistic concept, it is not delimited to strict technical environmental problem solving. It can easily be extended to looking for solutions to social, cultural and economic issues. When first using the IWF, teachers may, thus, not start with environmental challenges, but rather with local history and everyday life – to enhance children's local identity, local knowledge, and critical curiosity. They may spend time discussing children's visions for the future for their neighborhood, town or city. However, by involving science teachers, collaborating with nature guides

and environmental NGO and, not least, by establishing a living link between urban planners and schools, IWF show promise as a tool for exploring the environmental dimensions of local life as well.

Due to the delay caused by the Covid pandemic, we did not have an opportunity to explore whether and how use of IWF in schools might continue to grow, with ever increasing links to scientific information, historical and artistic material, and student reflections that might provide new starting points for upcoming projects. Critically, this also means that we have not been able to study the challenge of managing such a growing map. Another issue of interest to explore in future studies is the idea of IWF as a platform for children's democratic participation in development and governance of NBS. Our experiments were promising regarding IWF as medium for dialogue between children and governance agents but time limits restricted further exploration of this issue. A third issue for further studies, is whether IWF as visible physical manifestations may continue to serve as a reminder and inspiration for teachers, encouraging them to that it is alright to work stepwise and in stages, when attempting to build a bridge over Stevenson's gap.

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