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Design experiments for a development organisation in the Brazilian Amazon rainforest

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Abstract: In the midst of climate change, and the need to seek more sustainable ways of living, design is increasingly tackling problems at a societal level. This paper reflects on a strategic design project at a Brazilian foundation focused on sustainable development in the Amazon rainforest region. In this study, we asked what contributions design can bring to organisations involved in addressing development issues. The paper describes several experiments and strategies to make it tangible to non-designers how a design-led process unfolds and how design can support the organisation's efforts in delivering value to the communities they serve. The case study offers an example on how design practices combined with systemic approaches can spark increasing levels of collaboration across siloed departments.

Keywords: design practice; systemic design; organisational change & development; sustainable development;

1. Design daring to contribute to sustainable development

There is an undeniable importance of tropical forests in preserving liveable conditions for human society to thrive. Among the critical biomes to regulate Earth's climate is the Amazon Basin. This vast territory covers nine countries and has been suffering from human exploratory activities. The need to restore and regenerate the region is among the COP26 goals: "curtail deforestation" and "protect and restore ecosystems" (United Nations Climate Change, 2021). However, the challenge of developing the region without compromising the future of the next generations, the well-known sustainable development (WCED, 1987), involves dealing with wicked problems, persistent social and environmental issues.

In 1973 Horst Rittel and Melvin Webber described "wicked problems" as the issues that occur in complex situations, have no defined boundaries and cannot be solved because "there are no agreed or effective evaluation measures that would justify the claim" (Jones, 2014, p. 5). For example, there is no single solution to guarantee access to clean water because it involves transposing barriers in multiple disciplines (Banerjee, 2016). Furthermore, in sustaina-

bility discussions, traditional communities and indigenous communities, their languages, culture, and livelihoods are receiving more visibility (Porro, Veiga, & Mota, 2011) and supporting the transition to a biobased economy (Reingold, 2019). So then, what can design bring to this field?

Design holds the promise of a different way to address problems and deal with today's society's turbulence and complexity (Bason, 2016). The field is also evolving and incorporating into the practice a systemic view to be able to respond to the ever-growing complexity (Bijl-Brouwer & Malcolm, 2020). Systemic design research combines human-centred design with a broader understanding of the context and interrelationships brought by systems thinking (Jones, 2014). In terms of differences, systems thinking starts with conceptualising the system; in contrast, design thinking begins with creative inquiry. The first ends with the need for design action, and the latter can create systems in different dimensions, activities and organisations (Buchanan, 2019). One of the contributions of systemic design is fighting reductionist thinking present in several professionals, for instance, when medical practitioners are trained in specialisation for each part of the human body (Bijl-Brouwer & Malcolm, 2020). The understanding of systems can be drawn on different scales: person's life; team or organisation; place; or country (Human Learning Systems, n.d.). In the present study, the second scale is the most explored.

In light of this, addressing social and environmental problems requires multiple disciplines and understanding the bigger picture and its interconnected parts. It also means that generating solutions for those complex issues involves people with different expertise. Design thinking has already stepped into various sectors and organisations types; what remains a challenge is how to make it accessible for non-designers. The practice faces difficulties because it operates in a human-centred and nonlinear way that contrasts with established organisational routines and processes (Björklund et al., 2020). Among the aspects that lead to success in introducing design thinking is structure - frameworks and step-by-step guides - that lower learners' anxiety (Liedtka, Salzman, & Azer, 2017). The second aspect is that adopting design does not have to start with top-level management because small teams using design methods can spark interest and change in the organisation's culture (Liedtka, Salzman, & Azer, 2017).

Hence, design researchers may inform how this movement of working with development issues in complex contexts and organisations impacts design practices themselves. How and why does a design-led project aid a development organisation in identifying, creating, delivering, and implementing services aligned with its mission? How can non-designers adopt design principles to expand their solution space? There are many questions when setting up the study. By reflecting on our work with the Foundation for Amazon Sustainability - FAS, we hope to highlight the learning that the process revealed and the difficulties presented and intensified by Covid-19 measures - both contributions are relevant for keep evolving the design education and practice.

2. Project Set-up and Approach

This paper reports the process, outcomes and reflections of a project undertaken in an organisation dedicated to sustainable development in the Brazilian Amazon rainforest region. The group of authors is formed by a graduate student and two professors from the Faculty of Industrial Design Engineering in Delft, The Netherlands. The student has been actively involved in addressing societal pressing issues in Brazil by being part of youth networks and founding an initiative to contribute to the child foster care system; for which she visited FAS in 2019. The academic supervisors conducted extensive research on systemic design and design practice in European countries.

Before describing what has been done, we first introduce the host organisation of the presented study.

2.1 Foundation for Amazon Sustainability (FAS)

Having the mission of contributing to the environmental conservation of the Amazon, the Foundation for Amazon Sustainability is a non-profit civil society organisation based in Brazil with headquarters in Manaus. It was founded in 2008 through a partnership between the Government of the State of Amazonas and Bradesco Bank. Since then, it has been developing and implementing environmental, social and economic projects in the region. According to FAS 2030 Strategic Planning, the organisation draws on the 17 Sustainable Development Goals.

FAS is present in 16 Protected Areas for Sustainable Use; the organisation aims to improve people's lives, supporting sustainable ways of living that will help protect biodiversity in these areas. In 2019, 647 communities were assisted by the foundation, benefiting around 41,808 people. In addition, the organisation has recently increased its presence in Manaus, a city of estimated 2.219.580 people (IBGE, 2021), by promoting sustainable city practices and economic opportunities. To facilitate access to infrastructure, education, health, and entrepreneurial opportunities either in the Protected Areas or Manaus, FAS works with an extensive network of 261 partners and donors. For instance, public institutions, international development banks, private corporations, universities, non-profit organisations and social movements.

An example of a FAS initiative is income generation projects in which they support traditional populations by setting the enablers for the production of endemic crops and sustainable supply chains. It is based on helping the communities plan, structure, qualify and monitor their businesses and articulate access to public support. Therefore, their work navigates from the technical support to local communities to the influence of municipal, state and federal policies.

2.2 Research objective and method

The study took place in the first half of 2021, during the global pandemic; the work began with a kick-off in February and ended with the delivery of a report in July. Under the restrictions imposed by the Covid-19 pandemic, all the activities were carried out online. Working in collaboration with FAS, six people from the Innovative Solutions Department were involved directly in the process identified in this paper as the "FAS core team", which means they were part of discussions, activities, and next steps' decisions. The head of the Public Policy team was the primary contact person. However, we included staff beyond the host department as the project unfolded.

The organisation had 129 associate staff members in 2021. Figure 1 illustrates 43 participants (identified by numbers) and their departments that joined the study. Understanding how the FAS workforce interacts before and after the project became an additional measurable aspect to complement the qualitative data collected during reflection moments. In section 4, these interactions are compared and discussed.

We conducted this project both as participants and observers, which means that we facilitated the process and also made notes on meetings about how the team reacted to the methods we introduced. Workshop sessions were recorded and transcribed to capture participants' reflections. A collaborative whiteboard was chosen to document most of the activities, for instance, filling up a canvas, writing down decisions and planning the following steps. Regarding communication arrangements and meetings, email was the preferred channel; weekly meetings on Fridays ensured that everyone was on board with the process and could follow the project outcomes. Lastly, the project was carried out using Portuguese as the primary language, and the authors translated notes, canvas and interviews for this research.

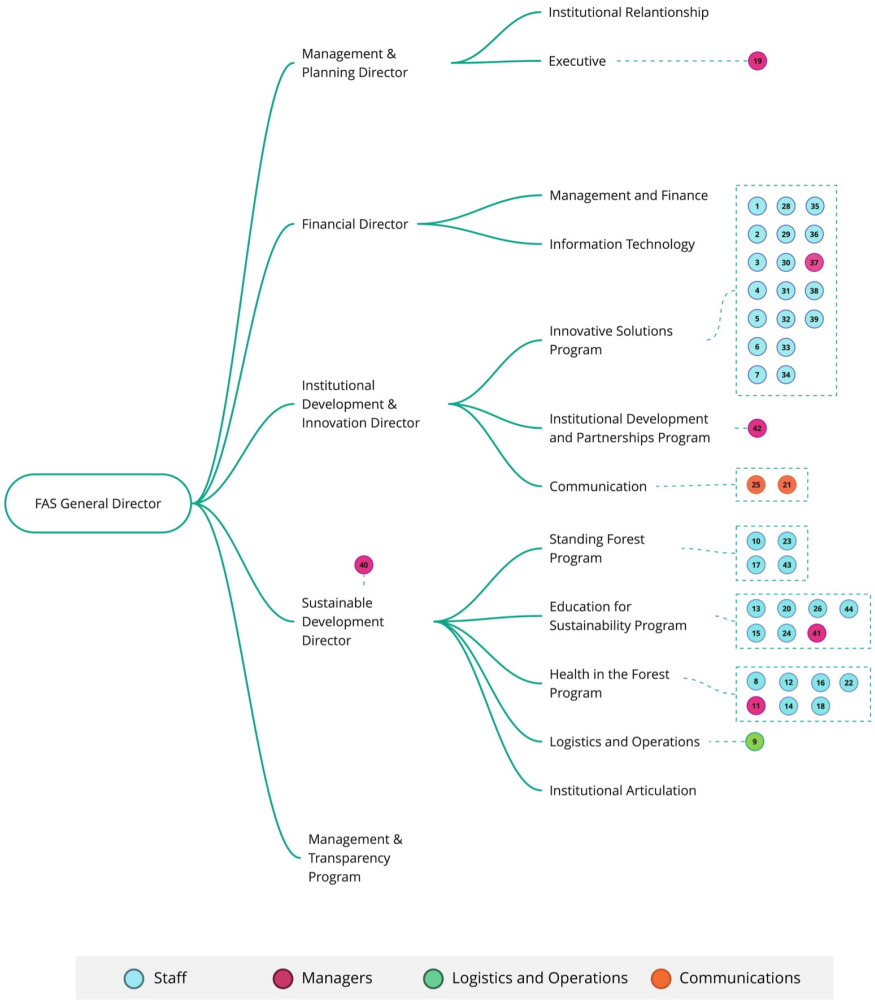

Figure 1. FAS main departments and participants involved in the study.

The project initially explored how design can propose a human-centred process when the organisation is involved in policy-making matters, then it unfolded in two streams (see Figure 2). Stream A started with several experiments that supported the redefinition of the initial problem. Later, the focus turned to test methods for co-creating an advocacy vision for the organisation. In parallel, Stream B delivers workshops to introduce basic design ideas and give hands-on experience on the design process beyond the core team involved in the beginning.

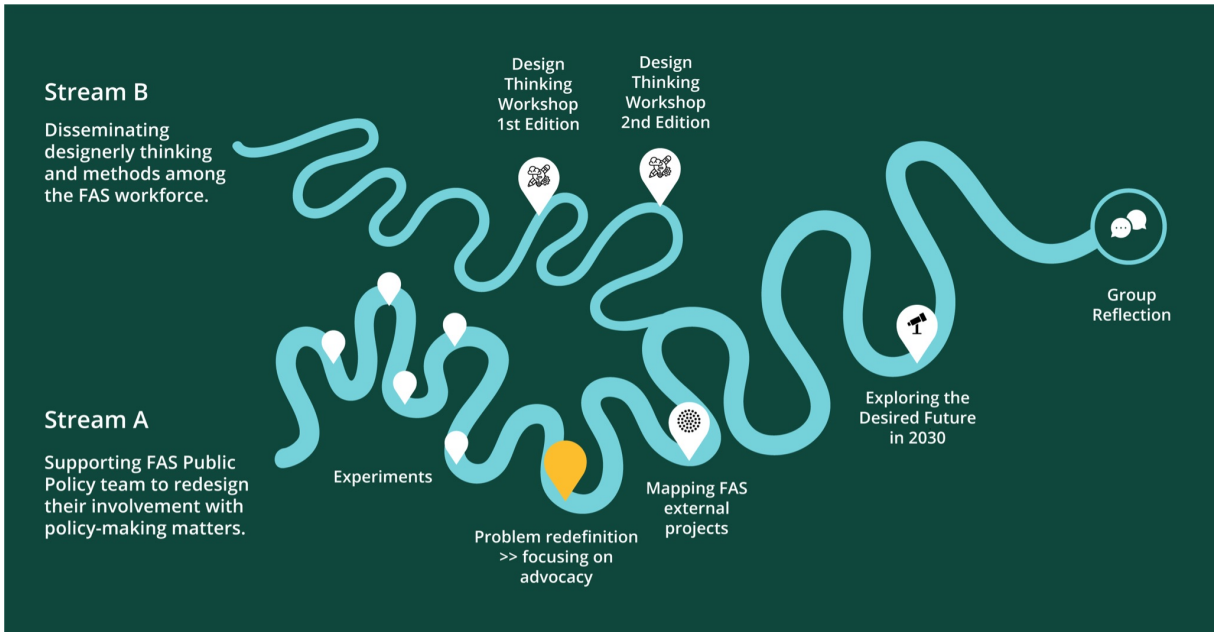

Figure 2. Two project streams.

3. Designing FAS public policy processes

Above all, we were interested in what design brings to complex challenges within an organisation that works on development issues, with our key question being: how can we support non-designers to adopt design principles to expand their solution space? The experiments that belong to stream A refer to a heterogeneous set of activities, where the purpose was to create bonds between the FAS core team and us and to explore through discussions: what challenges the Public Policy team was facing; the partner's network; and how the organisation was engaging with the communities in the urban and protected areas scenario.

In the first weeks of interactions with FAS, the challenge was to communicate how a design-led project takes place, which differs from the most common project planning approaches the organisation adopts. For instance, instead of making a plan stating the requirements of the solution, followed by the creation and implementation of a new policy-making process. We invited the team first to explore the problems faced by the Public Policy team and plan activities for the following two weeks. We were not setting the solution's requirements early, leaving room for experimentation and moving between understanding the problem and testing alternatives, demonstrating the non-linearity aspect of design practice.

We implemented the experiments differently by filling the canvas on collaborative platforms such as Miro and Google Slides or organising interviews with staff working in the field and interacting closely with those benefiting from FAS services. There was a gradual increase in the number of issues raised; for instance, we registered problems about writing policy briefs, evaluating policy implementations, engaging with partner organisations, and communicating results to funding partners during the meetings. Facing issues of this more strategic nature, we suggested finding a focus point to concentrate our efforts.

3.1 Redefining FAS public policy priorities

Once there was more clarity that "design" was not referring to graphics or concrete objects, the FAS core team increased the project's issues. We requested that they reflect on all the documented problems and choose one to be the main focus of the following weeks. We observed that this decision was emotionally tricky because all issues were relevant in their view. To overcome this challenge, we reassured them that moving forward with one point would not mean not going back or erasing the relevance of the issues raised. However, with the resources available (time and staff), focusing the effort will lead to more meaningful outcomes, such as generating and testing solutions and learning about the problem.

When the weight of making the right decision was off their shoulders, and that design involved experimenting, trying and learning from the failures, they decided that the lack of clarity on what policies the organisations wanted to influence left their advocacy work dispersed. For example, the head of the Public Policy team described that when participating in multiple external events, they did not know how to position the organisation in an array of policy themes or support the FAS communication department in writing and producing content related to public policy changes.

Therefore, the project focused on exploring ways to build an advocacy vision from this point. By advocacy, the project adopts the definition as a political activity addressing structural matters by proposing changing a law, public budget or improving the policy implementation to allow people to access fundamental rights (Barrett et al., 2016; Fox, 2001). Although the following section describes which methods we proposed, our interest is to capture how design practice could support the Public Policy team in the vision creation.

3.2 Co-creating an advocacy vision

FAS undertakes projects in different fields, from bioeconomy to health, which means navigating through various policy fields. For instance, the policies that regulate businesses that explore the local biodiversity are different from the policies that ensure priority vaccination to indigenous communities. The public policy team assumes that having areas to focus on will enhance the assertiveness in communicating with outside stakeholders. And based on this assumption, we propose two main activities that integrate an attempt to co-create an advocacy vision. Similar to experiments that initiated the project, we tested methods and learned from the outcomes with less pressure to validate the advocacy vision in the timeframe. Furthermore, we used the term "co-creation" to emphasise that the process needs to include people beyond the FAS core team; managers have a holistic view of the organisation and staff working in the field that has close contact with primary users of FAS services.

The first activity captured the current moment, a photograph of FAS external projects. For this, 22 employees joined a session and filled out a form where they input the projects they were familiar with and related to policy themes. For instance, describing the Solar Lab pro-

ject and connecting it with the following policy themes or adding a new theme: Mining; Deforestation, Fires and Forest Concessions; Bioeconomy; Public Health; Education and Citizenship; The project does not have a priority theme; Other. After gathering the data, we analysed, deleted double entries with the public policy team, and clustered the themes suggested. Finally, to facilitate understanding of the information, we generated an infographic (see Figure 3).

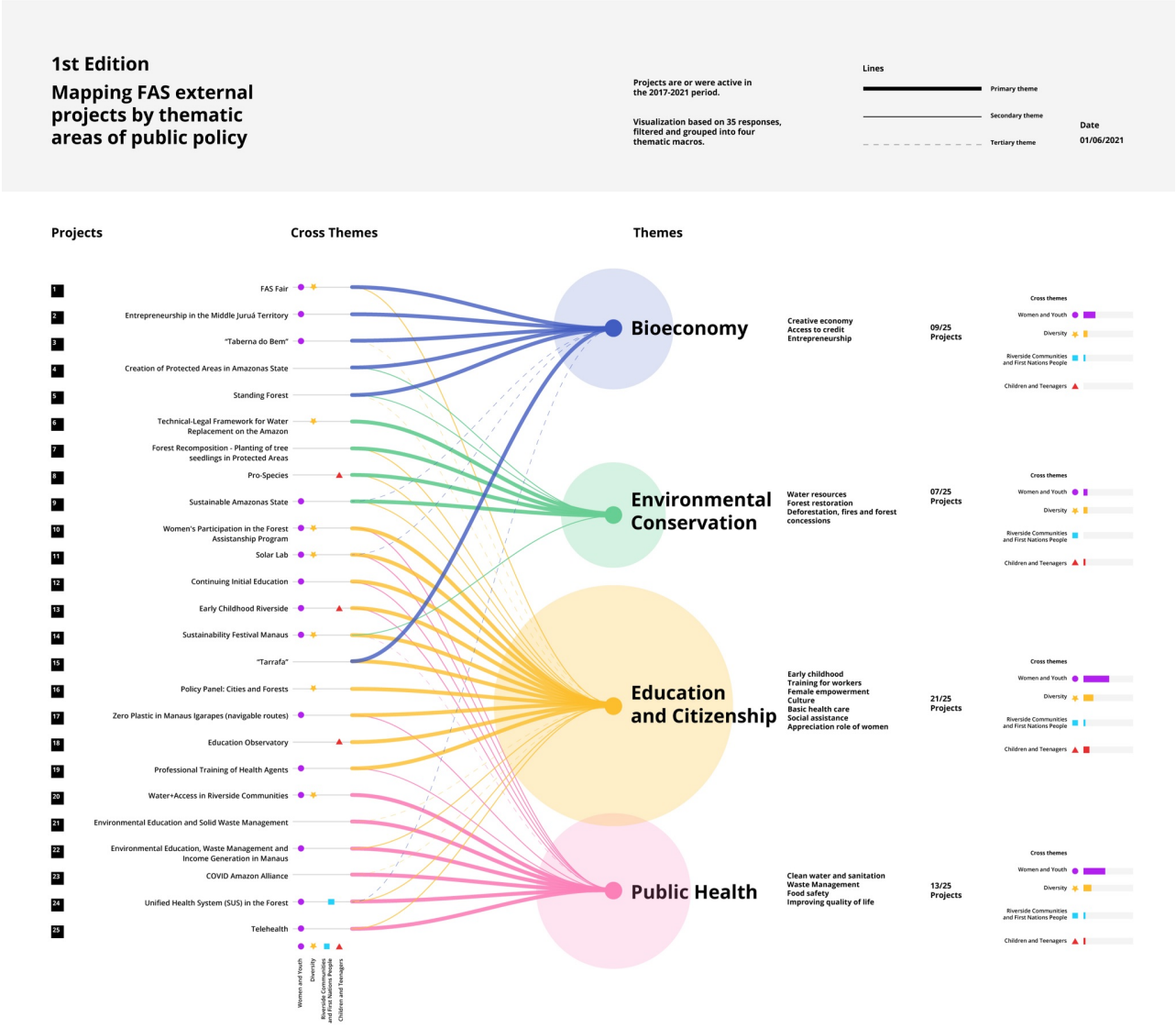

Figure 3. FAS external projects infographic.

On a side note, we should mention that we noticed increased engagement at this part of the project. *"The infographic was not created from the Public Policy team's viewpoint solely but considered the input from 22 participants"*, a comment from the head of the public policy team highlighting the benefit of viewing the organisation as a system of interconnected people working in interlinked projects. Second, in the last sessions, we were facilitating less and

more observing the meeting. FAS Managers and the head of the public policy team discussed and registered on the whiteboard by themselves.

Due to time restrictions, we could not continue working on the advocacy vision. However, the two main activities made tangible for FAS are how to organise activities that enhance collaboration and participation from other departments in tackling interconnected subjects such as policies.

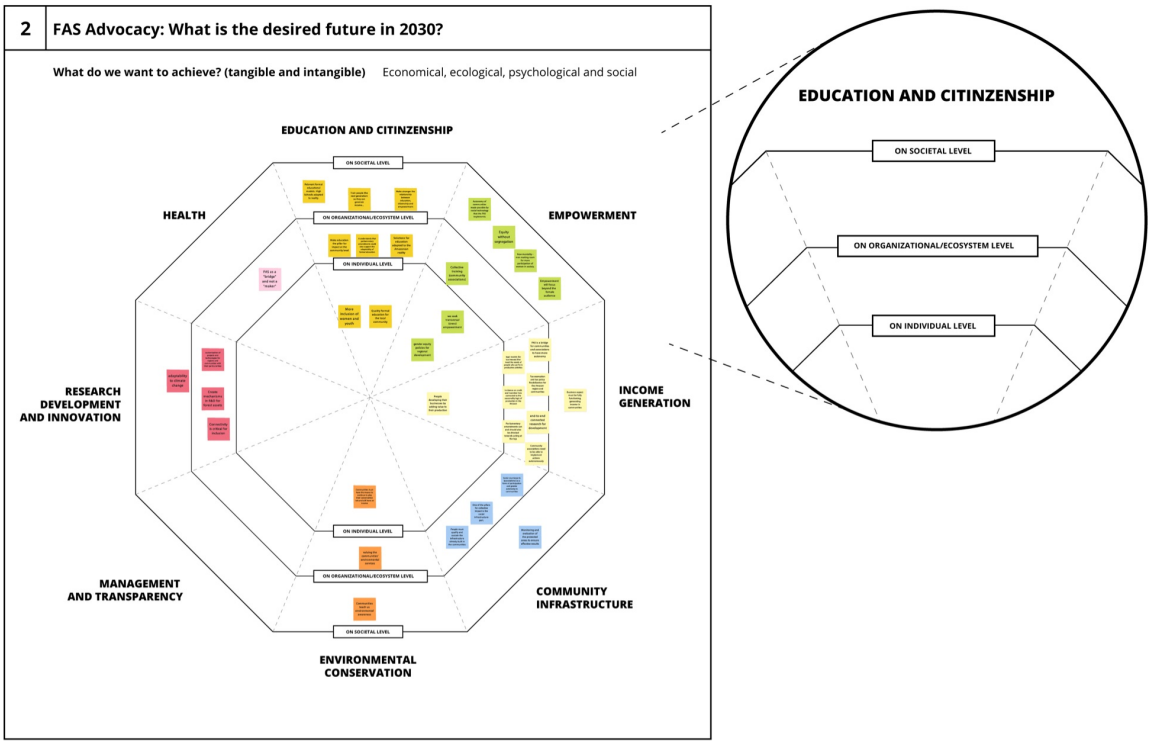

Figure 4. Canvas for registering the policies changes FAS wants to achieve in 2030. It builds upon the eight organisational strategic areas and three levels of impact.

3.3 Design thinking training

Stream B (from Figure 2) was open because a design-led approach was a novelty to the FAS core team, and terms such as "human-centred" and "prototyping" were unclear on how they could be applied in the context of the public policy team. So we decided to deliver design thinking workshops to give hands-on experience using methods from problem identification, ideation and prototyping.

We organised four sessions; in three hours, participants had a 30 minutes introduction on aspects of design practice followed by 90 minutes of practical exercise and ending with 30 minutes of group reflection. The final part was especially interesting for the present research; we asked, "How has talking to other participants influenced your project?", and came answers, for instance, *"To identify a need that the participant [#7] himself did not know he had."*

The first workshop edition was open to the Innovative Solutions Department staff, and the second edition was available to the whole organisation. The structure remained the same; the only change was that participants worked on redesigning a wallet for their partners. The latter participants redesigned the "FAS Happy Friday" group bonding activities that meet Covid-restrictions. Figure 5 illustrates the workshop structure and content.

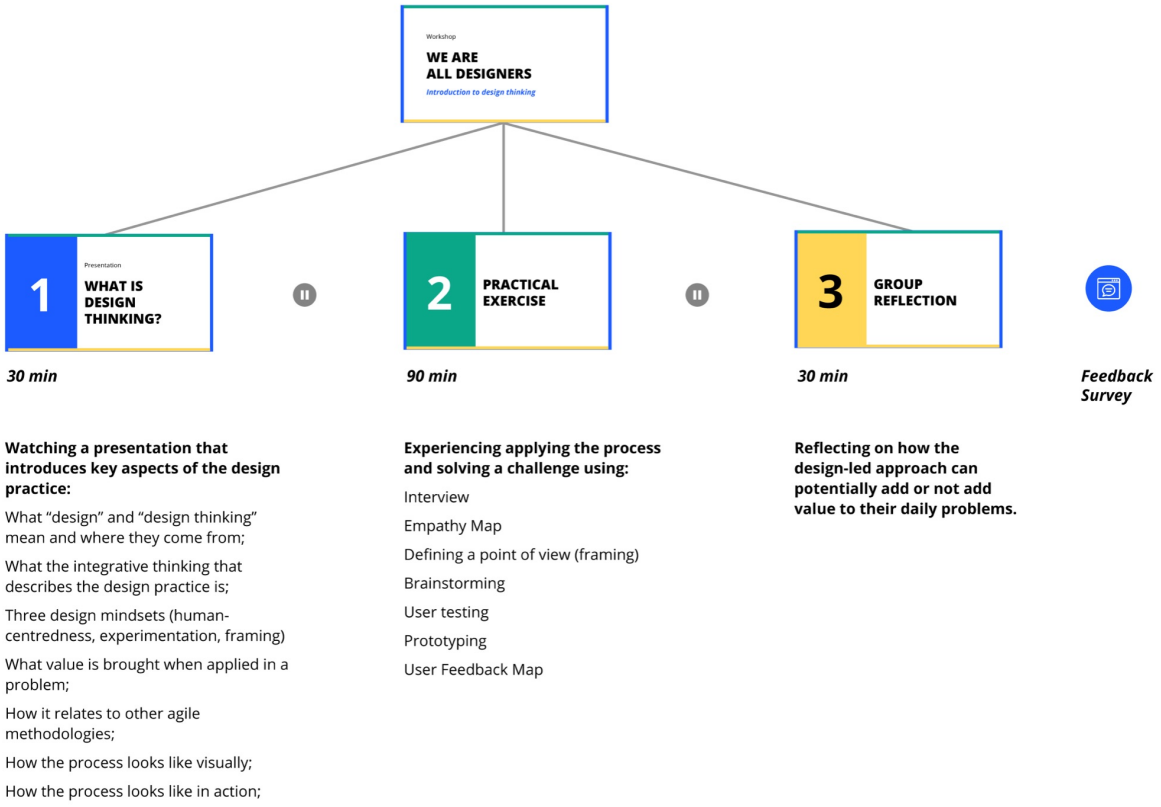

Figure 5. Overview of workshop structure and content.

The last part of the design thinking workshops was dedicated to group reflections. Similarly, at the end of the project, we hosted a meeting with the FAS core team to revisit the process and explore the learnings and what they thought would stay as a legacy for the organisation. We recorded the meetings and transcribed the comments that served to analyse the present study on all occasions.

The sections above describe the course of the actions during the project; Table 1 gives an overview of those activities and what impact they supported, backed up by quotes from participants.

Table 1. Summary of goals, activities, participants involved, impact and quotes.

Goal	Conducted activity	Nº of participants + departments	Achieved impact	Participant reflection
Embracing non-linearity	Fill Sailboat Canvas; Fill Stakeholders Map; Session to redefine problem; 2-week project planning.	3/1	Reveal partners network and their importance; Understanding iterative working; Experimentation and testing culture; Exploring outside the boundaries of the problem; Non-rigid planning; Review, discuss and prioritise challenges.	"I think that as learning it shows that what we are building is nothing written in stone, right. It was a real exercise to understand that a construction can and should be improved and adjusted over time, and that everything is well if we follow a route and it is not ideal" - Participant #4
Introducing design process	Design Thinking Workshops	38/9	Introducing design as a process; Practising design methods for problem and solution space; Showing possibilities that design can bring to the organisation.	"I see, reflecting a lot in the public that FAS attends, sometimes they may not be realising the greatest deficiency or the greatest need for something. Through this process, we can get there and find out what they do not even know and thus be efficient and effective in our work." - Participant #36
Expanding human-centredness	Fill FAS Best Practices Canvas; Conduct Explorative Conversations.	7/2	Empathising with the stakeholders; Realising the existence of different expectations within the same project; Uncover organisation's relationships with communities in protected areas; Uncover stories on organisation's culture and community engagement.	"What I would like to put into practice is the empathy part, during the elaboration of the processes. I think it is something we do not do, it's not a practice of thinking about pains and empathising with our audience and such." - Participant #4
Fostering collaboration between departments	Map FAS external projects; Fill 2030 Desired Future Canvas.	22/9	Interdisciplinary collaboration; Benefits of involving multiple perspectives; Breaking the silo structure; Bringing in different skill sets; Enabling co-creation; Generate an overview of projects and relations with policy areas; Register what policies changes the organisation wants to see.	"It is important to really give voice to all people, and that's why it reverberated so much internally, [...]. I think this was a great learning experience for us not only keeping it in the public policy box" - Participant #4 "I think we ended up actually opening the process a little late, but I think we saw this need later. So I think in the next similar opportunities is better to open the box at very beginning" -Participant #1

4. Findings

This project demonstrated how design practices and a systemic approach could support an organisation that promotes the sustainable development of the Amazon rainforest. The project involved six people initially, and as it unfolded, 43 staff members were invited to participate in the experiments and design thinking training. The Public Policy team stated that the process enabled them to go beyond the boundaries of their department. This section reveals the two main aspects that emerged during the project.

4.1 Enhancing collaboration

The Public Policy team named staff from other departments and managerial levels as relevant subjects to expand their view. To measure this perception, we analysed the interactions within the organisation before and after the project. By interaction, we considered when two actors were present simultaneously in an online meeting and engaging in a conversation. To create the first visualisation, we used the interactions within the department and management levels based on the interviews we had with participants before the sessions.

The resulting network map (see Figure 6) illustrates the staff interactions before and after the project. Network diagrams help portray the change created in the interaction patterns and the functioning of the community concerning this. In these network diagrams, produced through Gephi software, the colourful nodes represent the individuals, and the edges that connect the nodes represent the interactions. While the node colour is defined by the role of a specific individual at FAS, the node size is determined by 'degree', that is, the number of connections a node has. Additionally, in the standard mapping algorithm, we have used for both maps (Force Atlas 2), nodes with a higher degree are more 'central' to the network and nodes with similar interactions are pulled closer to each other. The map shows that in the FAS core team, the most involved actors in the project are identified from numbers 1-6, and the head of the policy team is identified as #1. There is a noticeable switch in the position of #1, becoming more central and more prominent in the latter.

The first map shows a clustered structure where different departments operate in silos and almost only communicate through the managers that are highly central to the network (Rodrigues, 2019). Additionally, there are two small groups that are not connected to the rest in any way. For instance, these two clusters belong to staff that work in the field either in the Protected Areas or Manaus city. This situation suggests a lack of flow in information exchange, which changes upon the implementation of design thinking. In the second network map, which portrays the situation obtained through the sessions, it is possible to see that the clustering is minimised. The highly central position of managers in the first map suggests a certain hierarchy that does not correspond to the open and flat character of design processes. The sessions also played a liberating role for staff members by placing them in the middle of the decision-making mechanisms while giving the managers a peripheral role while still keeping them connected. The numbers identified with a pink colour (11,19,37,40,41,42) are managers. After the project managers are distributed in a way that

they are not serving as a proxy to certain clusters. It is still possible to see a clustering among the managers in the second map. The reason behind this can be the organisational duties they share that enable the generated solutions to be implemented. However, further studies would be needed to validate this speculation.

The number of interactions increased significantly (from 238 to 346 edges), which resulted in a denser network structure (Seidman, 1983), suggesting that applying design thinking leads to a better-connected community with shorter and direct paths between employees. Additionally, the average network degree increased from 11 to 16, meaning that every actor interacted with 16 others on average.

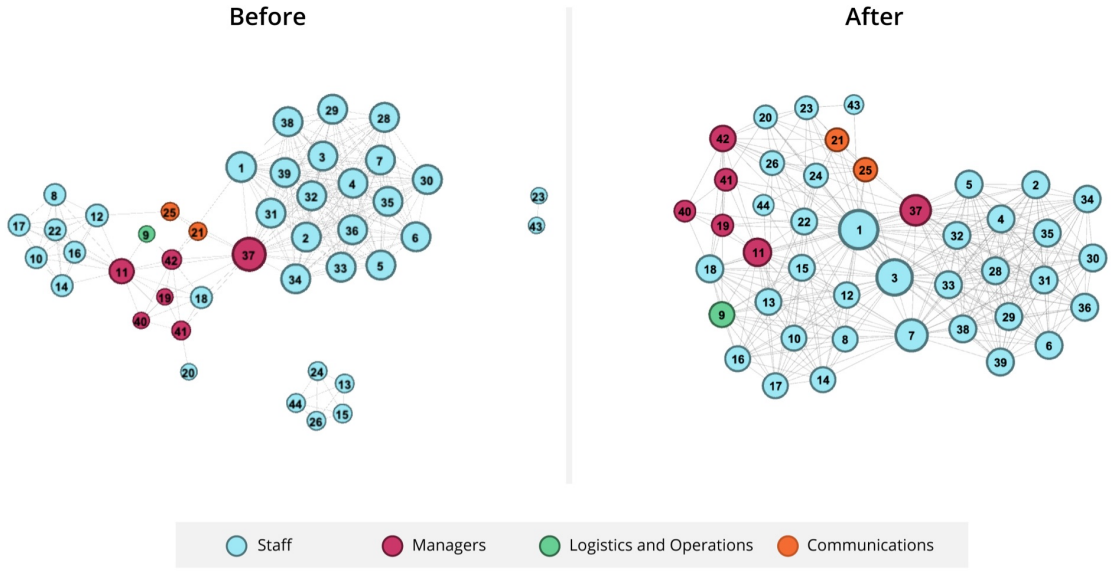

Figure 6. Network maps that show the change in community dynamics before and after the project. Each node represents an employee, and the links define the relationships in between.

4.2 Introducing non-linearity and experimentation

The project introduced designerly thinking and methods to the FAS workforce through a hands-on experience where participants could relate the human-centred design nature as beneficial for improving the services provided to the communities that live in Protected Areas and Manaus city.

By interacting and working closely with six people from the Public Policy team and Innovative Solution Program for four months and facilitating design thinking workshops for staff from different departments, it is possible to identify contributions of design practices. First, the non-linearity of the project approach was a novelty to the organisation and brought the benefits of in-between outcomes generated when project planning is more fluid and adaptable. Experimentation and making ideas tangible during the process revealed the means to invite and engage people from different departments in the organisation to give constructive feedback.

Despite pursuing sustainable development during a pandemic in a politically unstable scenario, the FAS workforce showed resilience, willingness and curiosity to learn new working methods. Now, it is in the organisation's hands to decide whether to cultivate the seeds this project planted. The design benefits are expected to vary according to the depth of design practices embedded in the organisation. Nevertheless, the results of our study promise to bring more innovation capability, leading FAS to deliver better services that meet people's needs and consequently support the environmental conservation of the Amazon rainforest.

Therefore, the findings answer our initial research question on how and why a design-led project aids a development organisation in tackling its challenges, first, by instigating more collaboration inter-departments and taking a non-linear approach in project planning. These two contributions are meaningful because they differ substantially in the organisation's modus operandi. Additionally, both add value when development experts are looking to create interventions in the region that have a long-term sustainable effect and, for this reason, already have to think and consider the bigger picture.

5. Conclusions and discussion

This project illustrates how to bring design practice to an organisation in the development field by combining practice and theory in design research. The approach overlaps with systemic design - in this case, applied at an organisational level - and it shows the results of increased interactions between departments after several activities sparked collaboration.

There were two types of enhanced collaboration; first, the study fostered collaboration with people in different hierarchical positions. However, power dynamics were toned down, as they were invited to test and be part of the process as the other staff joined, not necessarily holding power to approve or disapprove it. Furthermore, a design-led approach revealed the potential to bring staff that work out in the field closer to the people the organisation serves to those with more 'in-house' type of work (project conceptualisation and seeking partners and funding)—bringing the knowledge of those together potentially expanding solutions that add more value to the people the organisation serves.

The answers and solutions to complex sustainable development problems are not in designers' hands. However, a combination of design practice and a systemic approach can ensure that organisations in this field increase their collective intelligence and bring diverse voices to work together. We showed that it is more critical to reframe the problem and the practice itself rather than finding one size to fit all.

Designers with similar motivations can explore the contributions of design practices and systemic approaches for sustainable development at different scales, for instance, at the regional scale, where citizens and a network of organisations play a role. Also, they can identify changes in practice to fit cultural contexts and working conditions.

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