An open-source platform for international development

Operational framework

This operational framework presents the primary objective of the platform – i.e. facilitate the design and implementation of integrated development projects - and its three primary functions - i.e. showcase innovative ideas and technologies; facilitate inter-disciplinary, international and inter-temporal collaboration; and channel different types of funding to promising projects.

Designing and implementing integrated development projects

The overarching objective of the platform is to facilitate the spontaneous convergence of innovative ideas, individuals and financial resources with the final aim of designing and implementing adaptive and self-replicating integrated development projects (IDPs). The underlying function of IDPs would be to provide local populations with the primary pillars of sustainable development: sustainable water collection; provision of safe drinking water; healthy sanitation; access to health services; sustainable and healthy food production methods; efficient food processing; sustainable energy production; access to information technology and communication infrastructure; access to knowledge; optionality and free time[1]. To achieve this objective, the present framework suggests that IDPs should be designed on the basis of four guiding principles: integration, antifragility, profitability and emergence.

Integration is the primary functioning feature of IDPs. To work in an optimal way, IDPs need to be designed by thinking of all key functions of the project in an integrated way. Water management, sanitation services, agricultural production, food processing, energy production, health services and education must be thought as intertwined functions of the system. The inter-connection between these functions must be thought at two levels: (i) how each function feeds/serves other functions of the system (micro level) ; and (ii) how each function serves the development of the system as a whole (macro level). Innovative projects have already shown how principles of integration could be translated into operational modalities. For example, Sanergy is tackling the sanitary crisis in Kenyan slums through the development of a network of toilets managed by local micro-entrepreneurs in charge of collecting human waste and delivering it daily to a central processing facility, which then converts the waste into organic fertilizer for local farmers. In addition, Sanergy is conducting research to assess how human feces could be used to grow insect farms in order to reduce Kenyan imports of animal feed. The Sanergy model provides an illustration of how a single function (sanitation) can serve multiple purposes within the system (reduce health hazards and produce agricultural inputs) while increasing the system's independence from external factors (imported goods).

Antifragility is a property characterizing a system able to react positively to volatility, stressors, and external shocks. An antifragile system is not only resilient to negative influences but it is able to benefit from their occurrence[2]. A system designed to be antifragile is built on two specific properties: redundancy and optionality. Redundancy implies that the failure of one specific component of the system can be compensated by another component responding to a similar function[3]. Optionality allows the system to benefit from uncertainty by investing a small fraction of

1 Other pillars (such as security and freedom of speech) depend on external factors that cannot be fully dealt with at the local level.

2 The concept was developed by risk analyst Nassim Taleb in his book Antifragility.

3 e.g. kidneys in the human body, diversification of revenue flows in a company, etc.

its resources (human and financial) in a diverse set of high risk but high yield activities[4]. In brief, redundancy protects the system from negative shocks while optionality increases the system's exposure to positive shocks (e.g. new markets, innovative methods). Antifragile IDPs would therefore consist in socio-economic units protected from both internal failures and external shocks and designed to thrive in a context of uncertainty.

Profitability is a necessary precondition for expansion, whether this expansion occurs internally or externally. In a functional IDP, the first phase of expansion would be internal, driven by the need to make the system fully integrated, antifragile and profitable. Once the system reaches this equilibrium point, the costs of additional internal growth (e.g. organizational inefficiencies) are more likely to outweight associated benefits (e.g. economies of scale). The benefits of integration start diluting, hierarchy and administrative processes make the system less adaptive (and therefore less antifragile) and economic returns diminish as the costs of structural complexity increase. Once an IDP reaches its optimal size, growth must therefore occur externally. This second phase of expansion is driven by the creation of new IDPs, replicated on the basis of the functional properties of existing structures but managed in an independent way. However, by enhancing interconnection between mature structures and new ones, IDPs can start providing goods and services to each other (thus reducing dependence on “external” economies). As IDPs' dependence on the conventional economic system decreases, their margin of flexibility to create new operating rules increases (e.g. standards of production, trade arrangements, alternative monetary systems).

Emergence is a process whereby macro order arises from the chaotic (i.e. unpredictable) interaction of micro components. Translated to a local, regional or global economy, emergence could be defined as the development of a sustainable exchange system arising from the uncoordinated interaction of a vast number of micro agents. The present framework suggests that, through adaptation and self-replication, well-designed interacting IDPs could participate in the progressive emergence of sustainable local, regional and global economies. However, the creation of IDPs through self-replication alone is doomed to have a limited impact, for three main reasons. First, the expansion rate of these projects would be slow. Assuming an annual ROI of 10% (for illustrative purposes) and 100% reinvestment rate, a project could only replicate every 7 years[5]. Second, the expansion would be highly localized. IDPs would tend to replicate in the same region (proximity, contextual knowledge, potential for interconnection, etc.). Finally, relying on self-replication alone would imply a slow learning curve for any IDP working in an isolated way.

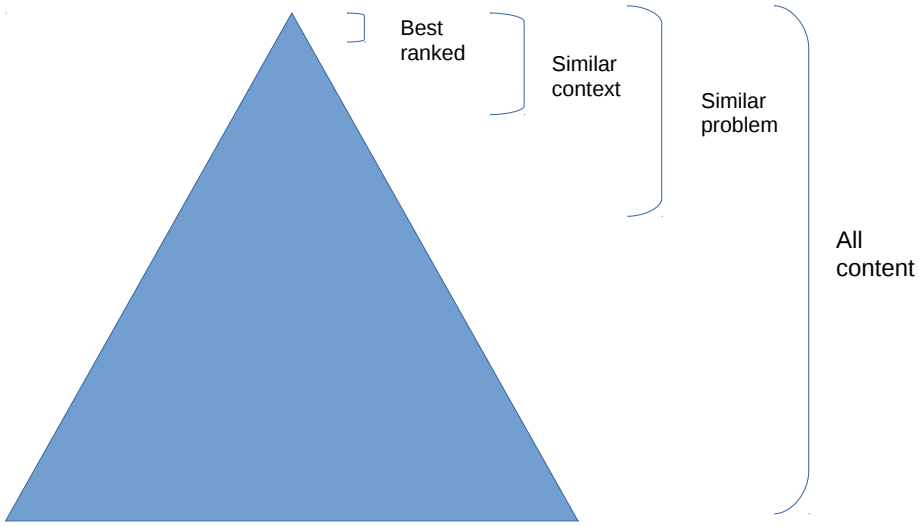
The growth rate of an IDP eco-system could however be enhanced by developing a collaborative process through which the lessons learned by initial IDPs can be used by independent project teams to set up unconnected IDPs. The development of the present open-source platform could facilitate this collective learning process if the following three activities can be performed in a connected and iterative way: (i) identifying efficient practices and technologies necessary for the development of functional IDPs; (ii) enhancing large-scale collaboration to improve these technologies/processes while adapting them to new contexts ; and (iii) funding promising projects.

4 i.e. the risk of failure of each individual activity is high but the potential payoff of one successful activity exceeds by far the overall initial cost.

5 The replication rate could possibly be increased substantially by allocating a fraction (10-20%) of the IDP workforce to high-yield activities (e.g. exports of intellectual services) but this approach relies on different assumptions which cannot be rigorously assessed at this point.

Showcasing innovative ideas, technologies and projects

The most innovative projects are often overshadowed by trendy concepts, lost in the midst of other competing ideas or left unnoticed for other reasons. Capturing valuable signals in a noisy environment is challenging. One of the primary functions of the platform would be to address this challenge by increasing the visibility of ideas and projects (uploaded by users) with the highest potential to solve a given problem in a specific context. This objective can be achieved by embedding four main features into the platform: content problematization, content contextualization, content rating and content connection.



Content problematization aims at identifying which problem(s) the content (idea, technology or project) aims at addressing. The problematization of each content uploaded on the platform would rely on a common problematization tree[6] classifying each type of objective development stakeholders might be interested in achieving (from improving soil quality for agricultural production to providing internet access in remote areas). Tagging each content according to the problems/objectives it aims to address would improve the relevance of browsing results and content suggestions.

While necessary, content problematization is not sufficient *per se*, **context** needs to be taken into account as well. Some ideas might be promising under certain circumstances but lose all relevance in other settings. A set of contextual maps is therefore needed to characterize ideas, technologies and projects depending on the conditions under which their value added over alternative options are the highest. These contextual maps could include : anthropogenic biomes (see annex 1), geographic characteristics (e.g. distance to the coast, to major cities), ecological characteristics (e.g. rainfall levels, soil composition, sun exposure, availability of certain materials), agricultural characteristics (e.g. traditional cultures, livestocks), economic characteristics (e.g. incomes, inequality), cultural characteristics (e.g. primary religions, work habits, political system), demographic characteristics (e.g. population pyramid, infant mortality), and so forth. **Content contextualization** would be conducted through two complementary processes. First, locations of interest (i.e. areas where IDPs could be implemented) would be analyzed and classified accordingly. Second, the factors of relevance/success would be identified for each relevant content. This double-entry characterization (location-content) would provide an efficient way to screen content according to local characteristics or specific geographic locations (see annex 3 for an illustration).

6 See annex 2 for an illustration.

Once content has been appropriately screened according to user's needs (i.e. solve a given problem in a specific context), a third criterion needs to be taken into account: content quality. **Content rating** (ex: like vs. dislike) can be used to translate users' individual opinion into a collective/aggregated assessment. A simple algorithm would rank the results of each search or suggestion on the basis of the rating scores obtained by the platform's content, ensuring the eventual disappearance of poor quality content.

The visibility of promising ideas, technologies and projects could also be enhanced using a fourth feature: **content connection**. By connecting each content page to other related pages, the nature of the platform would progressively shift from a screenable repository to a dynamic network evolving as new content is uploaded and newconnections are created. In order to be comprehensive, content pages should not be restricted to ideas, technologies and projects but also include pages such as organizations, individuals, books, articles and videos (see annex 4 for an illustration).

Enhancing collaborative synergies

Breakthrough innovations are the result of collaborative dynamics which tend to be overshadowed by the romantic figure of the "genius inventor" or "brilliant visionary". The talent of men like Thomas Edison or Steve Jobs did not lie in an innate capacity to imagine future technologies, but rather on their capacity to attract the most brilliant minds and pull them together around a common vision[7]. While a single man can carry a powerful vision, the knowledge, skills and efforts required to fulfill that vision are rarely the work of an isolated individual; and the more complex a problem, the more people are needed to solve it. Sending the first man to the moon required the collaboration of over 400,000 people[8]. John F. Kennedy might have been the one who first carried that vision to the public but the first step of Neil Armstrong on the moon was the result of an amazing collaborative process which lasted for nearly a decade.

Large-scale collaboration was already possible in the 1960s using paper, telegrams and phones as primary means of communication. Half a century later, widespread internet access should make large-scale collaboration much easier. Yet, success stories of large-scale collaborative projects are few and closed system approaches tend to prevail in most industries. This separateness is particularly visible in the field of international development where international organizations, governments, the academic arena, civil society and the private sector have been unable to develop a unified collaborative framework.

The technology to address global poverty exists, knowledge is accessible, funding is available and qualified individuals are willing to collaborate. Yet, we have been unable to pull these different inputs together. Why? Three main reasons can be mentioned. First, it is often difficult to understand the value of other actors' work when one has little knowledge of the constituents of this work, thus limiting our interest in connecting the dots. Second, the development sector relies increasingly on large structures, in which administrative and hierarchical processes leave little room to integrate collaborative endeavors with external agents. Finally, most development structures are highly

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7 **Thomas Edison**'s research laboratory was composed of 200 workers (scientists, machinists and craftsmen) divided into 10 to 20 teams working simultaneously to turn an idea from a prototype to a working model. Edison is credited for over 1,000 patents but these breakthroughs were the result of an intense collaborative work rather than the genius of one man. Similarly, **Steve Jobs** created the Ipod by pulling together the most visionary players in the field (Tony Fadell had already worked on a small hard-disk-based music player in the 1990s; Michael Dhuey co-invented the Macintosh II computer in 1987 and Jonathon Ive had been Apple's design guru for years).

8 Flight directors, camera designers, software experts, suit testers, telescope crew, aerospace technicians, photo developers, engineers, navigators, etc. (see the book Team Moon: How 400,000 people landed Apollo 11 on the Moon).

politicized, which tends to skew the incentive systems towards status quo decisions rather than radical changes.

In the present context, large-scale collaborative synergies could be enhanced through the development of a platform responding to four imperatives: openness, stygmergy-based functioning, ad hoc incentives and decentralized governance. **Openness** translates in both simple entry and simple exit for all stakeholders. The entry cost into the collaborative ecosystem must be as limited as possible, both conceptually (easy understanding of the system) and pragmatically (easy understanding of how to use the system and take advantage of it). The exit cost must also be reduced in order to enhance participation. The latter can be achieved, for instance, by limiting commitments to a single action or project, thus allowing any stakeholder to withdraw as soon as the action or project is completed.

Building the platform on the basis of **stygmergy** principles would offset the negative impact of limited individual commitments by creating a system structured to aggregate individual actions in order to fuel a broader collective process. Stygmergy-based functioning consists in leaving “traces” in the operating environment after the completion of an action with the aim of stimulating the realization of the next action, by the same agent or a different one. These traces can either be explicit indications of what remains to be done to complete a particular action or implicit indications embedded into the system. For instance, the elaboration of a contextual map for a specific location can hardly be done by a single person, due to the large range of expertise (e.g. in ecology, agronomy, demographics, meteorology, etc.) needed to complete a single map. By identifying users on the basis of their field of expertise and geographic interest, the platform could easily indicate to relevant users what information is still missing to complete the mapping[9].

Convincing different types of actors of the importance of a collective endeavor is not enough to ensure diverse and widespread participation. Each type of actor responds to different interests, making **ad hoc incentives** necessary. The collaborative system embedded in the platform must be designed in a way that ensures that the benefits of participation are maximized for each type of stakeholder. Researchers might benefit from participation if the platform provides a way to highlight their research, increase new research opportunities and demonstrate that their results are being used outside of the academic arena. Public funders might benefit if the system ensures that the country or organization gains visibility through the success of groundbreaking projects and provides accountability instruments allowing easy reporting to third parties (citizens, parliamentary bodies, etc.). Private funders might benefit if the system opens up new markets opportunities, provides transparent information on risks and ensures that funded projects communicate key data on a regular basis. This incentive scheme must be both deepened and extended to all other stakeholders (i.e. citizens, NGOs and in-house staff).

If these incentives are effective, dealing with a growing amount of participants might come with a series of challenges. **Decentralizing the governance** of the collaborative structure might prove to be an adequate way to deal with growth-related issues. In due time, national boards could be created to oversee the different processes requiring context-specific judgment. Similarly, thematic boards could be created to oversee the work conducted on systemic issues (e.g. international monetary system, trade policies, funding strategy, etc.). These boards could be chaired by a staff member in charge of selecting other board members. While the composition of thematic boards would depend on the topic of interest, national boards would ideally be composed of a diversified panel of

9 See this presentation for a successful illustration of an automated mechanism based on stygmergy principles. In his talk, Luis von Ahn presents reCAPTCHA, a collaborative system used to complete two different tasks: (i) prove that a computer user is not a robot; and (ii) assist in the digitization of books. The few seconds allocated by each of the 100 million computer users transcribing a ReCAPTCHA word each day are used to identify words that optical character recognition softwares have been unable to read. The system cross references individual inputs and integrates converging responses.

stakeholders (researchers, local public officers, local private investors, NGO representatives and citizens).

The importance of diversity within national boards is justified by the composite nature of the activities involved in the overall collaborative process. The development of the platform would indeed rely on four types of activities: **research work, content creation, fund channeling and project implementation**. These activities would in turn fuel an iterative process composed of five stages: community building, knowledge creation, platform structuring, project development and project evaluation. In brief, this process would consist in **building a community** [1] in charge of gathering and **producing knowledge** (i.e. data, information and analyses) [2] then processed by an automated system built into the **web platform** with the aim of identifying the most promising ideas/technologies in a given context [3], gather funding and operational teams to **implement these projects** [4] and **evaluate these experiences** to further the learning process [5] (see annex 5 for a synthetic table).

Research groups (composed of academic researchers, staff from specialized organizations or independent researchers) would need to be created (1) in order to conduct local and thematic diagnostics/analyses (2), to elaborate the contextual maps needed to improve the accuracy of the automated system (3), to provide technical and contextual expertise during the design and implementation of new projects (4) and to assist in the design or conduct of evaluation works (5).

Knowledge would be created by the users of the platform (researchers, practitioners, experts, civil servants or regular citizens). The composition of the knowledge base relevant for the purpose of this platform would consist in : a database of “dedicated pages” for each individual/organization/funder who could possibly play a role in the platform (1); a database of dedicated pages for each book/article/report/video and each project/technology/idea which could be relevant in the context of this platform (2); the connection and rating of each dedicated page and the problematization of each page dedicated to a project, a technology or an idea (3); documentation on project design and implementation (4); and feedback on evaluation works (5).

Fund channeling would be performed by in-house staff in charge of identifying both potential funders (bilateral donors, development organizations, investors, foundations and philanthropists) and promising project teams (1), assist in the preparation of funding proposals and prize contests[10] (4) and document the funding process (2). **Project implementation** would then be carried out by NGOs, entrepreneurs, academic teams or citizens on the basis of the proposal selected by funders. In addition to the actual implementation of the project (4), teams are required to document the process and the technology/model (2) and collect the data necessary to follow up and evaluate the project (5).

Channeling funding to promising projects

Development activities can be funded from a variety of sources (bilateral donors, international organizations, European Union, foundations and philanthropies, civil society) and through diverse financial instruments (grants, loans, private investment). A primary function of the platform would be to facilitate the convergence of ad hoc funding to the most promising projects. This objective can be achieved using three complementary mechanisms: funded contests, project proposals and unfunded contests.

A funded contest would involve one or several funders (bilateral donor, international organization, foundation or private investor) willing to provide financial support to implement a project aimed at

10 See details in next section.

reaching a predefined objective. The objective could be related to a quantifiable goal (e.g. providing deworming treatment to X children in country Y under T period of time), to a technological breakthrough (e.g. develop a low-cost and scalable solution to desalinate sea water), to process-related goals (e.g. design, implement and test a business model to provide sanitation services in city slums), or several of these modalities at once (e.g. develop a marketable solution to provide renewable electricity to X households in rural areas of country Y under T period of time).

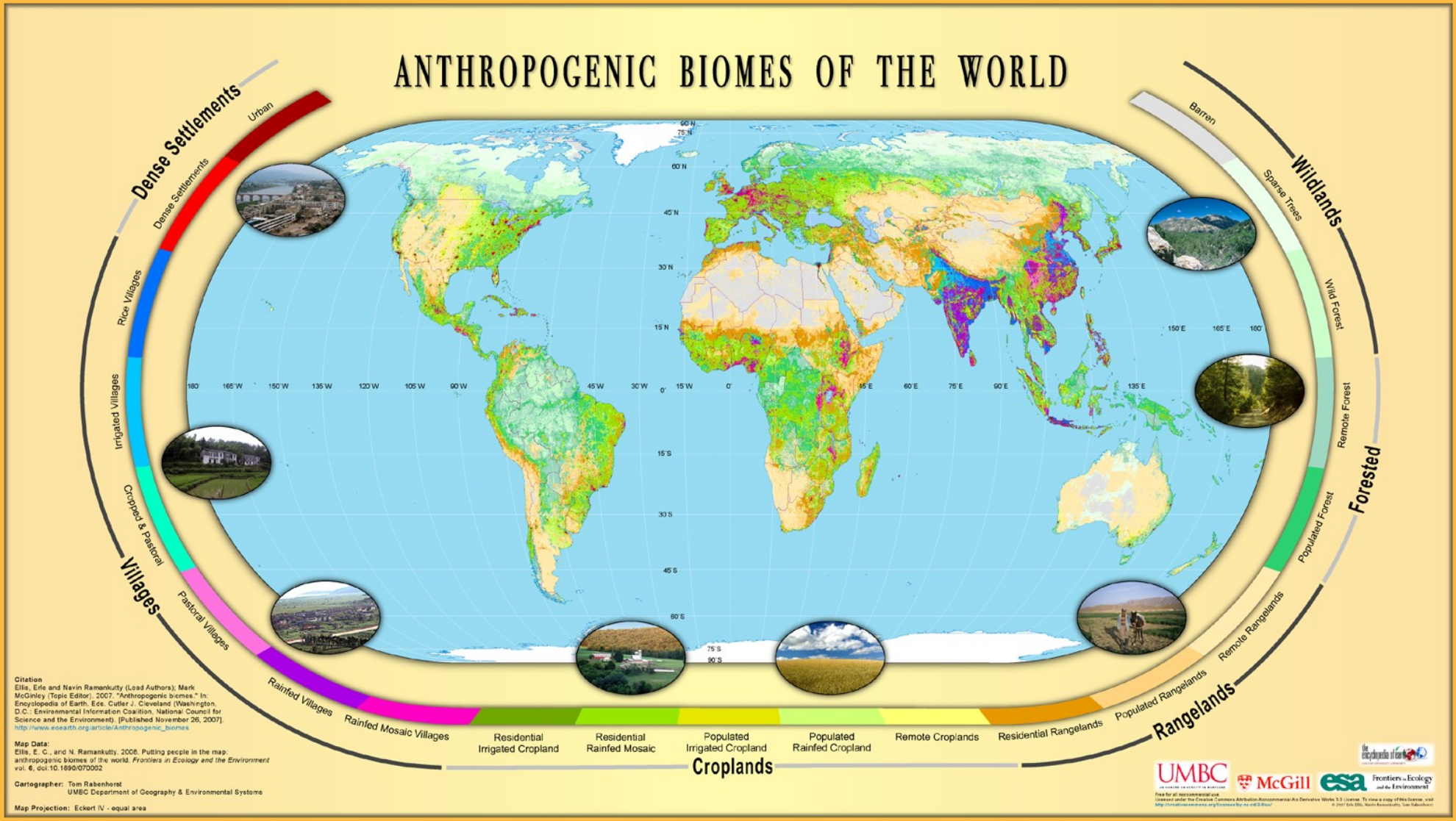
Contests would include a detailed description of funder's objectives and expectations, funding details (amounts, financial instruments, disbursements delays, etc.) and collaborative modalities (other actors to involve, documentation and reporting requirements, etc.). In-house staff would be in charge of: (i) assisting funders in the elaboration of the contest; (ii) promoting the contest to maximize the response rate; (iii) providing guidelines to prepare the proposals; (iv) collecting and screening proposals; and (v) ensuring that documentation and reporting are conducted appropriately throughout the project cycle. Funders would however be in charge of selecting the proposal(s) they deem as most promising.

A project proposal would involve a team seeking funding to design, implement or conduct a predefined project (technological development, project implementation, research program, start-up project, etc.). The proposal would need to provide a description of the project, the objectives, the targeted population, a provisional budget, detailed composition of the team and how documentation and evaluation work will be conducted. In-house staff would be in charge of identifying the most promising proposals and promoting these to potential funders. In due time, an ideal format might be the design of a dynamic catalog of project proposals from which funders could select the projects responding to their needs and priorities. Development donors might particularly be interested in a catalog classifying project proposals for each Sustainable Development Goal (SDG).

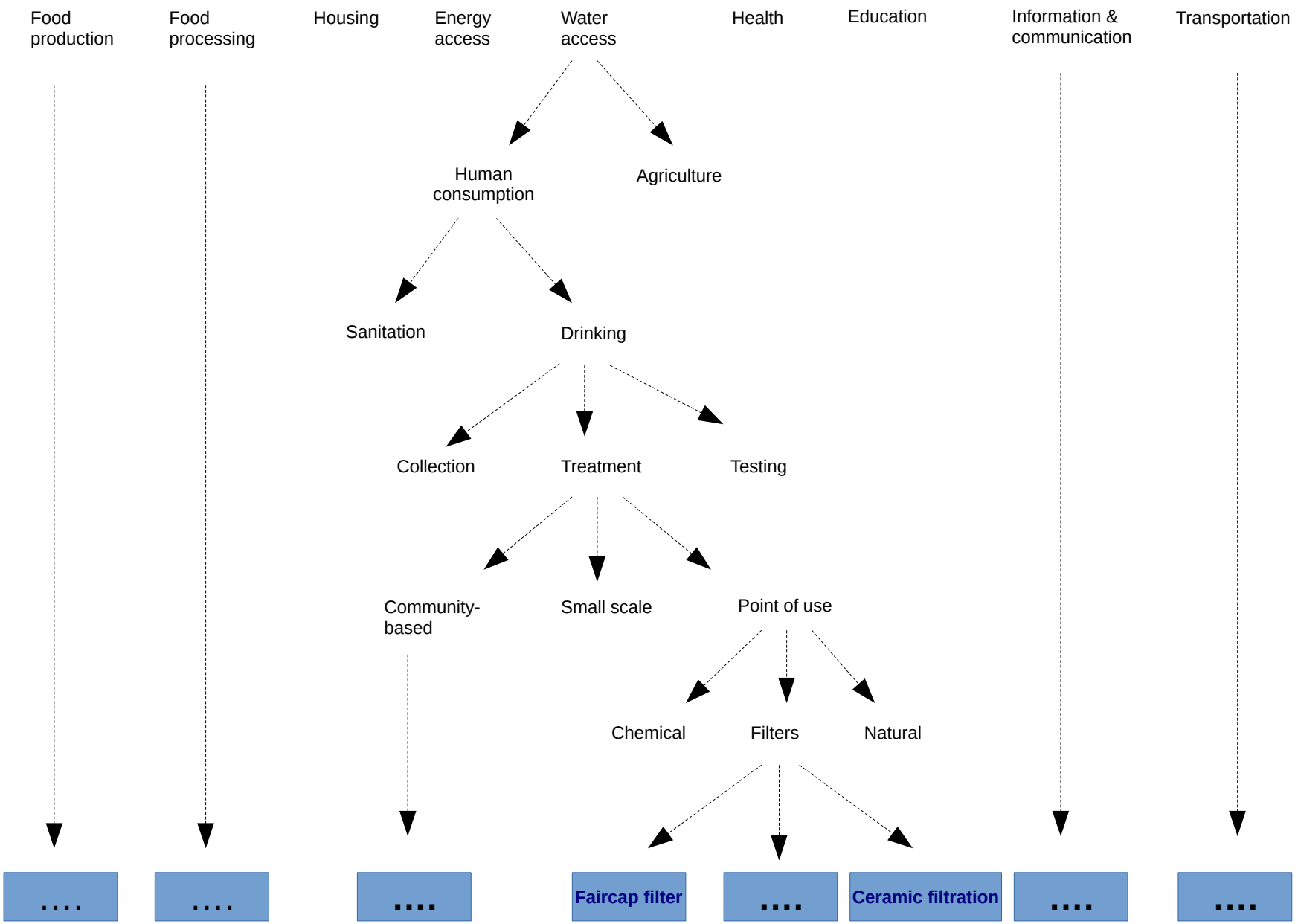
An unfunded contest would rely on the same logic than funded contests but would be fully designed by in-house staff. While the prize of the contest would be clearly specified, the funding would not be secured prior the launch of the contest. Staff would however commit to assist the winning team in seeking the funding necessary to implement the project. Unfunded contests allow to fill a possible gap in the case whereby key priorities of the platform are not receiving enough attention from funders (through funded contests) or project teams (through project proposals).

While the design of contests and proposals must remain flexible, all projects funded through the platform would need to comply with three requirements: (i) respond to a priority/need pre-identified or acknowledged by a working group of the platform; (ii) all designs produced through the project (technological or process-related) would be licensed as open-source and published on the platform; and (iii) a fee would be charged by the platform for each successful funding round. This last requirement would provide the basis of the economic model used for the development of this open-source platform.

Annex 1 : Anthropogenic biomes of the world



Annex 2 : Problematization tree (partial - water access example)



Annex 3 : Geographic targets for the “fog catcher” technology

Fog catchers

Anthropogenic biomes
Remote rangelands
Populated rangelands
Rainfall levels
< 50 cm per year
Wind velocity
> 3m/s
Altitude
>650 m above sea level
<800m above sea level
Etc.

Key contextual factors

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Atacama desert (Chile, Peru)

…

...

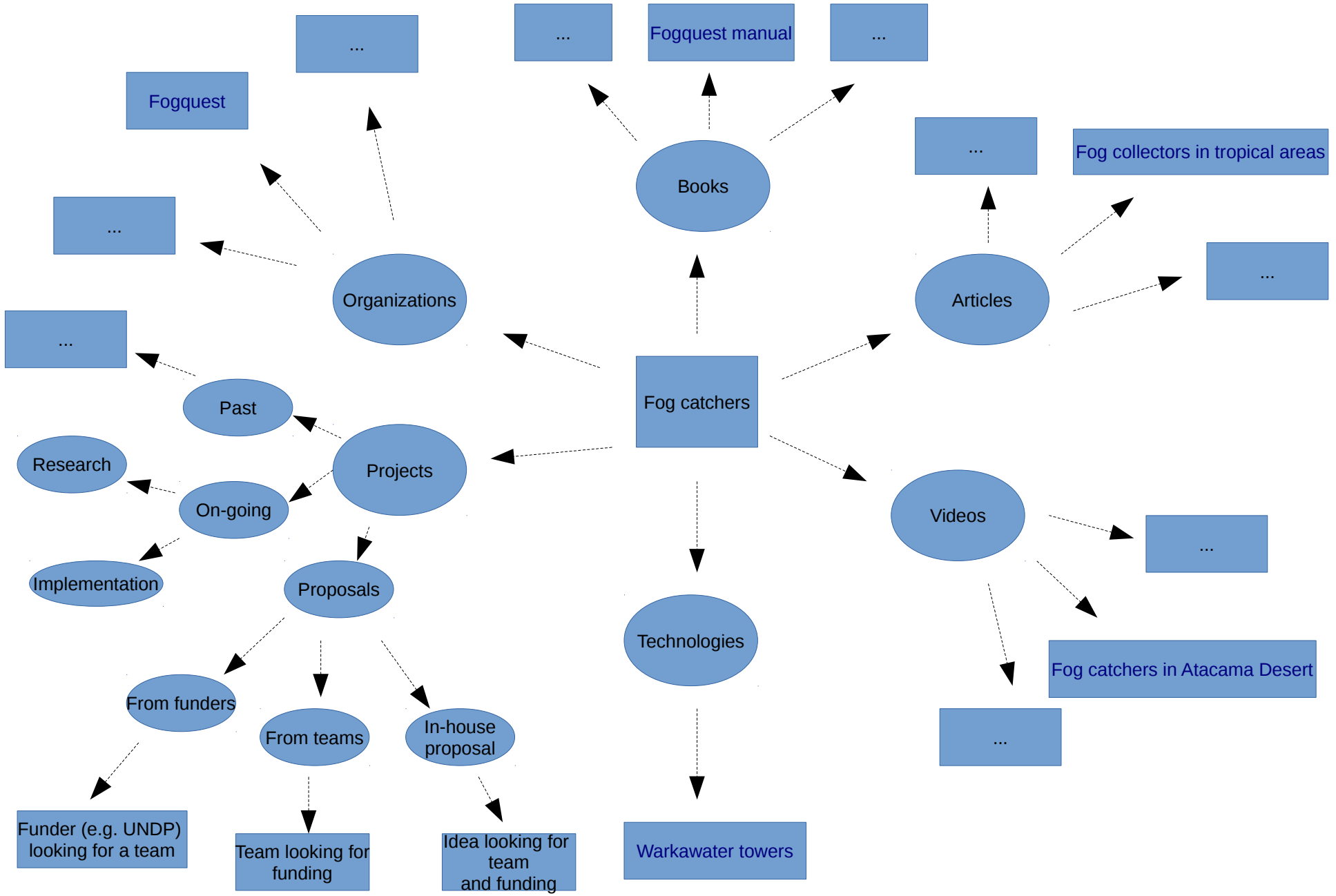
Sidi Ifni Morocco

...

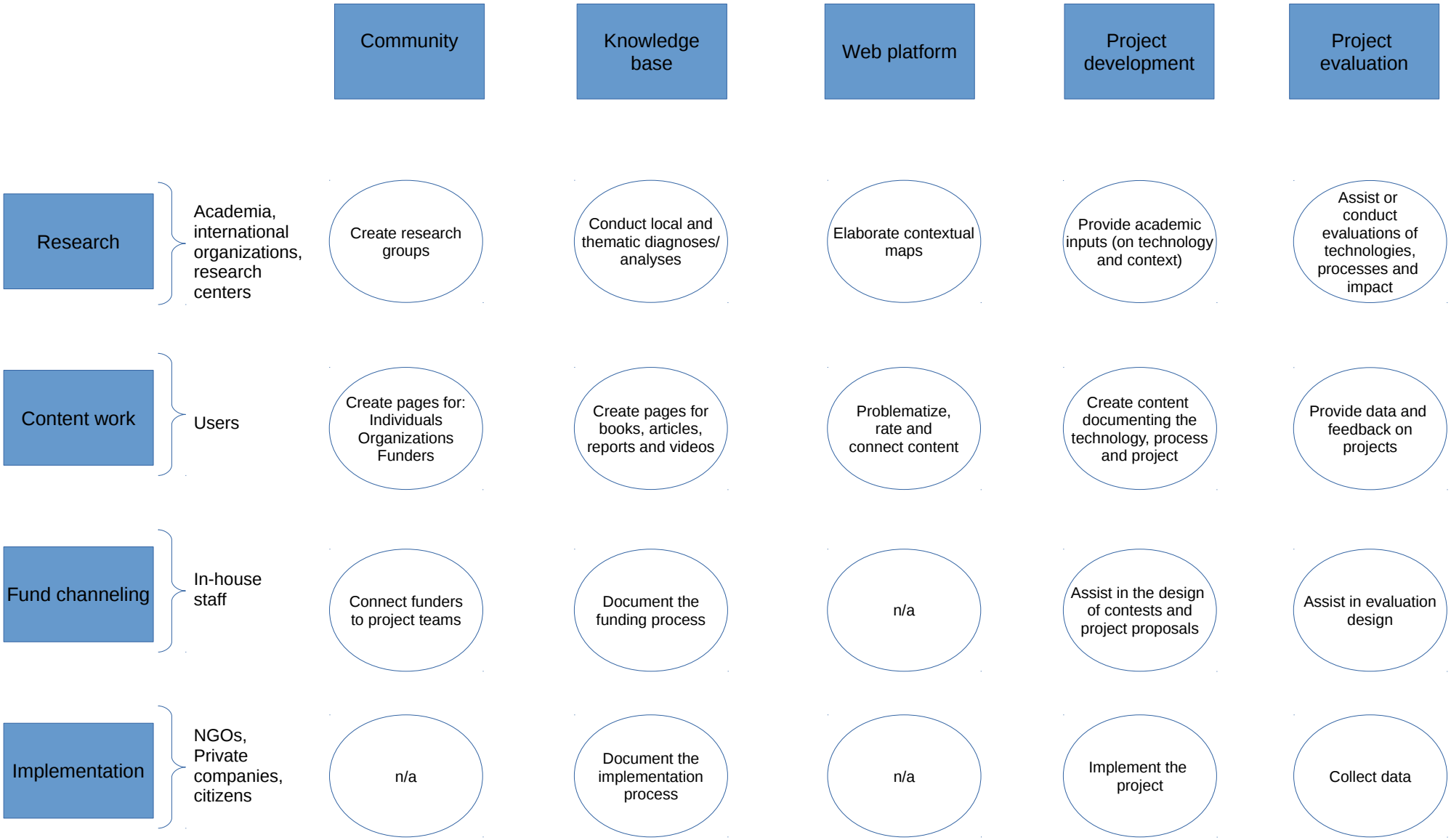
Eastern Nepal

The platform matches the content to the locations fitting the contextual data considered as determinant for the success of the technology.

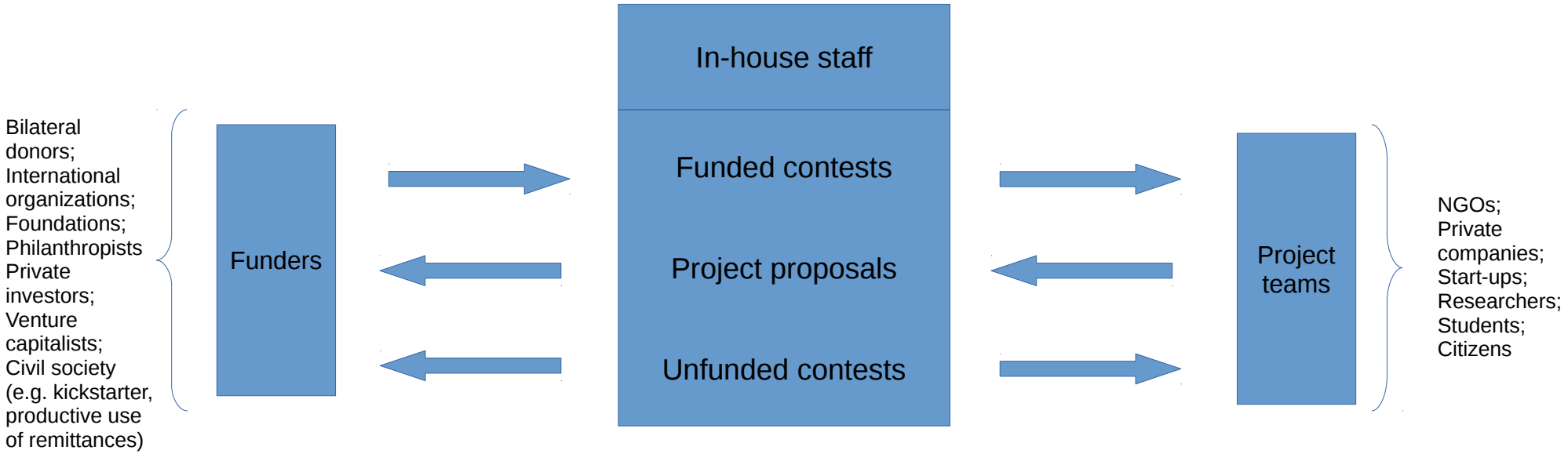
Annex 4 : Content connected to the page “Fog catchers”



Annex 5 : Activities involved in the collaborative process



Annex 6 : Three mechanisms for fund channeling



The direction of the arrows indicates which actor initiated the process.