Tech4Dev
Operational Report
2021

Report by Hilda Liswani & Beatrice Scarioni
December 2021

Tech4Impact

Tech4Dev EPFL
Innovation Park
Building J
1015 Lausanne

Hilda Nambili Liswani
hilda.liswani@epfl.ch
+41 21 693 4878

EPFL

Content

Section 1: Overview **4**
Executive Summary 4
How we work 5
What we do 6

Section 2: Impact realised **14**
Collaborative Research Grants 14
Transforming ideas into impact 16
Tech4Dev Grantees - Cohort 1 16
Tech4Dev Grantees - Cohort 2 24

Section 3: What's next? **33**

Meet the Team **34**

Section 1: Overview

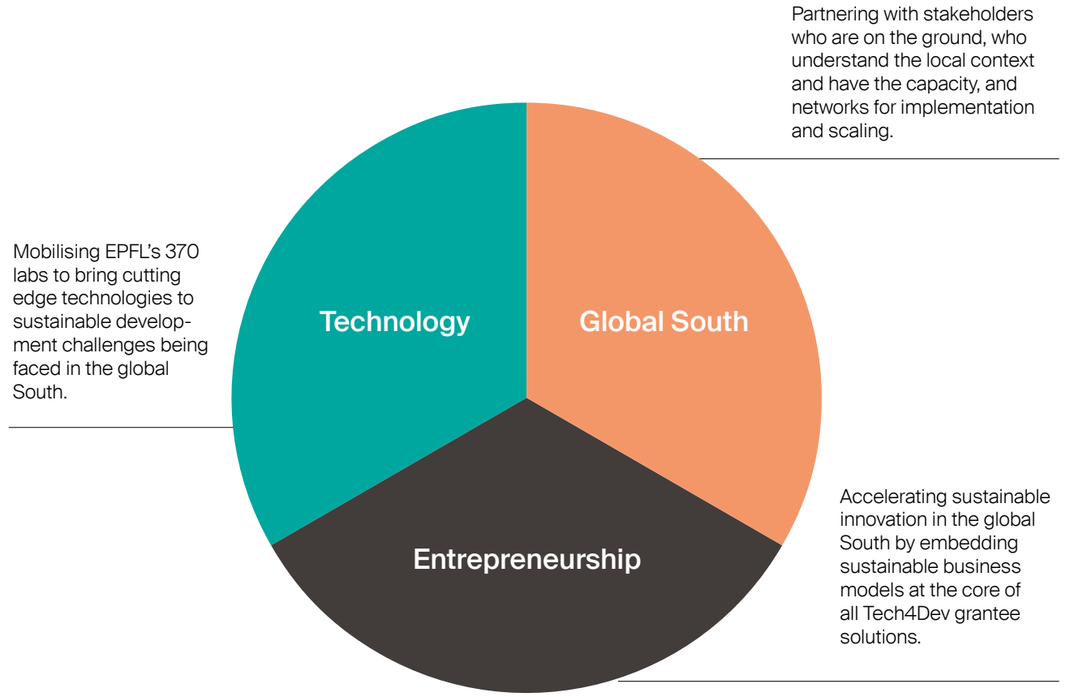
1.1 Executive Summary

Research and innovation have the potential to tackle many of the malfunctions of our socio- economic systems. Despite the potential for accelerating sustainable development and reducing inequalities in some of the poorest regions in the world, most of the current research approaches aimed at solving global development challenges are subject to two major fallacies:
1) the vast majority of research projects are not embedded in concrete socio-economic and cultural contexts;
2) the research projects are not sufficiently oriented towards implementation of the results for true impact. As a result, many innovations do not bridge the gap between the lab and the real world.

At the same time Non Governmental Organisations (NGOs), International Organisations (IOs) and other actors of humanitarian programs are faced with the difficulty of making their interventions sustainable and long-lasting, as well as to scale their impact across different contexts. In both cases, appropriate and affordable technological and entrepreneurial solutions could play an important role, yet access to such solutions is not always possible, often due to financial constraints, or a lack of knowledge about the existence of such solutions.

EPFL Tech4Dev aims to play a pioneering role for accelerating and scaling innovative and beneficiary- centered technological solutions that have a tangible and lasting social impact in the global South. To ensure the success of the program, we have implemented several innovative elements: embedding the development of innovative business models in joint academic-NGO research collaborations; rigorous evaluation and selection process of research projects based on an international expert evaluation panel; step-wise milestone-contingent implementation, impact oriented M&E system; and scaling of solutions through social entrepreneurship.

1.2 How we work



EPFL Tech4Dev focuses on innovation acceleration and aims at bridging the theory-practice gap in order to research and successfully implement innovative technological solutions that can scale and reach a growing number of beneficiaries in the global South.

The initiative is one among a few that explores novel ways for universities to contribute to the economic, social, and environmental development in the global South, and advances these current approaches with its dedicated technological entrepreneurship angle. Tech4Dev builds on the foundations of Tech4Impact's NGO Council.

The NGO Council is a cross- cutting and collaborative platform comprising 26 NGOs including WWF, Human Rights Watch, Terre des Hommes, and other well-established organizations to collaboratively source EPFL's research and innovation that could strategically accelerate their impact on the field. The NGO Council is the main source for identifying the research challenges. Adopting a transdisciplinary approach, we foster large-scale implementation of innovative technological solutions in the global South.

1.2.1 Who powers us: Tech4Dev Impact ecosystem

NGO Council

The NGO Council is a cross- cutting and collaborative platform comprising 26 NGOs including WWF, Human Rights Watch, Terre des Hommes, and other well-established organizations.

EPFL Labs & Students

EPFL is a public research university located in Lausanne, Switzerland. It specializes in natural sciences and engineering. It is one of the two Swiss Federal Institutes of Technology, with three main missions: education, research and innovation.

Lac leman

We are at the centre of the unique ecosystem of the “Lac Léman” region, with International Geneva merely a stone throw away from the thriving academic environment of Lausanne, we engage in building bridges to advance the UN Agenda 2030.

SDC

The Swiss Agency for Development and Cooperation is an office-level agency in the federal administration of Switzerland, and a part of the Federal Department of Foreign Affairs.

Beyond

We continually work with stakeholders around the world to break silos and facilitate collaboration for sustainable innovation in the global South.

1.3 What we do

1.3.1 Objectives

Tech4Dev focuses on the following overall goal:
To promote relevant, actionable, and human-centered research that has the potential to have a positive tangible impact in the global South .

Tech4Dev achieves this goal by:

- Flagship grant program
- Student initiatives
- Engagement

EPFL

Grant program

The EPFL Tech4Dev flagship grant program has accelerated the co-design and co-creation of technological innovations between EPFL labs and NGO Council members by providing grants of CHF300,000. To date we have awarded 8 grants over two separate calls (four grants per call).

Ultimately the Tech4Dev grant is:

- Providing a unique platform to identify, promote, support and accompany impact-oriented, human-centered technology development for the global South: Housed at the Vice-Presidency for Innovation at EPFL, Tech4Dev provides a unique platform for the development of robust technological solutions jointly identified by key stakeholders from the global South (NGOs, IOs, policy-makers, corporates, entrepreneurs, citizens) and researchers from EPFL.

  This partnership promotes actionable research and the deployment of research findings in the form of scalable solutions. This latter element is particularly relevant for implementing solutions in the global South, where urgent and large-scale transformative change is required to shift to a sustainable and resilient path.

- Adopting a step-wise, milestone-contingent implementation at the intersection of technology and sustainable development in the global South: Projects often suffer from falling into the “research-practice gap” and fail to achieve the desired impact. Given our set of expertise and our impact-driven mission, we make the implementation of the identified solutions a top priority. Drawing on our expertise in social venture capital processes, a milestone- contingent deployment and impact plan will be an essential component of the funding process, so that effective deployment and the achievement of impact on the ground can be ascertained.

- Empowering a new generation of global engineers and entrepreneurs, who accelerate the implementation and adoption of innovative solutions in the global South: Tech4Dev engages in entrepreneurial capacity building in the global South to promote entrepreneurship as a means for reducing inequalities (e.g. Sustainable Business Model trainings).

  Moreover, we intend to explore two paths to scale the technological solutions in the global South:
  1) Involving students (from EPFL and from the global South) to act as change agents by offering internships, research projects, study trips and final theses that support the roll out of technological solutions for solving complex social and environmental development problems; 2) Empowering individuals in the global South by equipping them with social business models that provide them with an opportunity to become active as social entrepreneurs and disseminate the technological solution in their specific local contexts.

See section 2 (page 16-31) to learn more about our grantees.

Student initiatives

Summer School

Last summer, we organized a 6-weeks virtual Summer School for students from all around the world in partnership with Mohammed VI Polytechnic University (UM6P) and Universidad de Ingenieria y Tecnologia (UTEC).

The goal of the program was to develop innovative and sustainable solutions to core societal challenges faced by 6 of our NGO partners in the Global South. The NGO partners were Selco Foundation, Terre des Hommes, Medair, Base, UNAIDS and WWF. From July to August, 10 teams of 40 students from more than 20 nationalities and universities have been following a series of 5 workshops, meeting with stakeholders and working with mentors of their NGO partners to develop solid project proposals. In parallel of the workshops, the students participated in weekly peer sharing sessions, office hours with the workshop facilitators and had to do a midterm and a final pitch. The final pitches were done during an online event where 168 people from more than 23 countries joined.

Outputs of the summer school

10
Internship opportunities

5
Solutions continued by the NGO (with or without the students)

3
Projects continued by the students (with or without the NGO)

Highlights from the summer school

Applications & participants

After a rigorous reviewal process, 40 participants were shortlisted from 161 applications from 38 countries. Our participants represented 19 universities and represented 23 different fields of study.

161 Applications

22 countries in selected applications

10 Teams

5 Workshops

4 Peer sharing sessions

20 1on1 coaching sessions

Meetings

Once the virtual summer school was kicked off, Tech4Impact and our partners went into full gear to ensure an interactive and engaging experience, despite the new remote setting.

Partners

The summer school was a truly collaborative effort which mobilised multiple players throughout the process. The student teams were accompanied by 10 NGO mentors and workshops were led by 6 facilitators. The final award ceremony was deliberated by 3 jury members who brought the summer school to a successful conclusion.

3 University partners

6 NGO Partners

10 Challenges

EPFL

Awarded team

Sustainability award

Team 4
NGO: Medair

A galvanized steel threaded reducer that is permanently fixed to the opening of the manual water pump. In addition, a small diameter galvanized steel pipe will be attached to the threaded metal reducer, whose purpose will be to ensure that the distance between the outlet and the jerrycan is reduced. Lastly, awareness campaigns will be organised in the rural communities of South Sudan through signboards, radio broadcasts (jingles), engaging religious leaders, educating children on the importance of reducing water wastage, and by organizing meetings with community leaders.

Best pitch at the final ceremony

Team 5
NGO: Base

Installing smart mini-grids made accessible through power purchase agreements and a guarantee fund. The mini-grids will be provided by dedicated technology providers who, along with financial institutions and donors, come together to form an ecosystem around renewable energy projects for refugee camps.

Best implementation plan

Team 9
NGO: WWF

An online platform that allows wildlife agencies to easily conduct african elephant population surveys in a digital and automated way, provided approximate GPS coordinates of the population of interest. It uses artificial intelligence to detect and count elephants from satellite images allowing wildlife agencies to survey elephants as they migrate over large areas.

The platform is designed to perform in areas with sparse vegetation in southern Africa.

Innovation award

Team 3
NGO: Terre des Hommes

A plug-and-play data driven system to monitor water quality. It consists of several sensors to measure all the variables. The data collected by the sensors is then stored online and displayed in real-time on a digital platform, accessible to water and sanitation experts. The digital platform also offers data visualization and analytics.

To see the full list of challenges and solutions as well as the teams please see appendix I p. 37

Engagement

Road to Bern

Tech4Dev, in partnership with The World Bank and the Permanent Mission of Switzerland to the United Nations in Geneva and the Geneva Internet Platform hosted a virtual event exploring data and technology for development.

By addressing data issues through different angles, such as their collection, protection, sharing and use and by matching it at the same time with key sectoral dimensions like health, science, technology, intellectual property, business, climate, humanitarian challenges, trade or environment, the event aimed to enhance the added value of data to ultimately accelerate the implementation of the 2030 Agenda.

Showcase 2030

Our Showcase 2030 was a 2 days virtual event that brought together impact-driven startups, leading researchers, professors, students, core partners and investors – all to showcase disruptive, innovative and entrepreneurial solutions from EPFL and around that address the most pressing challenges of our time.

The event was composed of 3 plenary sessions in which Tech4Impact and 15 of our partners showcase sustainable innovation initiatives in different formats, ranging from short lightning talks to roundtables. In addition to that, in collaboration with 20 additional partners, we offered 22 online masterclasses that happened between the plenary sessions. Finally, the showcase has also been a fundraising opportunity for 15 EPFL sustainable startups that were presented in an online startup exhibition and that have been connected to 36 investors through a match making process.

The Showcase 2030 welcomed 345 participants on the first day and 298 on the second, connecting from more than 40 countries around the world.

Impact Lunch

The Tech4Dev Impact Lunches are building a community of researchers who are paving the way for technological innovation in the global South. Tech4Dev provides the space for researchers to meet, exchange, explore collaboration opportunities and get to know Tech4Dev and our network of global South partners. We have conducted 3 virtual lunches and 1 in person lunch to date.

EPFL

Section 2: Impact realised

2.1 Collaborative Research Grants

Tech4Dev consists of two calls for collaborative research projects between Non-Governmental Organisations (NGOs) and EPFL researchers, each for a duration of 2 years with a CHF 300'000 milestone-based grant. The first call was launched in December 2019. The application and reviewal process took approximately 3 months and as a result of the Tech4Dev International Expert Panel's (IEP) judgment, 4 collaborative research projects were selected based in Kenya, Cameroon, Bangladesh and Colombia. The second Tech4Dev call was launched in November 2020 and welcomed a second cohort of 4 collaborative research projects.

Step 1: Matchmaking

Sourcing technological solutions for challenges in the global South from the EPFL researcher community

- Members of the Tech4Impact NGO Council submit a one-page description of a research challenge
- NGO challenges are divided by sector and theme and shared with the EPFL research community (370 Labs, more than 2,000 researchers)
- The researchers are then matched with the NGO(s) that submitted the challenge in order to develop a joint transdisciplinary research proposal
- The proposals are evaluated by the Tech4Dev International Expert Panel, which will meet once a year and select a maximum of four projects to receive funding based on specific selection criteria (see appendix 3)

Step 2: On-boarding

On-boarding the awarded projects to ensure alignment and consistency in Tech4Dev expectations and requirements.

- KPI's and impact metrics are set collaboratively at the on-set between the EPFL Researcher and the NGO/ Global South partner in order to map out the forecasted impact for the duration of the 2 year grant.
- A Budget split letter is submitted by each project to the Tech4Dev team, to ensure the allocated funds are divided appropriately as outlined in the Tech4Dev requirements. At least 40% of the budget must be allocated in the global South.
- As per EPFL protocol, an Ethics review (see appendix 4) is conducted to determine whether the research being carried out is consistent with the requirements of the EPFL Human Resource Ethics Committee (HREC).

Step 3: Researching and Innovating

Co-designing innovative human-centered solutions based on multiple iterations between EPFL researcher and NGOs

- Researchers develop the potential solutions to the identified problem in close collaboration with the NGO and its global South partners.
- Prototypes of the solution are tested by the field teams of the respective NGO(s).
- The multiple iterations will allow for a human-centered design process and feedback loops between the field and the lab until an appropriate, robust and affordable solution has been identified.

Step 4: Implementing and Scaling

Implementing the solution and identifying most appropriate social business model to scale solution

- Facilitating connections and empowering local entrepreneurs to act as social entrepreneurs: Tech4Impact experts will accompany each project from the beginning in order to explore routes to implementation of this technology, including for profit and social business models, respecting equitable partnerships.
- Student teams will support the roll out of technological solutions through dedicated programs such as INSSINC.

Social Business Models (SBMs)

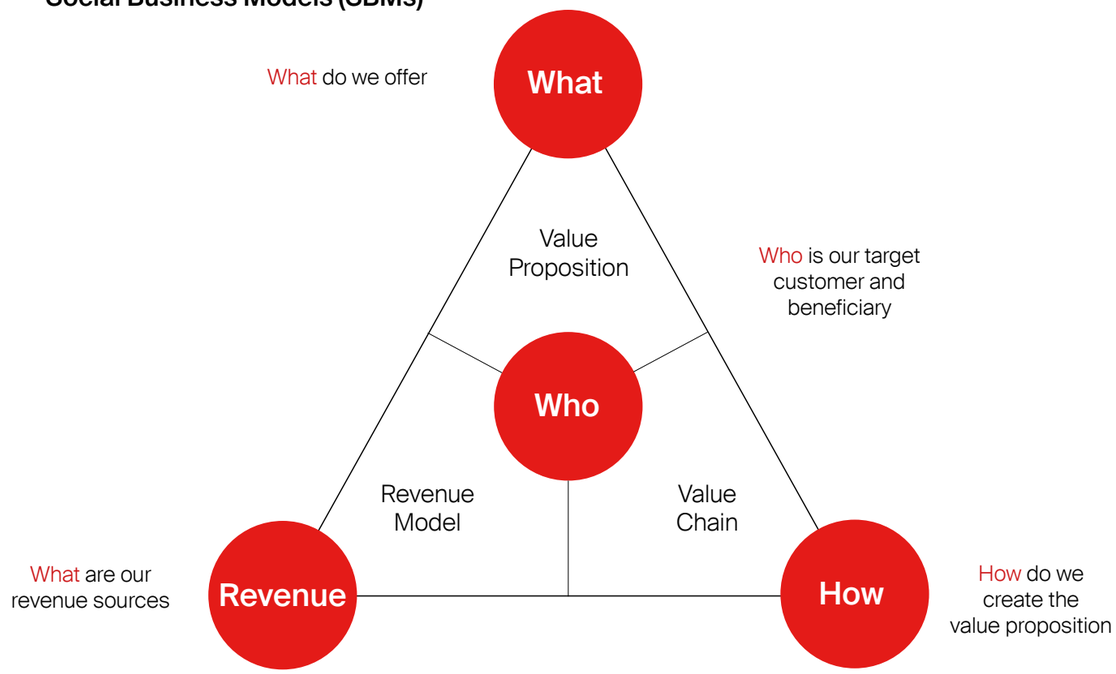


Table 1. Social Business Models (SBMs) are the ways that a business is designed to create a specific positive benefit/outcome for one or more of its stakeholders. See Appendix 2 - Revenue Model and Description

2.2 Transforming ideas into impact

2.2.1 Tech4Dev Grantees - Cohort 1

3D4Peace

Country: Colombia
Collaboration: Laboratory for Processing of Advanced Composites, OMNIS Institute, University of Los Andes

Challenge

Colombia is heavily impacted by armed violence as a result of 50 years of conflict between the government and the Revolutionary Armed Forces of Colombia (FARC), and is the second most mined country in the world after Afghanistan. These accidents have serious consequences, including death, injury, long-term disabilities and psychological trauma. In Colombia, disability equipment and assistive technologies are inexistent and/or unaffordable for the large majority; the only devices available are imported and are not covered by health insurance.

Solutions

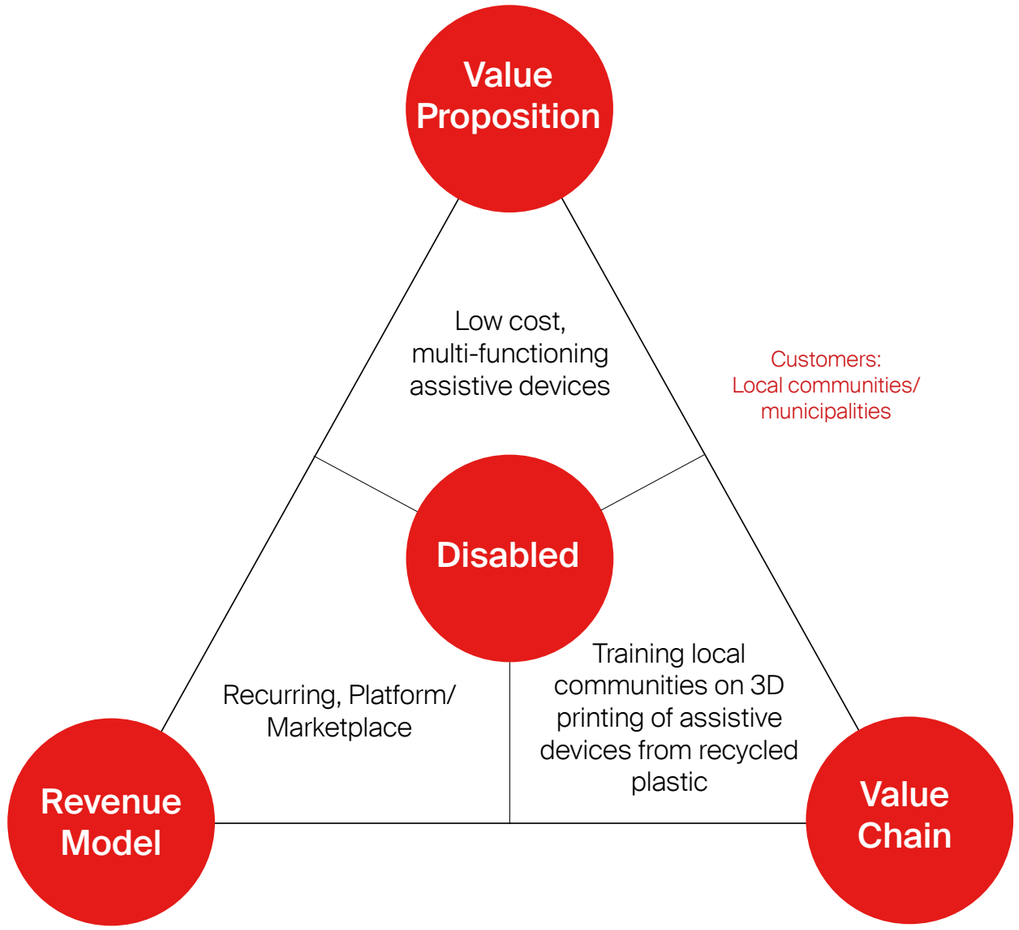
The objective of this project is to develop and implement low-cost and sustainable 3D printed composite assistive devices in local Colombian communities for disabled people, based on plastics and natural fiber wastes. The challenges are to create robust and high-quality devices taking into account limited technical waste management infrastructure and to create businesses with environmental benefits (waste management) and social benefits (helping disabled people + job creation). This 2-year project promotes social, educational, technical and scientific solutions through a dynamic collaboration and exchange of researchers between EPFL, the University of Los Andes, and 2 NGOs (OMNIS Institute and Fundacion Todos Podemos Ayudar).

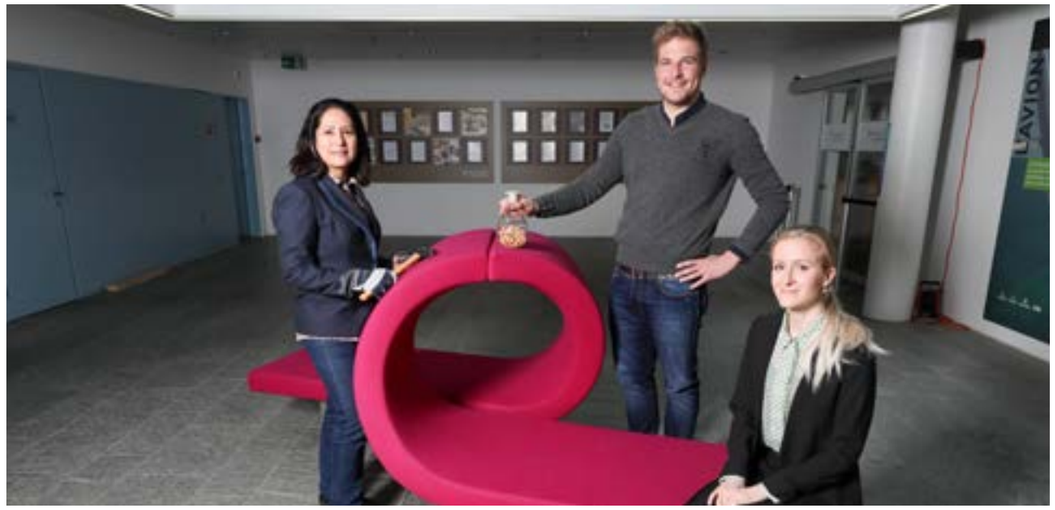
EPFL

Impact

The first series of 3D printed assistive devices made out of recycled plastic and natural fibres printing filaments has been printed. An online database with the different assistive devices available will be soon published.

Social Business Models (SBMs)





SusTarp

Country: Bangladesh
Collaboration: Laboratory of Sustainable and Catalytic Processing, Medair

Challenge

In Bangladesh, as well as in the rest of the world, plastic tarpaulins are the fastest and most efficient assistance given by all agencies and organizations in the world seeking to provide basic emergency shelter.

While very practical and proven over the years, these materials are not recyclable and humanitarian workers seek alternative shelter products (tarpaulins) made with environment-friendly materials, which are recyclable or – ideally – bio-degradable.

Solutions

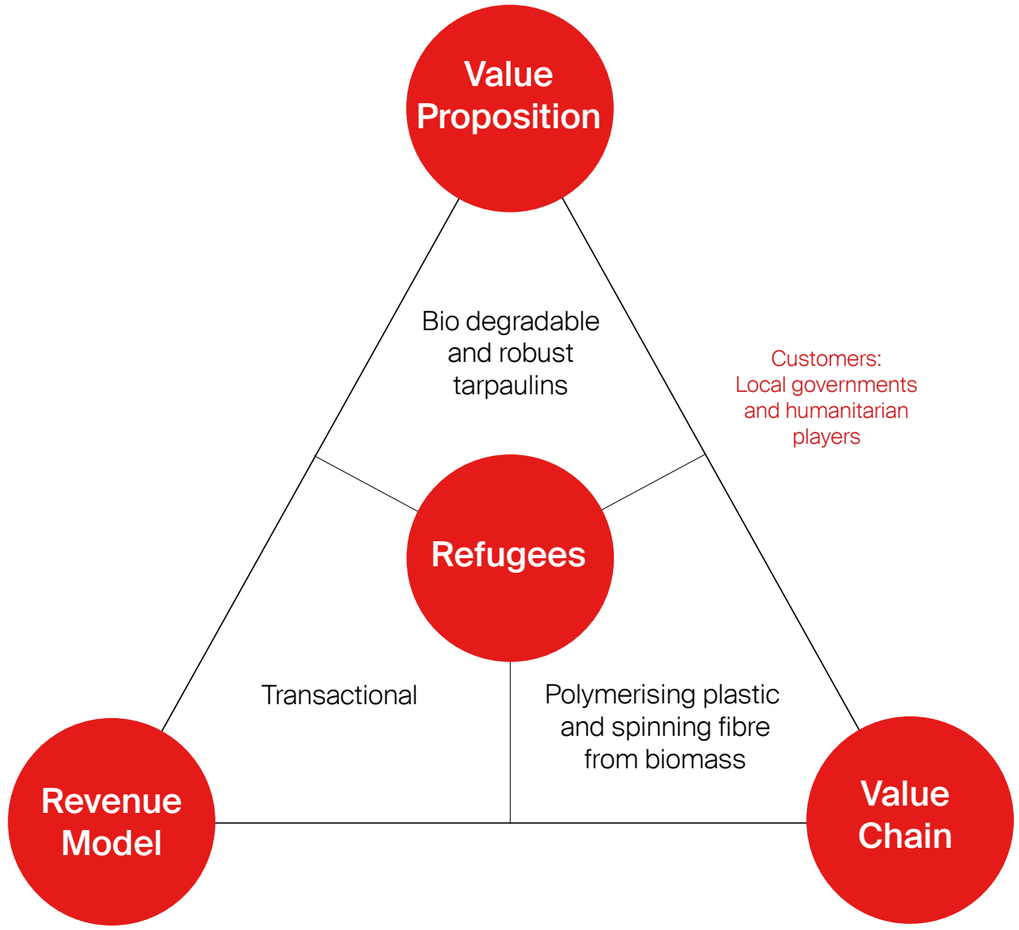
Plastic tarpaulins are the most basic, fast and efficient solution to provide basic emergency shelter in humanitarian crises. It is a quick impact solution, which saves lives, but such excessive use of plastic significantly impacts the local environment.

LPDC has recently developed a disruptive technology to convert agriculture residues to polyester, which is 100% bio-based and fully bio-degradable. The objective is to close a circular bio-economy loop by transforming locally under-utilized wastes into tarpaulins. For this study, wastes from Bangladesh will be collected, transformed to polyester granules at EPFL and sent back to a Bangladeshi partner for yarn spinning and tarpaulins fabrication.

Impact

Several feedstocks have been analysed and tested in order to create a biodegradable polymer with the optimal properties to create a tarpaulin. Unfortunately, the production process was not scalable. The team has pivoted to sourcing xylose in existing stream in the Global South and continue the development of co-polymers as a suitable material for tarpaulins in the coming two years by leveraging in-kind funding from the partners.

Social Business Models (SBMs)



Solar Cooking

Country: Cameroon
Collaboration: The Laboratory of Renewable Energy Science and Engineering, Soft power

Challenge

More than 3 billion people rely on polluting fuels and technology for cooking, heating and lighting only 17% of the African population have clean cooking access.

Solutions

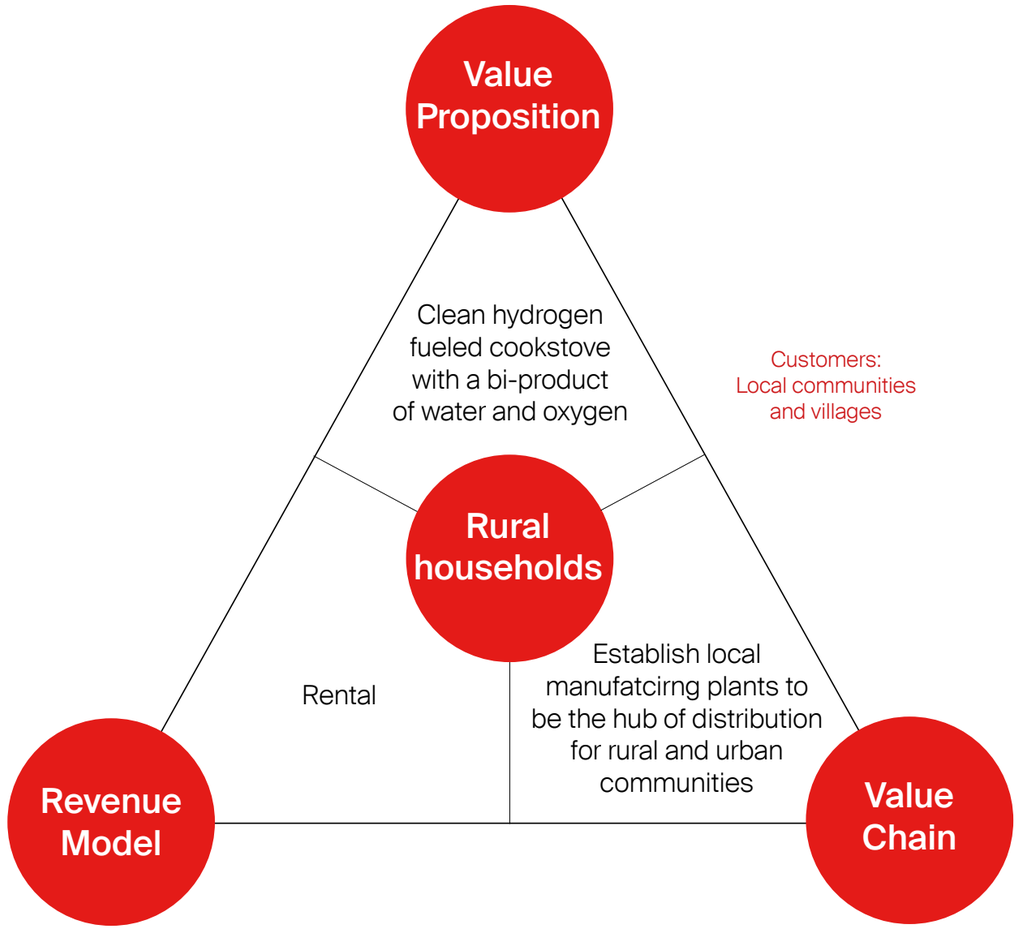
The project aims at a practical demonstration of the use of solar hydrogen as a promising and competitive fuel for clean, safe and modern food cooking in the Global South. Today, in developing countries, food cooking represents the largest energy end-use, and more than 2.7 billion people still use charcoal, firewood, agricultural waste and animal dung. The main problems related to the use of those solid fuels are household air pollution and greenhouse gas emissions.

We propose to combine both production and consumption aspects in a complementary way, through the design and installation of a solar hydrogen production power plant in Cameroon. It will be coupled to an efficient storage solution for fuel delivery to households, the latter being equipped with homemade hydrogen-powered stoves. As an interesting side effect, the combustion product is drinkable water.

Impact

The solar power plant is already installed in Douala, Cameroon.
The hydrogen stove prototype was designed, manufactured, tested and is working properly. The full system will be on site by the end of the year.

Social Business Models (SBMs)



Global Neonat

Country: Kenya
Collaboration: EssentialTech, CPHD Kenya

Challenge

In 2017, 98% of the 2.5 million newborns died, 7,000 every day, occured in developing countries. 89% of these deaths could be prevented if global neonatal mortality rate were as low as it is in the most developed countries.

Solutions

Global NeoNat is a project developing a robust incubator for newborns and a sustainable training in the Global South. Incubators are indispensable tools in primary healthcare, to take care of sick and underweight newborns, which represent a large percentage of child mortality today (40%).

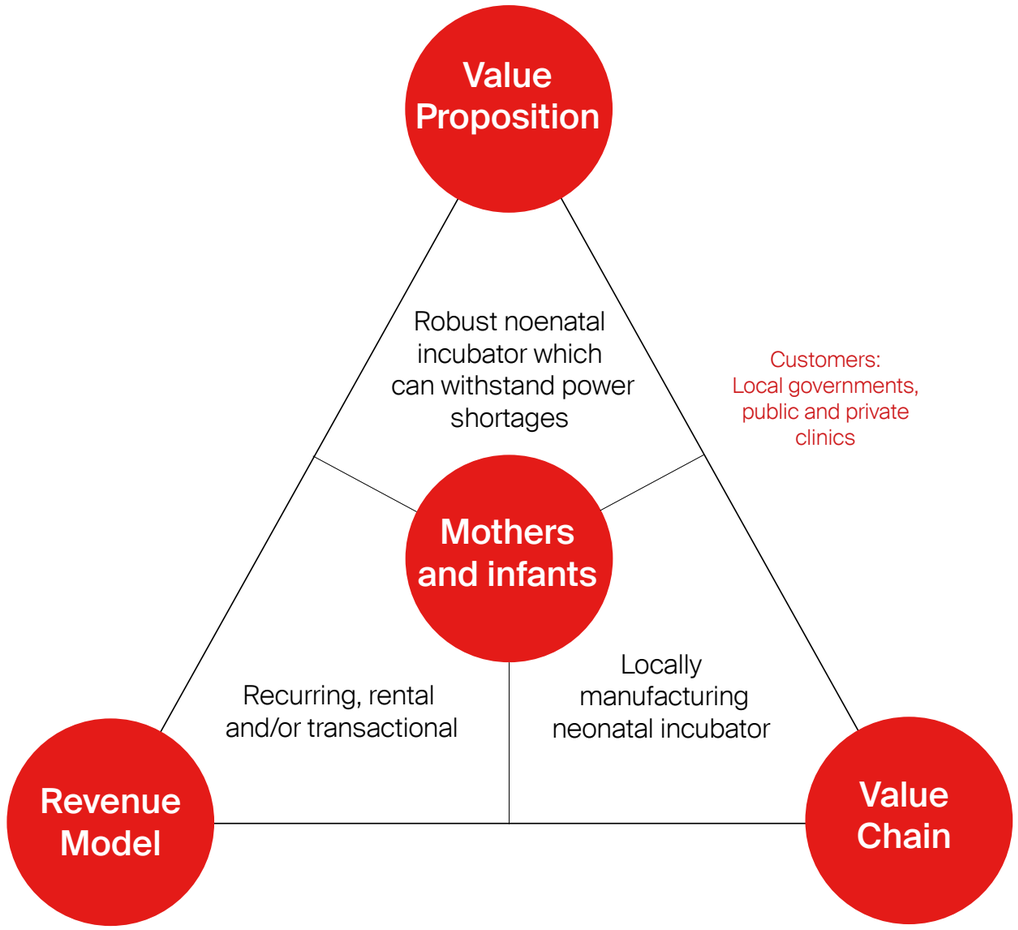
This essential incubator will be simple and intuitive to use. It will have all the necessary features of a state-of-the art incubator, whilst being well adapted to the context of a district hospital in the developing world. Extensive research has already been conducted at EPFL, in collaboration with African partners in Kenya, on many aspects of great importance to this topic. Workshops with Swiss and African pediatricians have allowed to fine-tune and confirm our understanding of the necessary constrains and specifications of the incubator.

EPFL

Impact

The non-functional prototype is ready, they are conducting a survey to investigate local manufacturing capabilities in Kenya and the functional prototype will be tested in the field in Feb 2022.

Social Business Models (SBMs)



2.2.1 Tech4Dev Grantees - Cohort 2

GIS Toolkit

Country: Malawi
Collaboration: EPFL Urban and regional planning community and EPFL Centre for Excellence in Africa, World Bicycle Relief.

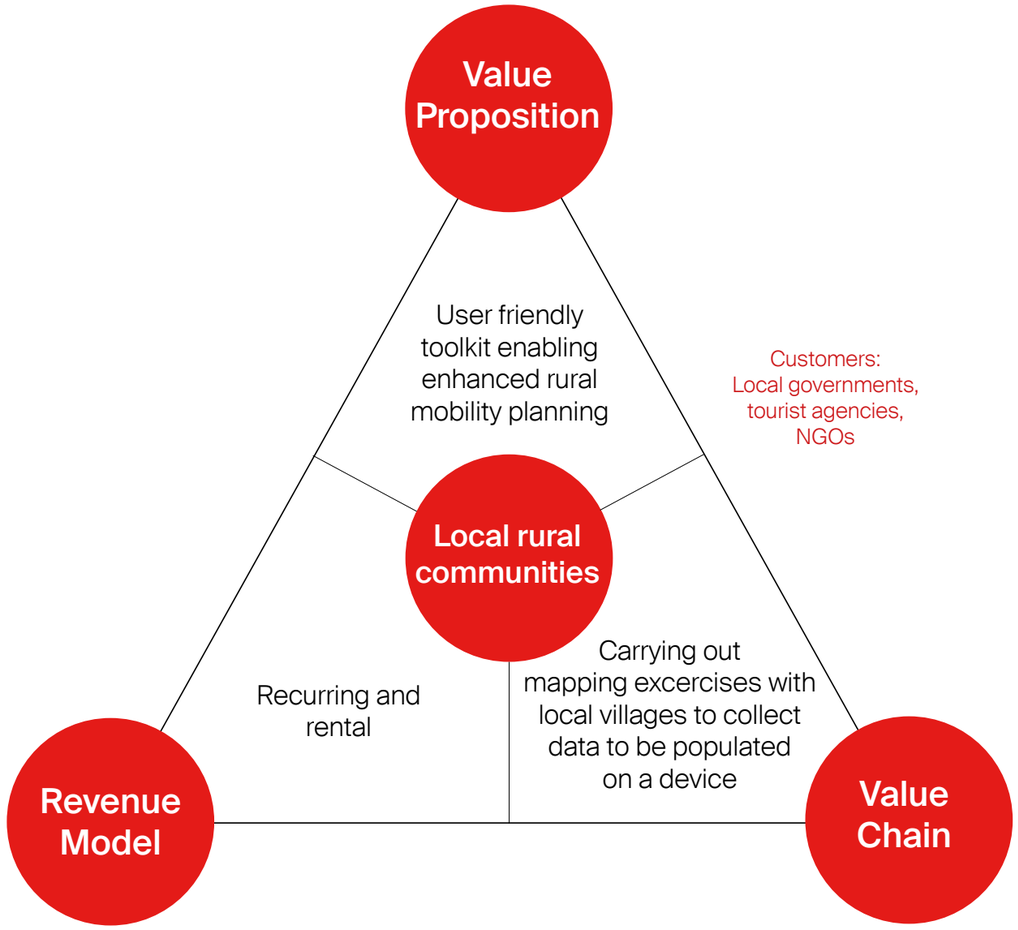
Challenge

Globally, over 1 billion people in rural communities do not have access to reliable transport. The need for transportation sidelines a large proportion of rural communities, for whom mobility is one of the main factors of vulnerability.

Solutions

The project proposes an open-source, participatory mapping toolkit aimed at rural communities of the global South. This toolkit aims to facilitate both collecting and sharing geodata required to evaluate the accessibility, utilization and sustainability of mobility options. Ultimately, it is intended to support decision-making regarding the development of transport solutions in marginalized areas.

Social Business Models (SBMs)



ColdBox

Country: Mozambique
Collaboration: Laboratory for Functional inorganic Materials, EPFL EssentialTech Centre & SolidarMed

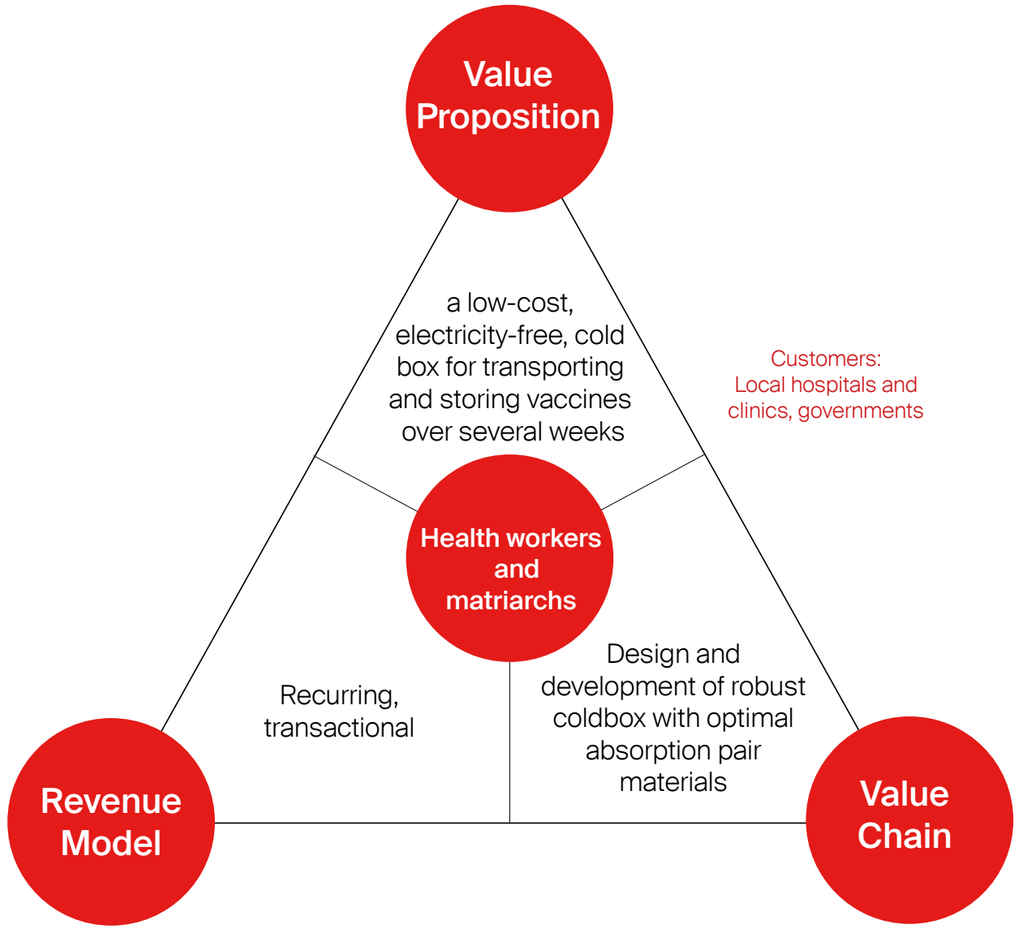
Challenge

Annually, more than 25% of vaccines are wasted: in low-income settings, it is mostly due to a lack of a continuous cold chain rooted in missing or unreliable electricity supply infrastructure. Current cooling equipment is expensive, uses a large amount of electrical energy and environmentally harmful refrigerants. To be effective, most vaccines require storage at 2°C to 8°C from production to patient.

Solutions

Coldbox is a project developing a low-cost, electricity-free, cold box for transporting and storing vaccines over several weeks. The research will focus on fine-tuning absorption materials by optimizing their properties for harsh climate and to incorporate them in a robust and highly insulated vibration resistant cold box. In the second year, these prototypes will be field tested in rural Mozambique.

Social Business Models (SBMs)



Cervical Cancer

Country: Cameroon
Collaboration: EPFL Signal Processing Laboratory 5, Hôpitaux universitaires de Genève, Département de Gynécologie et d'Obstétrique, ASCRES, and Dschang University Cameroon

Challenge

Each year, around 266,000 women die of cervical cancer and this number is projected to reach 416,000 by 2035. More than 85% of these deaths occur in low- and medium-income countries where availability of trained healthcare providers and access to expensive screening devices are limited.

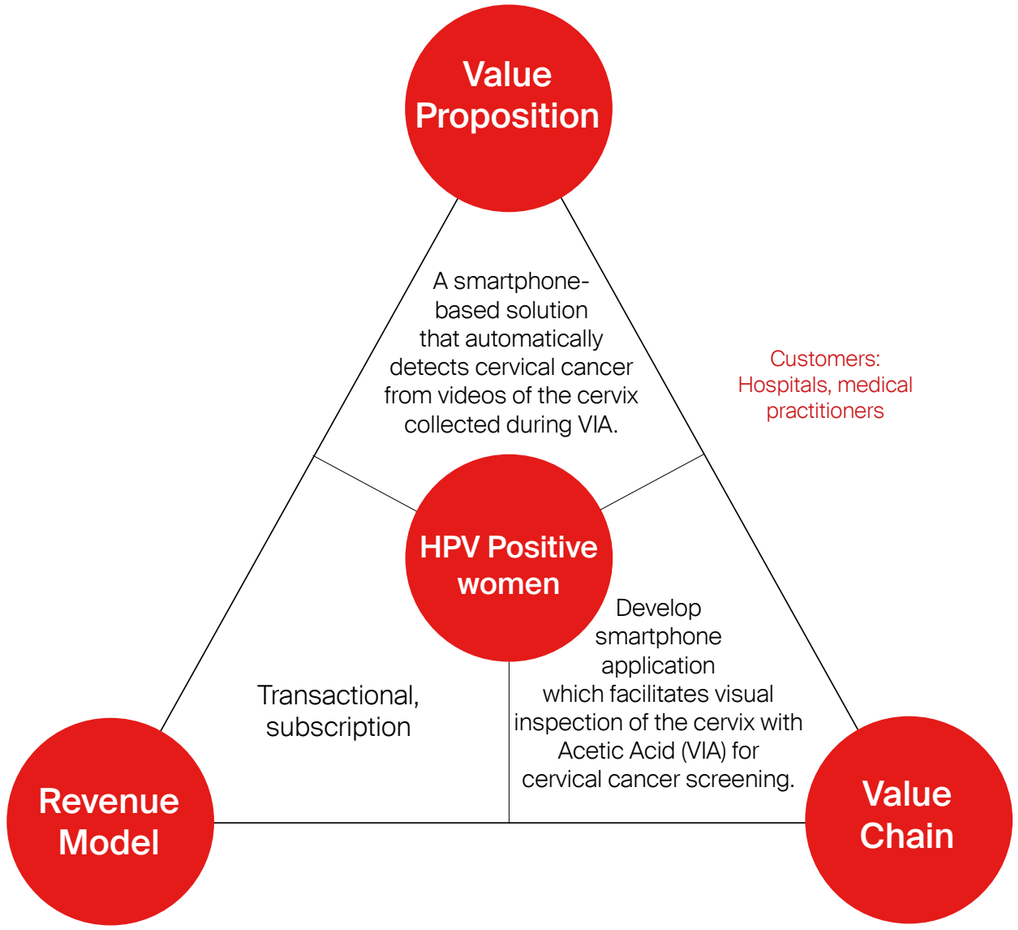
Solutions

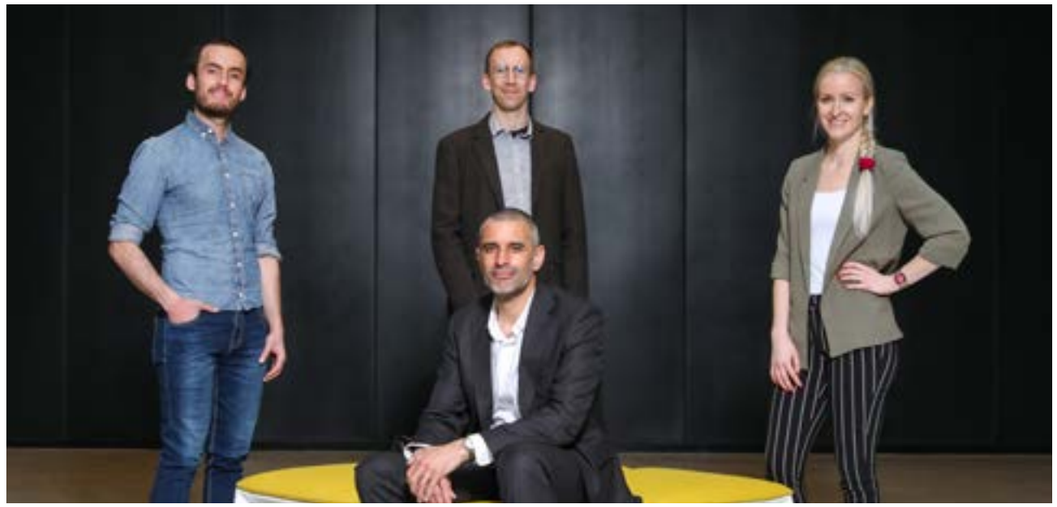
Visual inspection of the cervix with Acetic Acid (VIA) is a simple and well-established technique for cervical cancer screening, well adapted to low- and medium-income countries. However, this assessment by human observers is generally subjective and accuracy is limited.

Our project aims at implementing a smartphone-based solution that automatically detects cervical cancer from videos of the cervix collected during VIA. Each year, around 266,000 women die of cervical cancer and this number is projected to reach 416,000 by 2035. More than 85% of these deaths occur in low- and medium-income countries where availability of trained healthcare providers and access to expensive screening devices are limited.

Automated VIA Classifier (AVC) offers a low-cost solution for cervical cancer screening with the potential of scaling-up, appropriate and affordable for low income settings.

Social Business Models (SBMs)





CDRS

Country: South Sudan
Collaboration: EPFL Structural Exploration Lab, Medair East Africa, University of Djuba

Challenge

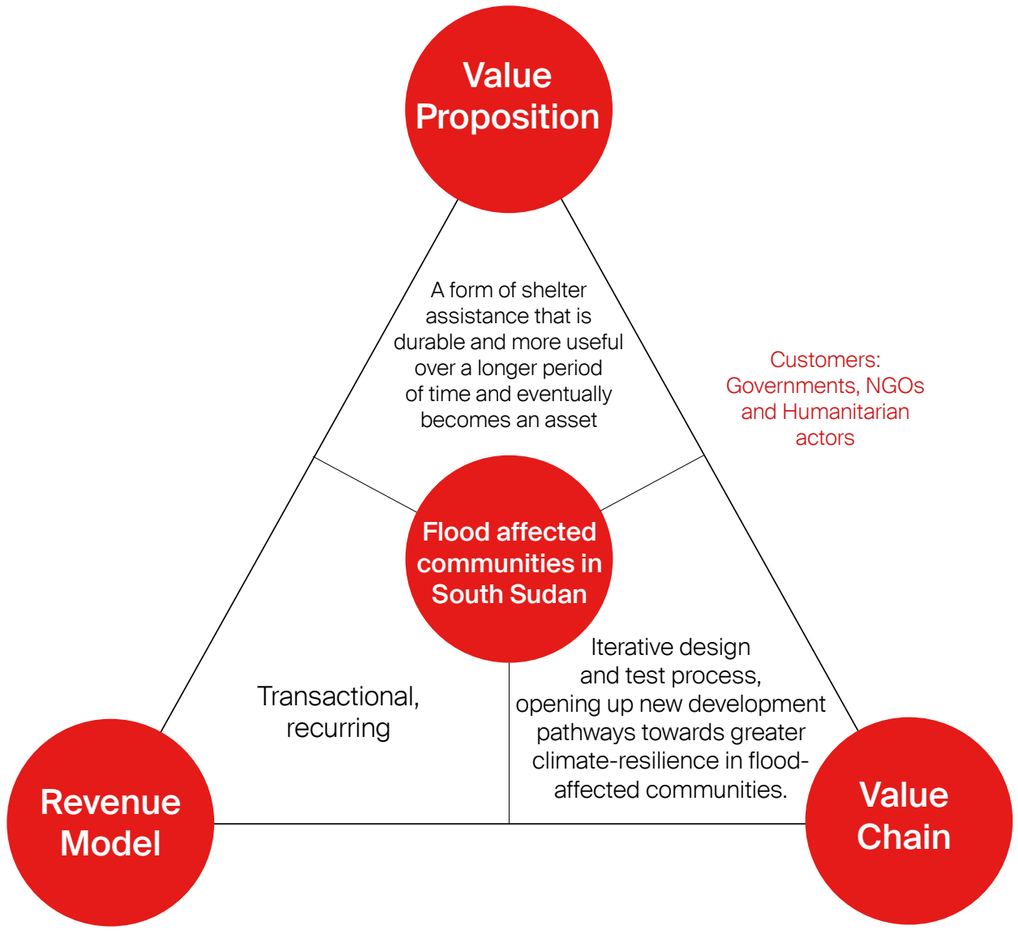
Provision of flood resilient housing in South Sudan is constrained by prevailing limitations in availability of materials, skills and funding for shelter assistance. In the country, nearly all manufactured building materials must be imported. Furthermore, the poor condition of the national road network increases the cost of internal supply chains. On the other hand, the lack of construction skills, particularly in rural areas most affected by flooding, hampers development of more resilient housing.

Solutions

Driven by a need to respond to severe and increasing seasonal flooding in South Sudan, Computational Design for Resilient Shelters aims to improve shelter assistance through the creation of a more resilient shelter design.

The project will unlock new shelter solutions optimised for material use, cost, and versatility. Combined with first-hand knowledge of local socio-technical context, these technologies will integrate with vernacular construction through an iterative design-and test process, opening up new development pathways towards greater climate-resilience in flood-affected communities.

Social Business Models (SBMs)



Section 3: What's next?

Going forward, Tech4Dev aims to become the platform for collaborative creation of sustainable ventures with local ownership and impact as DNA.

One of the ways we plan to achieve this is by continuing to create spaces for EPFL labs and Tech4Dev global south partners to cultivate meaningful and impactful relationships. To facilitate this we will be launching the “Emerge Labs”.

Emerge is a 1 month long series of workshops where NGOs and EPFL labs can meet and explore pathways for partnership around specific topics.

During this month NGOs and EPFL labs will be able to:

- Understand different partnership options available to them
- Be exposed to various use cases where their complimenting competencies can lead to concrete solutions
- Get familiarised with impact evaluation and sustainable business models
- Get insights on implementing in global South contexts

Join us in our journey towards impact!

Meet the team

Tech4Dev is proudly managed by Beatrice Scarioni, Head of Tech4Dev, Hilda Liswani, Tech4Dev's Sustainability Engagement Manager and Antoine Gomez, Junior Project Officer.

They have followed the program from the onset and together maintain and bring the goals of Tech4Dev to life while also finding new and innovative ways to expand its mission to broader frontiers. The team is ultimately driven by the passion to demonstrate a more equitable and inclusive approach to development cooperation technological innovation for the global South.

Béatrice Scarioni
Head of Tech4Dev
beatrice.scarioni@epfl.ch

Hilda Liswani
Sustainability Manager
hilda.liswani@epfl.ch

Antoine Gomez
Project Manager
antoine.gomez@epfl.ch

Credits

Cover © Alain Herzog
p. 4 © Pexels
p. 10 © Pexels | © Pexels
p. 11 © Pexels | © Pexels
p. 12 © Pexels
p. 16 © Alain Herzog
p. 18 © Alain Herzog
p. 20 © Alain Herzog
p. 22 © Alain Herzog
p. 24 © Alain Herzog
p. 26 © Alain Herzog
p. 28 © Alain Herzog
p. 30 © Alain Herzog
p. 30 © Pexels

EPFL

Appendix 1 - Challenges proposed by NGOs for the Virtual Summer School

NGO	Challenge	Solution 1	Next steps
Selco Foundation	How could we design a low-cost and efficient portable vaccine carrier working with solar energy to ensure a fast and efficient delivery of this product in rural and remote communities of developing countries?	Team 1 : A vaccine carrier that uses the heat of the sun to produce the refrigeration needed to maintain the cold chain for the vaccines. The box uses an absorption refrigeration cycle that uses solar energy as its heat source to provide the energy needed to drive the cooling process. To make it functional even when there is no solar energy available, the system includes an energy storage system that uses no batteries, but ice. The design of the carrier is a box-frame with a lid on top. The ice storage and the refrigeration system will be integrated in the box-frame. The solar collector will be mounted in one side of the box. It will be manufactured from locally available products.	Selco will continue working on this challenge. The summer school helped them to get additional knowledge and ideas to tackle cold storage of vaccines. All the students working for them have been proposed to do an internship at Selco.
Selco Foundation	How could we design a low-cost and efficient portable vaccine carrier working with solar energy to ensure a fast and efficient delivery of this product in rural and remote communities of developing countries?	Team 2 : A multicopter drone service to make quick, last call emergencies vaccine deliveries. With hubs located at the last accessible town/village, the drones can live up to their characteristics, being fast, safe and reliable. With it being a multicopter, it has the ability to vertically take off and land which allow them to bring back the medical waste - consequencing from the vaccination- to the hub where it can be properly disposed of.	Selco will continue working on this challenge. The summer school helped them to get additional knowledge and ideas to tackle cold storage of vaccines. All the students working for them have been proposed to do an internship at Selco.
Terre des Hommes	How could we build an efficient and reliable data-driven system for water supply in refugee camps that helps provide safe and clean water for all?	Team 3 : A plug-and-play data driven system to monitor water quality. It consists of several sensors to measure all the variables. The data collected by the sensors is then stored online and displayed in real-time on a digital platform, accessible to water and sanitation experts. The digital platform also offers data visualization and analytics.	The inputs from the participants helped Terre des Hommes to dig in some directions they haven't thought of. Currently, Terre des Hommes is fundraising to continue developing this solution. In parallel, two of the students are working on their own solution to solve this challenge through the EPFL Changemakers Program.
Medair	How could we reduce the amount of water that is wasted during collection at manual water pumps in rural areas of developing countries?	Team 4 : A galvanized steel threaded reducer that is permanently fixed to the opening of the manual water pump. In addition, a small diameter galvanized steel pipe will be attached to the threaded metal reducer, whose purpose will be to ensure that the distance between the outlet and the jerrycan is reduced. Lastly, awareness campaigns will be organised in the rural communities of South Sudan through signboards, radio broadcasts (jingles), engaging religious leaders, educating children on the importance of reducing water wastage, and by organizing meetings with community leaders.	Medair used the summer school as an opportunity to explore this challenge further. They might use the inputs from the students to implement a solution in the future. They proposed an internship to the students that worked with them
Base	How could we develop efficient renewable energy systems for humanitarian organisations operating in refugee camps?	Team 7 : A one-stop grocery shopping app that helps consumers make smarter eco-conscious decisions by encouraging users to shop sustainably. A GPS feature allows the user to find sustainable and local food shops everywhere around her/him.	The solution was interesting for Base. The team of students want to continue it on their own. Thus, both the students and Base will work on that solution. Base will tweak it and adapt it to its needs.

NGO	Challenge	Solution 1	Next steps
		The sustainability of shops is evaluated through different certification labels of the food available that the user can filter depending on its preferences. The app also propose additional services such as adapting to shopper habits, online purchases and grocery delivery.	
Base	How could we improve the circularity of solar energy technologies in the Global South?	Team 6 : A Li-ion battery recycling plant in Kenya, the first of its own in the country. The recycling plant's main product is the virgin materials extracted from the wasted batteries that will be sold to manufacturers. Remaining working cells in the wasted batteries will be examined, refurbished and then sold to solar companies. The old batteries will be collected thanks to different partners such as solar companies, E-waste recycling plants and individuals that will get rewarded in exc	The inputs from the students have been interesting for Base to dig more into this challenge. However, the solution is not focused on what Base can do, thus the solution will not be implemented
Base	How could we develop efficient renewable energy systems for humanitarian organisations operating in refugee camps?	Team 5 : Installing smart mini-grids made accessible through power purchase agreements and a guarantee fund. The mini-grids will be provided by dedicated technology providers who, along with financial institutions and donors, come together to form an ecosystem around renewable energy projects for refugee camps.	The solution had a strong focus on business model innovation and thus was adapted to what Base is doing. They will use it as a base to come up with a solution.
UNAIDS	How could we incentivise individuals to contribute to a social cause through a digital asset rewarding system?	Team 8 : An online donation reward platform that would work as a plug-in via online retailers, streaming services and others, where individual donors can make a small contribution to the social and sustainable projects along with their purchases. After donating, donors will be sent a link to the platform, where they will see the progress and current news of the projects they have donated. Each time they donate, donors will receive SMILES (an online currency) which can help them receive exclusive products or discounts as well as representing their ranking and the level of impact they have made.	The inputs of the students were useful to advance on the conceptual aspects of the solution. The next steps for UNAIDS will be to start prototyping the solution through EPFL student internships
WWF	How can we leverage technologies to avoid elephants being killed by poachers?	Team 9 : An online platform that allows wildlife agencies to easily conduct african elephant population surveys in a digital and automated way, provided approximate GPS coordinates of the population of interest. It uses artificial intelligence to detect and count elephants from satellite images allowing wildlife agencies to survey elephants as they migrate over large areas. The platform is designed to perform in areas with sparse vegetation in southern Africa.	WWF was happy with the advancements that the students have bring to the solution. 3 students from the team will continue working on the solution with WWF, which is currently looking for internal fundraising.

NGO	Challenge	Solution 1	Next steps
WWF	How could we use technology to create a detailed and easily updatable global map of land and sea tenure, accounting for tenure uncertainty?	Team 10 : A platform that seeks to provide data depending on the user registered in the system. There will be public information available for anyone, but for more detailed or sensitive content the user will have to get special access. Data and information are provided by the general public. Data from this source will go through various levels of validation from our partner organization experts before it is uploaded.	The inputs of the students were interesting for WWF to explore the challenge. However, the solution proposed is not adapted to the needs of the NGO, thus the solution will not be implemented.

EPFL

Appendix 2 - Revenue Model and Description

Revenue Model	Description
Transaction revenue	One-time sale of goods or services.
Project revenue	One-time project.
Recurring revenue	Customer pays for access to a product or service in installments (usually monthly or yearly.
Service revenue	Service provided to customer. Customer pays for time or expertise.
Freemium	Offer subset of features for free. Try to convert free customers to paying customers.
Advertisements	Sell ad space.
Marketplace, platform	Platform or marketplace to connect buyers to producers.

Appendix 3 - Selection Criteria

Selection and Eligibility Criteria of Projects for the International Expert Panel

1. Eligibility criteria

- Inclusion of scientific or implementing partner from the global South
- Implementing partner has to contribute to the budget (in-kind and/or cash)
- 40% of the total budget has to be disbursed in the global South

2. Selection criteria

Innovativeness

- Pertinence of technology innovation in addressing the needs in the global South
- Assessment of the maturity of the technology
- Competitiveness vis-à-vis to existing solutions on the ground

Social and environmental impact

- Social and/or environmental relevance of the considered need in the project
- Potential to create social and environmental impact on the long term in the global South
- Strength of the EPFL-NGO fit in addressing a common need in the global South
- Ensuring that the global South beneficiaries' needs are met by EPFL research

Implementation and scaling:

- Transferability potential of EPFL technology towards application in practice
- Implementation and testing in the global South
- Potential for scalability of the project after implementation
- Financial sustainability of the project (e.g other funding options after the 2- year grant)

Budget:

- Validity of proposed use of the budget with clear breakdowns
- Balanced budget allocation to different stakeholders, including EPFL researchers, global South partners or entities

Team:

- Team's ability to realize the project
- Team composition (multidisciplinary, diversity, gender-balanced, etc.)
- Team dynamics and cooperation between researchers and global South partners, following the KFPE principles

Ethical issues & open access:

- Assessment of team's abilities to deal with ethical issues (if applicable)
- Ensuring open source and open access of the specific technology to other global South partners

Appendix 4 - Ethics self-assessment form

Name call : .....
Ethics self-assessment

Project title:
Name Principal Investigator and affiliation:
Email:

Research on Human Embryo/ Foetus	YES
Does the proposed research involve human Embryos?	☐
Does the proposed research involve human Foetal Tissues/Cells?	☐
Does the proposed research involve human Embryonic Stem Cells (hESCs)?	☐
Does the proposed research on human Embryonic Stem Cells involve cells in culture?	☐
Does the proposed research on Human Embryonic Stem Cells involve the derivation of cells from Embryos?	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

Research on Humans	YES
Does the proposed research involve children?	☐
Does the proposed research involve patients?	☐
Does the proposed research involve persons not able to give consent?	☐
Does the proposed research involve adult healthy volunteers?	☐
Does the proposed research involve Human genetic material?	☐
Does the proposed research involve Human biological samples?	☐
Does the proposed research involve Human data collection?	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

Privacy	YES
Does the proposed research involve processing of genetic information or personal data (e.g. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	☐
Does the proposed research involve tracking the location or observation of people?	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

Research on Animals	YES
Does the proposed research involve research on animals?	☐
Are those animals transgenic small laboratory animals?	☐
Are those animals transgenic farm animals?	☐
Are those animals nonhuman primates?	☐
Are those animals cloned farm animals?	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

Research Involving Developing Countries	YES
Does the proposed research involve the use of local resources (genetic, animal, plant, etc.)?	☐
Is the proposed research of benefit to local communities (e.g. capacity building, access to healthcare, education, etc.)?	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

EPFL

Dual Use	YES
Research having direct military use	☐
Research having the potential for terrorist abuse	☐
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	☐

Ethics Self-assessment

If your answer is 'yes' to one or several questions in the Ethics Issues Form, please add below an ethics self-assessment on how you intend to deal with the ethical issues raised within your project and the authorization (if any) you will seek to obtain. Max 2'000 characters.