

# Bio-hack my world

## Problem Statement:

Our core idea is that UNDP alongside UNICEF establish a National Biohacking Initiative that will foster innovation, education, and meaningful engagement of communities around the country in finding solutions to the rising environmental challenges. The Initiative will focus on biowaste as an entry point into creating entrepreneurial opportunities for a greener future. The idea is to make science accessible to the general public in the same way computer programming became accessible to the general public in the 1970s.

Biowaste in North Macedonia accounts for 45.6% of all waste produced in the country. Most of that waste, approximately 95% ends up in open landfills and dumpsites, emitting greenhouse gases, and contributing to a range of environmental challenges for our society. The system [educational, civic, business] has been sluggish to foster innovation in reusing and/or repurposing bio-waste. Public institutions have also done little to tap into the transformative potential of this type of waste. Entrepreneurs are yet to tap into the potential of biowaste while a significant reduction of the number of students enrolling in technical studies is an indication that youth does not recognize the business and career potential in working on this or related environmental solutions.

Waste in North Macedonia is a structural systemic challenge, and we recognize that there are no silver bullets for solving complex challenges, however by activating a portfolio of options to tackle these challenges we might enable systemic change. The citizen-driven bio-hacking movement, which aims to democratize science and make it more open to the public, is one of these options we trust will improve the situation in our country and will accelerate change. This movement, despite some stigma attached to it, is now being recognized as one of the solutions to some of society's growing list of complex problems. The next generation of biohackers has set their sight on solving global problems. Some good examples are: tackling urban pollution by using homebrew biological systems, using bacteria to clean oceans, or transforming biowaste into viable products. The movement is spearheaded by the, so-called, Do It Yourself [DIY] laboratories<sup>[1]</sup>. Many of them are referred to as biohacking laboratories, where based on "de-skilling" approaches, participants are creating open-science innovations or for-profit startup businesses. "De-skilling" is primarily undertaken by individuals with extensive research training from academia or corporations, who then mentor and oversee other DIY biologists with little or no formal training. The biohacking laboratory is nothing different from "Lego" laboratory that has all the equipment needed for an amateur innovator. Under the eye of supervision of a professional technician, they can make for example synthesis of orange biowaste and transform that polymer into an essential oil that they can sell on the open market for profit or present it to an investor.

At the moment, North Macedonia does not have a biohacking space where innovators, entrepreneurs, students, or teachers could test ideas, learn, and experiment. Furthermore, there is no space for experimental learning, science co-creation, or out-of-the-box thinking when it comes to scientific experiments. The biohacking movement is almost? nonexistent; however, we have already mapped pioneers from both the academia and business sector who can spearhead the change.

The problem with the lack of a circular bio-waste ecosystem lies in the absence of investments in science and the disconnect between academia and industry, which has been multiple times highlighted in reports of the [Joint Research Committee of the EU](#). Furthermore, North Macedonia records a very

modest level of R&D expenditures compared to EU member states. The current picture is even worse considering the declining trend of 40 R&D investments in recent years.

This joint initiative incorporates three distinct pillars through which we aim to build: 1) innovation and entrepreneurship; 2) education and schools' engagement; and 3) public demand and participation. This initiative is nested in existing programme frameworks of UNDP and UNICEF and is aligned with national priorities and action plans.

#### Pillar 1 - Innovation and Entrepreneurship

**GOAL: Establishing a biohacking lab in North Macedonia, open to the public, will contribute to bringing science closer to the community of entrepreneurs, and will enable the design of durable solutions for the complex environmental challenges of the society.**

In a UNDP report presented to the Ministry of Environment in 2020, it was assessed that by applying circular practices to biowaste as a waste stream 303.74 Gg CO<sub>2</sub>eq/year GHGs saving compared to 2016, 463 new jobs can be created and 12.7 million Euro in economic benefits can be created, by 2030. However, in order to do so, we need to act now and act as innovatively as possible.

Focusing on Innovation and Entrepreneurship our aim is for the biohacking lab to serve as an acceleration hub that will spark curiosity and inspire a community of entrepreneurs, young people, and civil society enthusiasts to pursue activities in the realm of circularity with a focus, but not limited, on bio-waste.

At the moment, there are various laboratories for Science that are adjacent to Faculties and all of them are not well equipped and are closed to entrepreneurs, innovators, young people, and the general public, thus widening the gap between science and the public. This has multiple negative effects on society as a whole, where the academia doesn't communicate with the industry to feed them with new ideas nor there are any bottom up approaches in the form of startups that are working with bioscience.

For instance, the Faculty for Technology and Metallurgy should be the place for the next generation of food technicians, ecologists, and biowaste transformation researchers, but in reality, it only has 44 new students enrolled for the year 2021 down from 124 in the year 2015, and no important scientific breakthrough has been implemented by the industry or the business sector in the previous period. In addition, there are technically qualified young professionals educated in Vocational schools for food technicians and chemical –technology that either doesn't pursue their studies in the fields or there is a declining trend in enrollment for such programs. To illustrate, 30 students enrolled in the food technician high schools program in 2017, but only 15 the following [year](#). On the other hand, in the chemistry–technology program there is a steady trend of around 400 enrolled students for the same period, however, most of them don't proceed to universities nor open business in the area.

Our hypothesis is that starting such biohacking initiative and opening a biohacking lab will encourage a shift in narrative and act as a system transformation initiator that will inspire young people to shift their focus of interest to STEAM research and in near future create economic opportunities including start-ups, spin offs that will employ highly skilled labor, especially youth and high school students.

#### Pillar 2 – Education and schools engagement

**GOAL: Co-design and co-deliver an educational programme of the Biohacking Lab together with science teachers and industry professionals to serve curriculum and schools all over the country, with special focus on the most marginalized and rural areas.**

The educational programme of the Biohacking Lab will intentionally design the curriculum so that it is available and accessible to all groups, including marginalized groups of youth (i.e., from the rural areas). Through modalities such as school incursions, regional school fairs and community-specific student challenges the Biohacking lab will spark interest and stimulate innovation and entrepreneurship as part of the formal education process. This is especially important for rural communities in the country which are currently facing higher than average poverty rates.

The programme will connect to the curricula of the schools about chemistry and biology, primarily. In partnerships with the municipalities and the schools across the country, when a certain topic of biology is to be learned an educational visit will be organized, using mobile equipment, to support the learning of the students through experiential learning and hands-on experiments. Additionally, on-line experiments, incursions (BioHack in the school), bio-waste collection points and science school fairs will be organized to raise students' awareness and curiosity for the science behind biohacking and the potential of reusing bio-waste.

The educational programme of the Biohacking lab will also create new multi-sectoral partnerships with existing public and science institutions that can contribute to a broader experiential learning network. Namely, the newly established Biohacking Lab will link up with multiple existing venues and institutions which have recently joined forces into a Science Learning Network. This network has already secured strong support and commitment from the Government and a wide array of existing institutions and venues with potential to deliver science-based educational programmes supportive of curricula delivery in schools. While most of these institutions have a long tradition of expertise and knowledge generation in the country their outreach and community engagement programmes have certainly been lacking. The innovative approach and cooperation that the Biohacking lab will bring to the Science Learning Network will model co-creation and innovation with key principles of circular economy, aiding to the delivery of the curriculum and revival of the other partner institutions.

### Pillar 3 - Building public demand, community participation

#### **GOAL: Stimulate public demand and community participation in biowaste repurposing**

The third pillar of the National Biohacking Initiative focuses on public demand and community participation. Under this pillar we are going to organize multiple Biohacking and Science festivals and caravans in both urban and rural areas that will stimulate public demand for uptake of climate change adaptation in formal education as well as spark interest in biowaste repurposing innovation and entrepreneurship.

This concept envisions multiple regional science fairs targeting major agricultural regions, national parks and vulnerable, poverty-affected communities. The science fairs would be carried out in partnership with science universities and institutes from the country. This approach has three distinct goals: 1) build interest among secondary school students to pursue a career in science and environmentally sustainable innovation and entrepreneurship; 2) link universities to the opportunities of the Biohacking Lab and offer opportunities to university students to use the opportunities of the Lab, innovate and showcase their projects to their community; and 3) link SME participants to a wider network of local and national partners and help them expand and enhance their future businesses.

Considering the large-scale reach of these events, the advocacy goals will also target the current low rate of girls and young women in science. The programme for these events will consistently promote the achievements and advancements of women in science. The programme team has explored a potential partnership with the UNDP Istanbul Regional Hub Women in STEM should this idea move forward.

[1] It is important to note that for centuries, experiments were performed in home kitchens, personal workshops, or small laboratories; and some of the greatest inventions were created in Do it yourself “DIY” laboratories. For example, in such a DIY lab created by Marie Curie in 1935, her daughter Irine and her son-in-law Frédéric Joliot-Curie discovered artificial radioactivity, finding for which they won the Noble prize in chemistry.

#### WHO IS THIS IDEA/INNOVATION GOING TO BENEFIT OR IMPACT?

*Please describe your target audience.*

The intervention is structured in such a way that it will affect the system in three different ways. It will affect our primary audience young people from primary school to high school (10 to 18 years old), the secondary audience – students and recent graduates (19 to 24 years old), Entrepreneurs and innovators from all age groups and the public and local communities where we will bring science back in a fun and engaging way.

The educational component will be focused to educate and engage. One of the (early) priorities for the BioHacking Lab will be to bring science and experimentation into contact with the students and teachers. We aim to improve the community understanding and value of science and experiential learning, and thus support educational outcomes. Mechanisms and activities such as student boards, parents' meetings, school gardens, science fairs, exploratory excursions, videos, podcasts, and social media activities will be organized to educate and engage. Students will get to opportunity to explore, think, and play with scientific concepts, from magnesium volcano to creating your own PCR test.

The schools are going to be connected with the science and research centres and this will add value to the curricula and the educational programme. Professional communities will be created within the schools for knowledge sharing and strengthen the teacher-mentor network. The OECD [Talis](#) survey has demonstrated on multiple occasions that professional learning communities yields most results in teachers. This will advance the interdisciplinary approach and help create a bridge between different disciplines such as biology, chemistry, ecology, architecture, design, economy, climate change, biowaste, etc.

The entrepreneurial ecosystem that will be created around students and recent graduates of, but not limited to, STEM related faculties is going to be strengthened with an open and common space where creativity and entrepreneurial mindset will be cherished. The beneficiaries from the entrepreneurial component are the companies and the young innovators, the Startup eco-system, the academic community, the business and the science research institutes and Chambers of commerce, who will have space not only to experiment but share ideas, concept and most importantly create solutions.

Furthermore, the Biohacking lab will create connections with the municipalities and engage with the local youth councils and youth centers. The social innovation ideas generated by the Biohacking Lab will be proposed to the Municipal Council for support and invite Municipalities to support the sustainability of the ideas. The engagement component will create bridges and crossroads between the councils, youth centers, schools, startup community, citizens, and social innovators for solving local problems for improving the lives of the community and contributing to environmental sustainability. The most vulnerable and marginalized communities will remain a priority.

Activities such as science fairs focused on biology and chemistry for students, teachers and parents will raise awareness and engage the wider community. The community events will bring different stakeholders together, such as the private, academic and media sector. Journalists and media will be invited and engaged and through different communication digital activities, such as videos, live discussions, challenges, podcasts, web posts and articles, we are going to aim to stimulate behavior change and raise awareness on consumption, climate change and biowaste.

Finally, having the biowaste in focus for many important stakeholders, eventually the quantity that ends up in the Landfills will be reduced. This is particularly beneficial for the public communal enterprises that deal with waste management in the municipalities. This will reduce costs for the collection, transport and landfilling of the biowaste for the public communal enterprises and will benefit the environment and climate change in general.

### **IS THERE EVIDENCE THAT THE IDEA/INNOVATION WILL BRING THE EXPECTED BENEFIT/IMPACT?**

*If yes, please provide evidence.*

In 2020, UNDP conducted a deep listening process that identified behaviors and micronarratives from the industry signaling that such a biohacking intervention is needed. Overall, the deep listening process concluded that there is no active bio-waste ecosystem in Skopje, but there is a lot of potential for innovation and transformation of the biowaste if different actors manage to work together in a common space.

Some examples found in the deep listening process, that support the claim can be found in startups popping up in the region. For example, the winner of this's year [Balkan Green Ideas](#) is proposing a solution to the biowaste coming from citrus leftovers from the HOREKA sector.

The educational component of this proposal addresses another major issue. Namely, the education system lacks structured extracurricular and community engagement opportunities. It was only recently in 2020, when a national concept for extracurricular activities was adopted to structure but also stimulate extracurricular engagement. A [focused study by the OECD](#) found that participation in extracurricular science activities has a positive relationship not only with student performance, but also with their attitudes towards learning and belief in their own abilities. The proposed project takes this into account and proposes a multitude of opportunities for extracurricular, experiential learning and community engagement. Such activities are regularly welcomed by schools and students and help create a culture of student activation and participation.

Finally, two aspects of the Biohacking Lab add to the sustainability of the overall efforts. One is the envisioned financial model of the Lab itself. Namely, the Lab will draw on interest from the private sector and actively seek-out opportunities for cost sharing and innovation challenges. The Lab will also initiate a membership programme for up-and-running businesses as well as encourage a culture of giving back to the community of innovators, entrepreneurs, and researchers. The other sustainability aspect of the Lab is the nestling of its educational programme with the Science Learning Network. This UNICEF lead programme has secured government backing and support to elevate and sustain this network into a national initiative that advances education and interest in science among students and teachers, and fosters innovations among young scientists and entrepreneurs.

## EXPLAIN IN MORE DETAIL THE PROBLEM(S) THAT THE INNOVATION/IDEA IS TRYING TO ADDRESS?

*If appropriate, include relevant SDG target. Please keep it to 300 words*

Biowaste is the most abundant and renewable resource on earth. Accumulation of this biowaste in large quantities every year results not only in significant greenhouse gas emissions, such as methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O), contributing to the climate crisis and environmental degradation, but also in the loss of potentially valuable resources which can be processed to yield different valuable products.

According to the waste composition in the National Waste Management Plan, biowaste accounts for 45.6% of the total municipal waste in North Macedonia, making it by far the most important element of the municipal waste stream. Less than 1 % of the biowaste is composted and none is transformed into more viable products. Following the EU [Waste framework agreement](#), North Macedonia has set ambitious goals in the waste and biowaste management, committing to recycle 65% of the biowaste by 2030 and landfilling of biowaste should not exceed 10% of the waste generated by 2035 according to the [EU Circular Economy Package](#). If the country wants to accomplish these goals, it must act now and be as innovative as possible. Besides composting, more startups and entrepreneurs should start working in the field, young people and the education community should be engaged, and the wider community should be participating and changing behavior and perceptions on biowaste.

Furthermore, the educational system in North Macedonia does not have enabling environment nor encourages students, teachers to innovate, experiment and advance scientific knowledge. Recent KAP study (Knowledge, Attitudes and Practices) conducted by UNICEF shows that 75% of the schoolteachers do not have appropriate space and resources for practicing scientific experiments with their students. The study confirms that schools in North Macedonia lack the necessary resources to offer contemporary and exciting experiential learning, but they also lack guidance and advisory support considering the rapid advancement of science and technology. The access to science is even lower or nonexistent in the rural and marginalized communities. In general, the overall environment and infrastructure is not enabling nor encouraging students, innovators, and young entrepreneurs to explore, innovate, test, and validate ideas. Few laboratories exist in faculties, limited to the usage of faculty staff and science students and not welcoming to outdoor innovators and entrepreneurs.

The Biohacking lab is going to address these issues by becoming a Hub for innovators, entrepreneurs, students, teachers, young scientists, to experiment, innovate, learn, share, connect and network and engage with the wider community.

## EXPLAIN HOW THE IDEA/INNOVATION WILL CONTRIBUTE TO ADDRESSING THE PROBLEM FOR YOUR TARGET AUDIENCE?

*Please keep it to 300 words*

The establishment of the biohacking lab will have a direct impact on how we manage biowaste in our country, but also on how we perceive waste and the transformational potential it has. Ecosystems for bio-waste transformation are complex networks involving a variety of stakeholders, including start-ups, established businesses, research organizations, laboratories, and other infrastructure. To develop this ecosystem a BioHacking Lab will be fully equipped that will serve as a central point where the community will be built. The Biohacking lab is going to have the equipment to biosafety [level 2](#)

[laboratory](#) and will have 10 working spaces that can be rented to researchers and entrepreneurs that can use the space to prepare their experiments. This is similar to how coworking spaces rent spaces to digital nomads and IT workers. This modality will give the local community, students, teachers, researchers, entrepreneurs, and innovators a place to test, validate and experiment with business and scientific ideas. In the long term, we see this lab as a point that connects the local community to a global network of biohacking spaces, maker spaces, and hackerspaces across the world.

This Lab will offer students, teachers, and schools an educational programme for experiential, hands-on learning of natural sciences and advance the environment and climate change education; By organizing Pop-up Labs, hosted by schools across the country for a limited period within the school year, as alternative venues we aim to advance learning and teaching practices, in most vulnerable and marginalized communities. These hubs will also offer schools greater community engagement by hosting public events and lectures, but also by connecting with the other partner science institutions via the Science Learning Network.

The BioHacking lab will initiate the creation of school gardens, science fairs, exploratory excursions, videos, podcasts, and inspire students and the wider community to explore, think and play with scientific concepts. The Lab will connect to schools and other science centre's adding value to the curricula and the learning outcomes on STEAM disciplines. To advance education and learning, professional learning communities will be created composed of teachers who will share knowledge and support each other. This will advance the interdisciplinary approach and help create a bridge between different disciplines such as biology, chemistry, ecology, architecture, design, economy, climate change, biowaste, etc.

The BioHacking lab will enable and initiative activities for wider community engagement as well, such as science fairs and caravans that will bring different stakeholders together from the private to the academic sector, journalists and media. Different communication channels and digital products are going to be produced promoting scientific knowledge and innovation that will further raise awareness on consumption, climate change, and biowaste.

#### **NUMBER OF INDIVIDUALS TO BE REACHED AND OTHER KEY INNOVATION TARGETS BY DECEMBER 2022.**

Startups are one of the leading organizations that develop new solutions and products through transformative bio-waste processes. As a result of a report done by the UNDP City Experiment Fund, an ecosystem mapping of the players in the biowaste ecosystem around Europe. Most of those startups are coming from the western part of Europe, most predominantly UK and Denmark. Furthermore, the analysis showed that one-third of the mapped startups use the waste from agricultural production as resource/input for their product, followed by coffee and food leftovers. Except for some startups that are at an early stage in business model development no registered startups have been mapped in the territory of NMK. Even though North Macedonia is an agricultural country no startups or businesses are working with agricultural or other biowaste transformation methods.

One of the key innovation targets by December 2022 is to have at least 2 iterations of a program for agricultural biowaste transformation in regions where there are many producers of organic biowaste with a total number of 30 participating SMEs or startups.

We are planning to implement a mentorship program for at least 10 startups that are working in the field of biohacking and waste transformation to take them at least to a stage of an MVP. The startups that we have mapped have a solid business model around biowaste transformation but have not yet created an MVP. Furthermore, in partnership with the [Boost](#), a UNDP platform that amplifies innovative solutions we are planning to organize a biohacking challenge where the best solutions might receive seed financing from Boost financial vehicle.

A key milestone in the biohacking lab for the year 2022 will be to participate in the [iGEM](#) competition. iGEM is a non-profit organization dedicated to the advancement of synthetic biology, education and the development of an open collaboration. Participating in their annual worldwide competition may be the best way to introduce molecular biology projects into the ecosystem. No team of researchers, students or startups coming from the countries in the Balkans have participated in the competition. This prestigious competition's scope is totally open and the only requirement is that the solutions are aimed to solve a local problem. There are many examples of iGEM projects tackling the problem of biowaste: [Imperial College 2013](#): Degradation of non-recyclable mixed waste to be used as feedstock for P(3HB) plastic, [Calgary 2017](#): Turn human waste into PHB bioplastic, [CIEI-China2017](#): transfer osmotic pressure tolerant gene into the aerobic composting microorganisms, [Uppsala 2013](#): creation of easier to engineer probiotic Lactobacillus or [NYU-Shanghai 2019](#): make fish scale-derived collagen good enough to generate electricity and be used for tissue engineering.

The lab and the mentorship structure as it is envisioned can host, we hope, a winning team that will mark an achievement for the whole region.

A further interesting finding in the same report is that 260 [Horizon 2020](#) projects related to bio-waste have been co-financed by the European Union. The total costs related to the realization of the projects are EUR 912.821.358, of which EUR 691.284.098 (76% of the total amount) are funds provided by the Horizon 2020 program, while the remaining EUR 221.537.260 (24 % of the total amount) are provided by the project coordinators and participants. No entity from North Macedonia has so far coordinated a Horizon 2020 project related to bio-waste. We are making a hypothesis that biohacking initiative will accelerate research in

In our long-term key innovation target is that the biohacking lab will serve as a partner organization for at least one Horizon 2020 program or the After [Horizon 2020](#) program. Due to the limited timeframe this is planned to happen in the third year of the project.

On the educational side, we are planning to include schools, students, and teachers from urban and rural municipalities. As other innovation targets the BioHacking Lab will develop a school educational programme on bio-waste, linked to the official curricula, to engage as many students and teachers as possible on the topic of bio-waste related disciplines. The realization of the programme will strengthen STEAM learning outcomes and knowledge. Furthermore, professional learning communities of teachers will be created that will be focused on bio-waste knowledge sharing and learning. Another innovation target for engaging the wider community is that at least two science festivals will be held in the communities, with particular focus on engaging the marginalized and vulnerable groups. The Science Festivals are events that have not been organized in the country and we are seeing this as an opportunity to bring Science closer to the public and have the Biohacking Lab at the forefront of innovation and sustainability.



### **IS THIS A NEW IDEA THAT HAS BEEN JOINTLY DEVELOPED BETWEEN UNDP AND UNICEF?**

The initial idea for the creation of a biohacking lab as a biowaste transformation intervention was created as part of an urban system transformation project lead by the Istanbul Regional Hub under the Transformative Governance and Finance Facility TGFF activity, supported by the Slovak Ministry of Finance. The idea of the 9-month project was through a deep listening process and portfolio approach to design interventions on a city level that embed innovative methods in the design and delivery of programs.

The first phase of the project focused on small-scale experimentation, which gave the project a wide reach, whereas in the second phase of the project, the efforts started to converge, with an increased focus on urban experimentation/system transformation under the City Experiment Fund.

The option for establishing a biohacking lab was one of 7 options that were implemented as part of a system-wide transformation approach whereas the other options focused on proving that biowaste transformation is possible on a city level and that is feasible on the long term.

The UNICEF-led program on the Science Learning Network (SLN) was a logical step for the joining forces with UNDP in this jointly managed intervention. The Science Learning Network is a network of members i.e., science institutions across the country that offer an educational programme for schools on experiential learning and science experimentation to advance the environment and climate change education. The members of SLN are committed to sharing resources and knowledge, collaborating and engaging with schools, providing rich experience and experiential learning that are not possible within the school, and supporting the educational outcomes on science by developing and delivering programs in line with the curriculum. The SLN is flexible in including more science institutions as members and reaching vulnerable communities, areas affected by poverty, and rural communities.

### **IS THIS AN EXISTING SOLUTIONS THAT UNDP AND UNICEF ARE ALREADY JOINTLY WORKING ON AND THAT CAN, THROUGH SCALING, MAKE A BIGGER IMPACT?**

*Please include INVENT link if you have already uploaded this innovation to UNICEF's INVENT.*

No this is a new idea

### **AT WHAT STAGE IS THE INNOVATION/IDEA?**

Submitted innovations can be at any stage of development: ideation; research and development; proof of concept; transition to scale; or scaling.

The idea is at the proof-of-concept stage.

### **IN WHICH GEOGRAPHY IS/WILL THE IDEA/INNOVATION BE TESTED OR DEPLOYED?**

The idea is to be a Nationwide biohacking initiative. Although the central biohacking lab will be situated in the capital city of Skopje, which is the biggest city in the country with almost 1/3 of the population, most of the educational and outreach activities will be conducted outside of the capital. Most of the equipment that will be procured is mobile, meaning it can be transported to other municipalities and placed in regular school classrooms and/or dedicated spaces where there is water and ventilation. The focus of the activities will be to engage with the most climate and environmentally vulnerable

municipalities, as well as the diversity, ethnic background, and poverty levels, as important criteria for the implementation of the activities.

For example, the biohacking science carnivals will focus on the different environmental challenges that that society is facing. One caravan will go to a lakeside city where through simple experiments where everyone can participate in will display how using bacteria can clean rivers and lakes. Another caravan will go to an agricultural city showing how agricultural waste can be transformed into new products. The third caravan will go to a university city where there is little activity from the STEM-related faculties and one in a city where there is the biggest coal power plant in the country displaying how biowaste can be turned into electricity and/or biofuel.

**WHICH OF THE 6 GREEN SHARK TANK 2021 GLOBAL CHALLENGES AND AREAS OF INNOVATION BEST EXPRESSES WHAT YOUR IDEA/INNOVATION IS FOCUSING ON? PLEASE CHOOSE MAXIMUM TWO OPTIONS.**

1. Protecting children, young people, vulnerable and marginalised communities (including women and disabled people) from foreseen climate change impacts, environmental degradation, and geophysical disasters; 2. Promoting a green and sustainable economic recovery for vulnerable and marginalised communities; 3. Supporting children, young people and vulnerable/marginalised communities to strengthen their capacities to bounce back from environmental-related shocks and stresses; 4. Increasing the environmental resiliency of social services for children, young people, and vulnerable people including data, policies, and financing; 5. Enhancing the meaningful engagement of young people in climate and environment issues including through education, skills for green jobs, local and global advocacy, and increasing the meaningful participation of young people in climate/environmental policy dialogues at the national and international level; 6. Scaling holistic solutions to climate change and environmental degradation that span humanitarian response, disaster risk reduction, and climate adaptation programming.

**2. Promoting a green and sustainable economic recovery for vulnerable and marginalized communities.**

**5. Enhancing the meaningful engagement of young people in climate and environment issues including through education, skills for green jobs, local and global advocacy, and increasing the meaningful participation of young people in climate/environmental policy dialogues at the national and international level.**

**INCLUDE NAMES AND CONTACT DETAILS OF UNDP AND UNICEF TEAM MEMBERS**

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