

COMPANY REQUIRED TO UNEARTH INNOVATIVE SOCIO-ECONOMIC OPPORTUNITIES RESULTING FROM IMPROVED INTERNET ACCESS IN RURAL COMMUNITIES USING BIOMIMICRY AND DESIGN THINKING APPROACHES

A] Project Background and Description

The COVID-19 pandemic has taken a heavy toll on the economy of South Africa. According to the Rapid Needs Assessment of COVID-19 undertaken by the United Nations in South Africa approximately 652 000 Small, Medium and Micro Enterprises (SMMEs) in the formal sector, and 342 000 businesses in the informal sector require financial support for business continuity. For SMMEs to sustain their livelihoods during stringent lockdowns, online trading has become vital. As a result, the provision of affordable internet access particularly in rural and peri-urban areas, is expected to play a real role in South Africa's economic recovery by enabling SMMEs to shift towards digital operations and enhance access to markets, finance and services that are required in a post COVID-19 economy.

Quality and sustainable digital connectivity and Information and Communications Technologies (ICT) are therefore one of the pillars of socio-economic growth for South Africa. In this context, offering broadband internet as an affordable utility to persons otherwise unable to afford internet access can create dramatic benefits for education, commerce, equality, and overall economic recovery. As such, it can promote inclusion, efficiency and innovation.

In 2020, the United Nations Development Programme (UNDP) in South Africa, in collaboration with the Council for Scientific and Industrial Research (CSIR) supported four rural and township network operator SMMEs through the Rural Television WhiteSpace (TVWS) Network Operator Support Programme (Phase 1). Through this programme SMMEs were supported to roll-out low-cost internet connectivity to four provinces using CSIR's TVWS Technology. Beneficiary communities included Mdantsane (Eastern Cape), Thaba-Nchu (Free State), Ocean View (Western Cape), KwaXolo, Ugu (KwaZulu Natal).

While the provision of internet access in rural and peri urban areas is a leap forward, several challenges preventing its conversion into socioeconomic opportunities exist. While barriers include illiteracy and the lack of ICT infrastructure, the prevalence of a consumption mindset versus a creation mindset serves as a barrier to unlocking new value chains. To instill a creation mindset, this project aims to support communities to identify unique challenges or natural characteristics within their local environment and then to brainstorm ways of addressing or exploiting these by leveraging the improved internet access. This approach encourages the emergence of game-changer opportunities and new value chains. However, ICT can be damaging to the environment – consider e-waste and its toxicity, or inefficient energy consumption. To enable developed solutions to be more empathetic to all life forms, are environmentally friendly, socially sustainable and regenerative, this project will employ biomimicry and design thinking methodologies to uncover new opportunities. In this way emergent opportunities will empower locals to reap maximum benefits from improved internet access, but also enable social and environmental sustainability – addressing many of the UN Sustainable Development Goals.



The contracted company will be required to engage community members and explore the local environment within the four selected locations to identify local challenges or opportunities. Application areas may address issues such as the lack of water supply, unemployment, food insecurity, lack of public transportation, environmental pollution, etc. The company will be required to investigate how potential application areas can leverage the improved internet access, the principles of biomimicry and design thinking. The company is expected to investigate unique natural characteristics within the local environments and formulate these into solutions capable of fulfilling gaps/needs within the community. Following conceptualization, the contracted company is required to prototype and test the solutions. Experimentation may comprise the development of proof of concepts, prototypes, technology demonstrators, etc., which can be validated in the local context by potential end users. Experimentation aims to assess the validity of developed solutions and its potential to positively impact the targeted developmental challenge. All activities must include extensive engagement with the local community, including youth, local businesses, government and traditional authorities, etc., in order to co-create solutions that consider and respect the local culture and practices. This will aid future uptake and adoption of the developed solutions.

How Biomimicry has shaped the 4th Industrial Revolution and Information and Communications Technologies (ICT)

Claire Janisch, the founding Director of Biomimicry South Africa explained during African Utility Week that exponential technologies all involve biomimicry. Artificial Intelligence and Neurotechnology copy human intelligence; drones are based on natures animals of flight; the Internet of Things (IoT) and sensors draw inspiration from human senses and its connectivity through the central nervous system; robotics mimic the body of various species and even 3D printing draws on nature's way of creating every living organism - cell by cell, layer by layer.

While significant progress has been made, the 4th Industrial Revolution (4IR) is only getting started. Therefore, the opportunity (and responsibility) exists now to ensure it protects the planet rather than destroys it. Unlike other revolutions, 4IR technologies don't just impact the world on a macro scale, but instead they touch everyday lives – from work to play. This implies that through 4IR more sustainable practices can be embedded into our day to day activities. In this regard, the World Economic Forum (WEF) initiated the 4IR for the Earth program to actively make sure that emerging 4IR technologies contribute to biodiversity restoration and sustainable socio-economic development of society. Through this process, entire industries are committing themselves to building a safer, cleaner, and better earth while improving the livelihoods of communities.

In its 2009 report titled "Measuring the Relationship between ICT and the Environment", the Organisation for Economic Co-operation and Development (OECD) reported the increasing attention being given to both the positive and negative relationships between ICT and the environment. The report cites an example from the Global e-Sustainability Initiative which considers ICT's positive role in establishing a low carbon economy (improving efficiency in all sectors), as well as its negative impact of greenhouse gas emissions from ICT products.

In keeping with the growing trends towards adapting 4IR for a better planet, the objective of this project is to support communities having new-found access to the internet to leverage this utility to create innovative



solutions in a socially sustainable, environmentally friendly way. The hypothesis is that using this approach, innovative opportunities that can uplift the socio-economic status of communities will be unearthed. To accomplish this, the project will apply the principles of Biomimicry and Designing Thinking, namely; How can 4IR products/services utilise nature's extraordinary methods to grow while continuously generating value to the ecosystem (social and ecological) and regenerating the place in which they live? How can 4IR products/services take a life-empowering approach and contribute back to the (eco-)systems in which they are implemented?

Examples of application areas that can benefit from nature-based strategies and improved internet access are listed below. This list is not exhaustive nor prescriptive but merely serves as an example of innovations being sought. The project will rely on the methodologies of biomimicry and design thinking to uncover context relevant opportunities/applications.

- More efficient and sustainable products, services and processes within the transportation, healthcare, education, entertainment, and arts sectors.
- Solutions addressing food, water and/or energy insecurity.
- Products and services that employ ICT in monitoring, modelling, administration and dissemination. This could include:
 - improved access to online government services,
 - early warning or alerting systems for uncontrolled fires, weather disasters, crime and violence, or civil unrest,
 - environmental monitoring systems (air, water, soil pollution, deforestation, etc.) using sensor networks, satellite data or citizen science, and
 - o dissemination of information to improve environmental awareness, advocacy and behaviour
- Virtual products, services and processes to replace physical alternatives to reduce the environmental impact and consumption of natural resources. This can include promoting the use of online news, media and magazines instead of newspapers; accessing online movies/music instead of their physical analogues, reducing physical mail and paper use; promoting online purchasing; video-conferencing; telemedicine; and teleworking.
- Methods to reduce the harmful impacts of ICT infrastructure on the environment. Examples include methods of disposing or recycling ICT goods, retaining ICT equipment for longer or replacing it with more efficient versions. Development of a community e-waste strategy which includes the safe disposal of electrical waste.
- Methods to promote positive behaviour and attitudes towards ICT and the environment. Determine methods to encourage users of ICT to improve environmental outcomes.
- Solutions that promote the role of ICT in developing a knowledge-based society and the subsequent link between education/knowledge and actions that have a positive effect on the environment.



B] Scope of Work

The Approach

The biomimicry top-down or bottom-up approaches will serve as guiding principles for the project. The preferred option should be selected based on its relevance in each location. Using the bottom-up approach, an interesting natural characteristic prevalent in the locality should be identified and matched to potential applications that can leverage ICT. Solution designs will mimic the unique natural characteristics identified. Using the top down approach, challenges experienced by the communities should be identified and potential solutions designed by incorporating ICT and nature's ways of already solving the problem. Both approaches are summarised below.



Major activities/deliverables of the contracted company will include:

- a) Assess the local socio-techno-economic needs of the four selected communities as well as the natural environmental characteristics and select either the biomimicry bottom-up or top-down approach. This selection must be informed by researching the local challenges and natural phenomena. A needs analysis to uncover service delivery gaps or missing developmental opportunities (such as education or career opportunities) may be conducted. Other data resources such as desktop research, ecosystem analyses, community surveys and focused group discussions, site visits, interviews with businesses, NGOs, academic institutions, traditional authorities, local government and other public/private institutions are encouraged.
- b) Identify and assess any weak signals of change within each of the four communities and explore how biomimicry, design thinking, and ICT could help realise these trends. Only weak signals of change capable of significantly impacting local developmental challenges should be considered.
- c) For the top-down approach: Identify the key challenge and explore how biomimicry, design thinking, and ICT can offer potential solutions. Investigate how natural models, landscapes, biophysical and chemical strategies/processes can offer innovative solutions. Multi-disciplinary teams should be consulted, including biomimicry experts, solution end users, potential suppliers/retailers,



local authorities, youth, women, persons with disabilities, community leaders, etc.

- d) For the bottom-up approach: Identify the unique natural characteristic(s) within the local environment and probe how best to translate relevant principles from these, towards solving key challenges faced by locals. Interrogate how the natural phenomena can be transformed into sustainable solutions or new opportunities by leveraging design thinking and ICT. Conduct brainstorming sessions with end users, designers, potential suppliers and retailers, local authorities, youth, women, community members, women, persons with disabilities etc.
- e) At least one innovative opportunity/solution must be developed in each of the four communities (four solutions in total). Where feasible however, more than one is preferred.
- f) Following successful design and conceptualisation of solutions, develop testable proof of concepts/prototypes/technology demonstrators. Functioning prototypes manufactured using basic materials which can tested with end users within real-life contexts are expected.
- g) Conduct experiments on the developed prototypes. In-field testing by potential end users is required. Testable hypotheses, experiments and data collection frameworks should be formulated to probe whether developed solutions can address the targeted challenges.
- h) Based on experimental results, provide recommendations on scaling strategies for the developed solutions. Scaling recommendations should be informed by feedback from local end-users, potential suppliers/manufactures and other stakeholders invested in the potential outcomes.
- i) Compile a knowledge product capturing the methodologies, thought processes, and activities used to identify key challenges and the natural systems capable of addressing each of them. The knowledge product must incorporate solution design, development and testing, and discuss the potential uptake and impact.
- j) Facilitate training of local community members in biomimicry and design thinking, including youth, women, persons with disabilities, local government and small business. Ideally training should be conducted with individuals participating in the co-creation process.

UNDP and CSIR, through the implementation of the low-cost internet project have existing relationships and networks within the four communities. This includes local businesses, innovators, innovation hubs, local government and traditional authorities. While this could serve as entry points into the communities, the contracted company is expected to broaden this network to ensure multidisciplinary stakeholders are engaged in shaping and co-creating this project.

UNDP, CSIR and the local SMME internet service providers will also provide background information on the TVWS project, technical information, internet usage data, as well as support and guidance to enable the contracted company to successfully undertake the study. UNDP, CSIR and the SMMEs will continuously consult with the contracted company and review project outputs towards ensuring innovative approaches of internet uptake are identified.



C] Expected Outputs

Outputs		Delivery Dates
1.	Project inception report incorporating a well-defined and clearly thought through plan of work, tasks and timeline which respond to the terms of reference (TOR). The sequence of activities and the planning are logical, realistic and promise efficient implementation of the project. The frameworks, tools, and research methods are outlined.	10 working days after project commencement
2.	Report documenting at least four innovative socio-economic opportunities/solutions leveraging biomimicry, designing thinking and ICT and responding to local needs. Report should include assessment of community needs and the environment, any weak signal of change identified, and the biomimicry approach employed. All expected outcomes of the TOR are addressed. Images/diagrams/tables/, etc. are incorporated to present major trends and findings.	2 months after project commencement
3.	Report documenting solution prototyping and experiments, including testing results and methods, hypotheses and data collected. At least one innovative opportunity/solution tested in each community (four in total). Images/diagrams/tables/, etc. are incorporated to present major trends and findings.	3 months after project commencement
4.	Knowledge product capturing details of project methodologies, developed solutions, learnings, findings and outputs, focusing on the bottom up and top down approaches.	4 months after project commencement
5.	At least four training workshops conducted in each community covering Biomimicry and Design thinking	5 months after project commencement
6.	Final project report and presentation capturing major activities, developed solutions, findings, lessons and recommendations. All aspects of the TOR must be addressed, including potential scaling strategies. Final version of images/diagrams/tables/charts/etc., are incorporated to present major trends and findings.	5 months after project commencement

D] Institutional Arrangement

- a) The company will be directly supervised and will report to the Head of Experimentation at UNDP's Accelerator Laboratory in South Africa. All approvals/acceptances of outputs will be communicated through this supervisor. The supervisor will consult with teams of UNDP and CSIR experts to co-evaluate, design and approve outputs.
- b) The company will be required to report on progress at intervals as deemed necessary by the UNDP supervisor, but will be expected to provide feedback at least once a month. During



progress feedback the company may be required to produce presentations or documents covering work to date.

- c) The company is expected to interact with the CSIR and UNDP teams involved in the implementation of the TVWS low cost internet project, while performing activities. Interactions with other agencies, project co-implementors, donors, communities, local government units, etc., will be required to fulfill the TOR. The company is responsible for facilitating these engagements.
- d) UNDP will be responsible for managing this contract. UNDP will provide guidance on resources/persons to confer with, serve as the approving authority and is responsible for evaluating performance.
- e) The company is responsible for arranging and financing all aspects of data collection, analysis, reporting and all other needs to fulfill the contractual outputs. This includes but is not limited to travel, facilities, infrastructure, equipment, support services, logistics, etc.
- f) It is the responsibility of the contracted company to ensure all COVID 19 health and safety regulations and protocols are observed during the implementation of the project.

E] Duration of the Work

- a) The expected duration of work is 5.5 months. This includes 2 months of engagement for data collection and analyses, and 3.5 months for solution development, testing, and reporting
- b) The project is to commence once UNDP has issued the contract of services, and this will in turn inform the expected project completion date (i.e. 5.5 months following date of contract issuance).
- c) The company is expected to provide UNDP with adequate opportunity to review outputs and methods, give comments, and approve/accept outputs before the completion of the contract.

F] Duty Station

- a) The company's duty station during the contract may be remote. However, field work is expected to be undertaken in Mdantsane (Eastern Cape), Thaba-Nchu (Free State), Ocean View (Western Cape), KwaXolo, Ugu (KwaZulu Natal), South Africa to engage with the project implementation teams and beneficiary communities. Field work should be done in collaboration with the beneficiary SMMEs within the selected communities.
- b) The company may be required to report to or be present at UNDP/CSIR offices in Pretoria when feedback or one on one meetings are required. However, this will occur intermittently and only when required.

G] Qualifications of the Successful Company

a) Members of the company's project team should have at minimum a BSc/B-Tech or equivalent in the following fields of study: Chemical/Civil/Environmental Engineering, Ecology,



Sustainability, Systems Analysis, Natural Sciences, Biology, Physical Science, Biotechnology, and/or Community Development.

- b) The project leader should hold a MSc or PhD, or equivalent, and have at least 10 years of experience in the fields of Biomimicry, Engineering, Natural Sciences, Research and Technology Development, with at least 7 years of experience in innovation, executive management, project management, education and training, and community based project implementation.
- c) Project team members should have between 5 and 10 years of experience, with a good distribution of experience levels.
- d) Project team must demonstrate at least 5 years' experience in working with indigenous people of South Africa and be familiar with the key issues confronting rural and peri-urban communities. Previous experience in implementing projects in the Eastern Cape, KwaZulu Natal, Western Cape and the Free State provinces will be an advantage.
- e) The company must demonstrate clear evidence of previous projects with other UN agencies, intergovernmental organizations, international donors, local science & technology research and educational institutions, and/or national government.
- f) Companies able to incorporate local community facilitators into the project team and speak the local dialect, will be given preference.

H] Documents to be Included with Proposals

Interested companies must submit the following documents/information as part of their application:

- 1. Proposal:
 - 1.1. Provide a motivation explaining why the company is the most suitable for the work.
 - 1.2. Provide a brief methodology on how the company will approach and conduct the work.
 - 1.3. Provide a work / activity plan that will ensure achievement of project objectives/TOR.
- 2. Financial proposal, including a budget with detailed line items for the full project.
- 3. Curriculum vitae of project team members including experience in similar and or related projects and outlining requirements of Section G.
- 4. Offerer's letter to UNDP confirming interest and availability (template provided).

I] Financial Proposal

- a) In the computation of the total contract price all fees and costs related to project implementation must be included. This should include all professional fees, and be inclusive of travel, logistical and equipment costs.
- b) The financial proposal should stipulate the total amount required to conduct activities. Note that UNDP will not cover any other additional costs beyond the total amount specified in the proposal. The financial proposal shall specify the payment terms around specific and measurable (qualitative and quantitative) deliverables (i.e. whether payments fall in installments or upon completion of the entire contract).



c) Payments are based upon output, i.e. upon delivery of the services specified in the TOR. In order to assist the requesting unit in the comparison of financial proposals, the financial proposal must include a breakdown of this lump sum amount per output.

J] Evaluation of Proposals

Cumulative Analysis

The award of the contract will be made to the company whose offer has been evaluated and determined as:

a) Responsive/compliant/acceptable, and

b) Having received the highest score out of a pre-determined set of weighted technical and financial criteria specific to the solicitation.

* Technical Criteria weight: 70 %

* Financial Criteria weight: 30%

Only candidates obtaining a minimum of 70 points will be considered for evaluation

Criteria	Weight (%)	Max. Point
Technical		
Proposed Work Plan and Approach:	40	40
• The scope of work is well defined and responds to the TOR		
• The proposal is clear, and the sequence of activities and the		
planning are logical, realistic and promise efficient		
implementation to the project, within prescribed timelines.		
• The frameworks, tools, and research methods for data		
collection and analysis are clearly outlined.		
Expertise of company submitting proposal demonstrates the following:	30	30
g) Knowledge and expertise in required fields of study as per the TOR.		
h) The project leader and team have the required experience.		
i) Project teams comprise a good distribution of experience levels and fields of expertise.		
j) Experience running projects in selected provinces, familiarity with local communities, their culture and		
language.		
k) Previous projects with intergovernmental		
organizations/donors, and national government.		
Financial		



Financial Proposal:	30	30
 Budget is realistic and comparable to market-related costs for similar services Expected outputs are achievable within the proposed budget The budget provides for the most development impact for this project 		