UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project of Kenya

Project number:	UE/KEN/10/010
Project title:	Demonstration and transfer of environmentally sound technology for water treatment
Relationship to integrated programme	
Thematic area code	EAE
Starting date:	ASAP
Duration:	15 months
Project site:	Kenya
Government Co-ordinating agency:	Kenyan National Environmental Management Authority
Counterpart:	
Executing agency/ cooperating agency:	United Nations Industrial Development Organization (UNIDO)
Project Inputs:	
- UNIDO inputs:	€80,000
- Support costs (13%):	€10,400
- Counterpart inputs:	
- Grand Total:	€90,400

Brief description:

The principal objective of this project is to contribute to an increase in the proportion of the population of the Watamu-Mida community with a clean and reliable supply of drinking water. The main outcome with be the increased volume of an improved drinking water supply, which will become available through the installation and operation of the water treatment unit as the principal output of the project.

UNIDO is currently implementing the "Collaborative Actions for Sustainable Tourism (COAST)" project in Kenya. This project will be linked to the COAST project and will build upon the current activities being conducted in the Kenyan coastal region. The use of a water treatment process to deliver clean and safe water, in combination with the use of a renewable energy source, is in line with the project's goals to use technologies that do not put undue stress on the delicate ecosystem.

The project responds to MDG 7, which addresses access to safe drinking water, and to the country's development plan, Kenya Vision 2030, which has identified improved access to water and sanitation as a country priority.

Approved:

	Signature:	**Date:**	**Name and title:**
On behalf of ……..:	_____	_____	_____
On behalf of UNIDO:	_____	_____	_____

A. CONTEXT

Kenya is considered to be a water scarce country. In the past decade it has suffered from several droughts, most recently in 2009. Although 2010 has seen improvement in rains, both drought and flooding are recurring problems which makes it difficult to ensure the provision of reliable and safe drinking water.

MDG 7c, calls for halving the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015. According to the World Bank World Development Indicators in 2008 the population's access to an improved water source in Kenya was at 85% for urban areas and 49% for rural areas. In the year 2000 access was at 67% and 49% of urban and rural areas, respectively; so although there has been an improvement in the urban areas it is evident that there is still a lot of work that needs to be done. Clean drinking water is an essential aspect of development, the lack thereof is directly linked with poverty; it contributes to malnourishment and can be the source of disease. Access to safe sources of water protects health, lowers health costs and improves livelihood security.

The project is in line with the Country's development plan, Kenya Vision 2030. Vision 2030 is based on three pillars: economic, social and political. The social pillar has among its objectives increased access to safe water in urban and rural areas. It has flagship projects (medium termed projects) aimed at the progressive realization of the right to water and sanitation for Kenyan's population through the improvement of water service facilities. This national goal is also in line with MDG 7: Environmental Sustainability.

UNIDO is currently implementing the "Collaborative Actions for Sustainable Tourism (COAST)" project in several countries in Sub-Saharan Africa. The COAST project initiated in November 2008 and has ongoing activities in Kenya. This project will be linked to the Coastal tourism project and will build upon the current activities being conducted in the Kenyan coastal region. Through this project UNIDO can provide the technical assistance to the community in terms of the application of environmentally sustainable practices which contribute to protecting the unique coastal and marine ecosystems off the Kenyan coastline.

B. REASONS FOR UNIDO ASSISTANCE

The COAST project has ongoing activities in the Watamu region and is working with the emerging eco-tourism sector to incorporate environmentally sound practices in their operations. The use of a water filtration treatment process to deliver clean and safe water, in combination with the use of a renewable energy source, is in line with the project's goals to use technologies that do not put undue stress on the delicate ecosystem. The COAST project played a critical role in identifying the location for the "Demonstration and transfer of environmentally sound technology for water treatment" project based on existing activities and technology needs identified. This community was identified given their limited access to a reliable source of clean water and limited access to electricity mains.

UNIDO can contribute to poverty reduction through sustainable tourism by working with the community and the emerging eco-tourism sector to assure that the development activities follow cleaner production and environmental management practices. The hotels and supporting businesses must be aware of waste and energy management issues in order to not put undue stress on the delicate ecosystem. UNIDO has the opportunity to support both the community and local SME's in the Watamu-Mida area by strengthening the community's capacity to deliver safe drinking water through environmentally sustainable practices.

The Government of Slovenia has agreed to finance the "Demonstration and transfer of environmentally sound technology for water treatment" project. The project will provide technical assistance for the installation of a solar powered, drinking water treatment system; training necessary to assure proper use of the water treatment unit and of the solar powered energy source, as well as appropriate waste management; and a financial feasibility

assessment and financial management plan to assist in the long term operation of the water treatment system.

C. THE PROJECT

C.1. Objective of the project

The objective of the project is to contribute to an increase in the proportion of the population of the Watamu-Mida community with a clean and reliable supply of drinking water. The transfer of technology will provide a direct benefit to the community by providing a clean source of drinking water. In addition, the increased access to drinking water will assist in strengthening the emerging eco-tourism industry by providing a secure source of drinking water which the local eco-tourism sector can also make use of.

C.2. The UNIDO approach

The project will be linked to the COAST project currently being implemented in the country in order to maximize existing UNIDO resources in the field and build upon ongoing efforts. This will help ensure that the activities of the project are not carried out in isolation and can maintain long-term sustainability. However, the project will have its own experts, which will focus on the specific project goals of improving the access to clean water through the installation of a drinking water treatment unit.

One of the expected outcomes of the COAST project is for each country to adopt and implement a Sustainable Tourism Management Strategy. The strategy seeks to capture the most urgent needs with regard to contaminant related threats and impacts of the industry, and demonstrate an ability to address these through the use of Best Available Technologies and Best Environmental Practices (BAT/BEP).This project will reinforce the COAST project activities by demonstrating the use of a BAT/BEP technology that uses renewable energy to support the local community in an region recently diversifying into the eco-tourism industry. Lessons learned from this project on the use of BAT/BEP technologies will provide input into the development of Kenya's Management Strategy by the COAST project.

Site Selection

The COAST project is implementing an integrated planning and management of sustainable tourism project in the area and has been working with the local eco-tourism sector. The project seeks to strengthen the local eco-tourism industry by training and technology transfer which are in line with BAT/BEP strategies. Based on ongoing activities in the coastal region of Kenya, the COAST project team, in conjunction with the project's NEMA national focal point coordinator, has identified the Watamu-Mida region for the demonstration and transfer of the proposed technology. Preliminary assessments have identified a candidate site; this area suffers from water scarcity and unreliable energy supply through the existing grid. A secured supply of safe drinking water, powered by solar energy, would help meet the basic services needs of the community and provide the basic services needed to support the growing eco-tourism sector.

A field visit was conducted by the COAST project team to the Watamu-Mida region in order to assess the potential site of the treatment system, see Field Visit report in Annex A. Preliminary discussions with the community emphasized the importance of the siting of the treatment system. The legal ownership of the site must allow for the installation and safety of the equipment, the site must be near the raw water source to minimize pumping and piping needs; there must be easy access to the site (especially for women and children who are generally tasked with water collection); some sort of alternative energy must be able to be provided (grid access, generator, etc.). All these considerations will be defined during the inception of the project as the siting of the treatment system will have a big impact on its success.

Energy supply

UNIDO's Water Management Unit (WMU) will implement the project but there will be close cooperation with the Energy and Climate Change (ECC) Branch. The ECC will provide technical support with regards to the equipment's renewable energy supply. Their support will include assistance in the development of the requirements necessary for the selection of the equipment, with particular attention to the technical specifications of the equipment's energy supply. The solar panels should be able to provide a consistent energy supply; however there should also be an alternative source of energy available to provide backup when solar power is not sufficient.

Financial feasibility
In the initial phase of the project a financial feasibility assessment will be carried out by the project manager using COMFAR III software. This assessment will provide information for the development of a financial management plan, including the payment system to be developed during the course of the project.

Community ownership of treatment system
In order to assure the long term sustainability of the technology transfer a critical preliminary phase of the project will be to successfully establish the private venture or community organization to operate the treatment system. To ensure community ownership the private venture/community organization must be legally established; however the exact mechanism will be determined during the inception of the project. It is envisioned that the legal entity to be established will have ownership of the land where the system is installed. During the field visit conducted by the COAST project preliminary discussions were held with some community members to discuss possible organization structures. NEMA will play an important role as their presence on a local level can help guide the organization process.

The organization will have the responsibility of management, operation and maintenance of the equipment. The project will support the organization by providing a financial management plan and O&M training.

C.3. RBM code and thematic area code[1]

The RBM code is DE12 – Resource-efficient and low carbon industrial production. The thematic area code is EAE.

C.4. Expected Outcomes

The main outcome of the project will be an volume of an improved drinking water supply. The community will have increased capacity to provide itself, and the emerging eco-tourism sector, with a reliable source of water as a result of the application of an innovative technology consistent with BAT/BEP practices.

An additional outcome is the increased technical capacity of the community to operate the treatment process, give maintenance to the equipment and handle the waste by products such as spent filters or non-potable water produced. A protocol, including standard operating procedures and waste management guidelines will be developed designed to meet the specific needs of the site and the community.

[1] The theme codes are: EAE, PRP and TCB

C.5. Outputs and activities

Output 1: Establishment of a private venture/community organization to operate the units	
Activities	**Responsibility**
1.1 Identify and establish a private venture/community organization to operate and maintain the units	Project manager (PM), national consultant, NEMA
1.2 Develop a mechanism to operate and maintain the system, including a financial management plan	National consultant, PM, private venture/community org.
Output 2: Installation of water treatment unit and supporting infrastructure	
Activities	**Responsibility**
2.1 Secure location for installation of unit	NEMA, private venture/community org.
2.2 Installation of water treatment unit	PM, sub-contractor
2.3 Establish system for distribution of the water (storage tank, pump, etc.)	Sub-contractor, national consultant
2.4 Monitor raw and treated water to assure quality & sustainability	Sub-contractor, national consultant
2.5 Test-run of the water treatment system to demonstrate compliance with water quality standards, target production volumes and test the payment system	Sub-contractor, national consultant
Output 3: Develop technical capacity of the community to operate an independent water treatment process	
Activities	**Responsibility**
3.1 Conduct training workshops on O&M	Sub-contractor, national consultant, PM
3.2 Develop a site-specific protocol for daily use and maintenance	Sub-contractor, national consultant

C.6. Timeline of the activities

Activity	Month														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.1 Identify and establish a legally recognized community organization/ committee or community/ private venture to operate and maintain unit															
1.2 Develop an O&M and financial management plan															
2.1 Secure location for installation of the equipment															
2.2 Selection & installation of water treatment unit															
2.3 Establish system for distribution of the water															
2.4 Monitor raw & treated water to assure quality & sustainability															
2.5 Test-run of the water treatment system															
3.1 Conduct training workshops on O&M															
3.2 Develop a site-specific protocol for daily use and maintenance															

C.6. Risks

- The main risk of the project is the ability of the private venture /community organization to sustainably operate the new technology. Therefore, the successful establishment of the private venture /community organization is critical to avoid this risk.
- There is a risk involved with the source water to be treated. Preliminary consultations have indicated that there are wells in the Watamu-Mida location that could potentially provide raw water to the treatment system; however further studies will need to be conducted to assure that the wells can provide sufficient quantity of water and water of suitable quality. This risk is associated with climate change; Kenya has suffered from droughts on and off over the past years and a drought could affect the amount and quality of the water being treated.

D. INPUTS

D.1. Counterpart inputs

The national counterpart is the National Environmental Management Authority (NEMA), through the Coastal Marine and Fresh Water Department. They are currently working with UNIDO on the COAST project and have an ongoing collaborative coastal sustainable tourism project in the Watamu area. They will be involved in the final selection of the site for the installation of the treatment system, based on ongoing work with the local eco-tourism sector and with particular consideration of the legal ownership of the property. They will also be involved in identifying the appropriate private venture/ community organization to assure the sustainability of the technology.

D.2. UNIDO inputs

1. National staff

A national expert will be recruited to assure that the technology is well integrated into the Watamu-Mida community. The expert will be tasked with assisting the PM in identifying and establishing the private venture/community organization that will operate and maintain the unit. The expert will be responsible for developing a system to distribute the treated water, establishing a payment system that assures the financial sustainability and preparing an O&M protocol that is site-specific to this location (in cooperation with the sub-contractor).

The expert will be responsible for conducting standard water quality tests on the raw water source as well as monitoring the water quality once the process is in operation to assure the water produced meets national water quality standards. The expert will assist the PM with the overall on-site implementation of the project activities, such as the delivery of the training workshops, as per the terms of reference attached in Annex B.

2. Sub-contracts

A sub-contractor will be hired to supply and install the solar powered treatment unit. Once the water treatment system has been installed the sub-contractor must conduct a trial start-up period to demonstrate that the equipment is operating in compliance. In addition, the sub-contractor will also train the national consultant and private venture/ community organization on the proper operation and maintenance of the equipment. The subcontractor must assure that the waste products, including but not limited to spent filters and waste water, can be handled in an environmentally sound manner and do not pose a threat to the delicate ecosystem of the Watamu-Mida region.

1. Training

The project will conduct a training workshop for the operators on the proper operation and maintenance of the equipment. The operators will be members of the community, as identified through the private venture/ community organization. Training will be delivered by the sub-contractor, with assistance from the national expert, and will be conducted once the equipment has been installed and the start-up period has demonstrated proper operation of the technology.

2. Equipment and supplies

The project will purchase a solar powered, water treatment unit to install in the project demonstration site. The donor, the Government of Slovenia, has specified that the invitation for tender/public competition for the units be limited to Slovenian companies, institutions and/or consultants. Although the provider of the technology will not be nominated nor pre-selected by the Government of Slovenia, preliminary information on the potential national technologies has been collected. Annex D presents a description of a solar powered, stand alone mobile unit for water filtration that meets the general needs of the project and gives an estimate for the cost of given technology for reference purposes.

A subcontractor will be responsible for providing, delivering and installing the equipment, as per the terms of reference in Annex C. The equipment must be robust in terms of both treatment technology, as well as energy supply. Considering the remoteness of the location, operation of the equipment should be automated as much as possible. The solar power generator must be able to store energy for use during cloudy days and the equipment must also be able to connect to an alternate power supply in the case of prolonged cloudy weather.

In addition to the water treatment unit, the project will install a secure shed (or platform) where the equipment will be located, as well as, the auxiliary equipment needed to distribute the water to the community such as storage tank, pumps, etc.

E. BUDGET

BL based budget

Budget Line	Description	EUR
16-00	Travel of project staff	4,000
17-00	National consultant	28,000
33-00	Training	8,000
45-00	Equipment	40,000
93-00	Supporting costs (13%)	10,400
Total		**90,400**

Activity based budget

Activity	EUR
PM Mission to Kenya	4,000
National consultant	28,000
National consultant fee	23,000
Sampling & analysis of water	5,000
O&M Training Workshop	8,000
Equipment	40,000
Purchase of water treatment unit	30,000
Auxiliary equipment (shed/platform, pumps, spare parts etc.)	10,000
UNIDO Supporting costs (13%)	10,400
Total	**90,400**

F. MONITORING, REPORTING AND EVALUATION

A progress report and a final report will be prepared by the National Consultant. The progress report will be prepared nine months into the project to reflect how it has advanced at the mid point of implementation. The report will focus on the selection and installation of the equipment but shall also describe the establishment of the private venture/community organization, as this will be a critical part of the technology achieving long term sustainability in the community. The progress report should include a description of the technology selected and the auxiliary equipment or infrastructure needed to support the treatment units (storage tank, pipes, pumps, back-up generator, etc.).

The final report prepared by the national consultant shall describe the overall implementation of the project, including a compilation of the analytical results of the water samples, records of the quantity of water produce and a thorough assessment of the trial run. It should clearly identify how many people benefit from the water supply, with particular focus on gender considerations. In addition, the consultant will also provide a protocol on the equipment's O&M and an evaluation of the technology's sustainability factors, ownership issues and operational costs, as tested during the trial run. The final report will highlight the lessons learned, which will in turn be shared with the COAST project staff as a pilot study for the Sustainable Tourism Management Strategy.

Monitoring of the project implementation will be carried out primarily by the project manager. The PM will be assisted by the national consultant, who will be present locally and will have a day to day exposure to the project implementation. The national consultant will provide a progress report half way during the implementation to help assure that the tasks are being conducted in a timely manner. The PM will also maintain close communication with the subcontractor selected for supplying, transporting, installing and making the equipment operational.

In addition to the project team, the PM will also work closely with the COAST project which is currently implementing activities in the Watamu area. UNIDO, through the COAST project, has a team working at the national level that can assist with follow up and monitoring of the activities, as these have been developed to compliment and build upon their ongoing activities.

Results	Indicators	Means of verification
Objective		
Contribute to an increase in the proportion of the population of the Watamu-Mida community with a clean and reliable supply of drinking water	Number of people that use the supply of drinking water	Client survey
Outcomes		
Increased volume of an improved drinking water supply	Number of people with improved access to drinking water Sustained operation of the treatment unit under local management	Client survey Local authority and media reports The installed units' production records
Outputs		
1. Established a private venture/ community organization to operate and maintain the system	Legally established private venture/ community organization	Legal documentation/ contract
2. Installed one stand-alone, fully operational solar	Volume of water produced without interruption over a	Production records of the treatment unit

powered drinking water treatment unit	period of one year	
3. Developed the technical capacity of the community to operate an independent water treatment process	No. of skilled operators	Project self-evaluation report

A final self-evaluation will be conducted by the PM on the results of the project's implementation. The self-evaluation will be provided to the national counterpart (NEMA) and the COAST project.

G. PRIOR OBLIGATIONS AND PREREQUISITES

A prerequisite for successful implementation of this project is the ability to assure that the treatment units have an adequate location both in terms of legal ownership of the land where they are to be located, as well as an adequate source of water. Although preliminary discussions have identified several wells in the Watamu-Mida area that the community is already using, the water source will have to be tested to assure that it can be treated with the proposed technology.

H. LEGAL CONTEXT

The Government of Kenya agrees to apply to the present project, mutatis mutandis, the provisions of the Standard Basic Assistance Agreement (SBAA) concluded between the United Nations Development Programme (UNDP) and the Government on 17 January 1991.

Logical Framework

	Intervention logic	Verifiable indicators	Sources of verification	Assumptions
Development goal/impact	Contribute to an increase in the proportion of the population of the Watamu-Mida community with an improved supply of drinking water	Number of people that use the supply of drinking water	Client survey	
Outcome/ immediate objective	Increased volume of an improved drinking water supply in the Watamu-Mida community	Number of people with improved access to drinking water Sustained operation of the treatment units under local management	Client survey Local authority and media reports The installed units' production records	Replicability of the project
Outputs (results)	1. Established a private venture/ community organization to operate and maintain the system	Legally established private venture/ community organization	Legal documentation/ contract	Financial feasibility of the project
	2. Installed one stand-alone, fully operational solar powered drinking water treatment unit	Volume of water produced without interruption over a period of one year	Production records of the treatment unit	A reliable water source and secure location is available for installation of the equipment
	3. Developed the technical capacity of the community to operate an independent water treatment process	No. of skilled operators	Project self-evaluation report	Trained personnel will remain within the community
Activities	1. In collaboration with local community leaders and the private sector, establish a mechanism to operate and maintain the system, including a cost-recovery scheme.	Recorded standard operating procedures including for payments	Progress reports Local authority reports	The local community is committed to the project's goals.

	2. a) Identify the appropriate locations; b) build the infrastructure; c) set up a distribution system (storage tank) for the unit; and d) test run the system	Sheds and other infrastructure constructed	Progress reports	An appropriate site is provided by the community to house the system.
	3. a) identify the requisite skill sets; b) identify the trainees; and c) train personnel in the operation and maintenance of the water treatment unit	Number of trained operators	Examination results of training workshop	The community has the required personnel that is willing to be trained

Annex A - First Field Visit to Proposed Water Purification Site – Watamu/Mida Project Area

Visit Date: 7th September 2010

Purpose:

1) To meet with local community members and the Hotelier who has shown interest in becoming involved
2) To visit a few of the proposed sites and take ground photos for sharing with UNIDO and the Funder/Sponsor of this project
3) To propose a number of next steps prior to confirming the feasibility of the project and equipment

People Met:

No	Name	Designation
1	Samuel Nganga	COAST Demo Project Coordinator
2	Papu Haroon	Man Friday's Hotel
3	Gabrael K Kombe	Chairperson, Chambuko Village
4	Joru Baya	Uyombo Village Secretary
5	Jackson Cheno	Village security committee
6	John Amuma Muugu	Sub Chief, Matsangoni Sub location
7	William Carub Kombe	Sen Assist Chief, Matsangoni
8	Havis Gambo Aupande	Adviser, Wireless village
9	Chano Thoya	Uyombo village helper
10	Kanisa Chengo	Maintenance, Man Friday's
11	Chengo Ngolo	Uyombo village elder
12	Elisua Mzee	Chairman Chipande Primary School

Discussion:

The manager of the hotel (Mr Papu), introduced Mr Gibbon from UNIDO to the community members and asked him to give a brief introduction concerning the proposed/potential project.

After introducing the proposal, Mr Gibbon asked the community a number of key questions which they will be require to sort out before any equipment installation can take place. These were:

1) Suitable land being set aside for the project, with clear title or ownership to be held by the committee/community project (i.e.for the purpose of siting the pump(s) and any associated piping (e.g. for effluents and piping water to point of sale (water kiosk)
2) Ensure that the equipment is secure and that security is ensured for each site
3) Establish and register a community organization/committee for the purposes of training, management and maintenance of the equipment
4) Consider for back-up purposes during the rainy /cloudy season, accessibility to the national grid via existing electricity supply routes (e.g. there an electricity supply to the Safaricom aerial installation)
5) Identification and searching for proposed sites for the equipment – there could be five or more sites needed, as water quality and quantity are two key issues in the area (see attached pictures)
6) Location must be accessible to all, but especially women and children who normally perform water collection duties
7) Begin considering the identification of several local community members for technical training on how to use and maintain the equipment once installed.

Within the proposed site(s) there are six villages comprising approx 4000 households. The villages are: Uyombo, Madeteni, Wireless, Chambuko, Kadaina, and Maweni.

Currently, one of the proposed sites is near the Chipande primary school which has 700 children, all of whom are dependent on a WFP feeding programme. Currently however, due to the shortage of water, meals are not being supplied to the children as there is no water for cooking the food! The last food supplied to children in this manner was done during July.

Next Steps:

A. **Submit a site visit report to UNIDO/Sponsor**. Based on feedback received from UNIDO HQ and /or the Sponsor, then undertake items B, C, D below in that order.

B. **Technical assessment of water quality and quantity.** There appear to be two potential sources of water for use by the purification equipment:

- One is related to the mangrove pools where water collects and is naturally filtered by these trees. However these sources have high salinity and will require a qualified water engineer/chemist to assess if such sources can be utilized by the project.
- The second, are wells dug by the community. There are already a number of wells which are utilized by the local community for washing and in some cases, drinking purposes. However the depth of these wells probably ranges from between 5-15 meters and therefore two issues which will require technical assessment here are; the depth from which the equipment can draw the water, and secondly the quantity of water available. We spoke to one well owner who says they built the well in 1986 and they currently extract approx 1000 litres daily, but

the purification pumps require probably around 10 times this amount to make them economically viable.

C. **Contract a water specialist locally or from the sponsor.** To carry out the above work, which should conclusively answer the following questions:

- is there enough ground water to provide a continuous supply to the pump(s)?
- is the quality of the water suitable for purification using the equipment suggested?
- where would be the two most suitable locations for installation?
- how much would any site work preparation cost (including piping of water to point of sale and effluent management)?

D. **Establish a legally recognized community organization/committee to manage the project and beyond**

- If A and B are successful, then before the project starts there needs to be a suitable organization formed (for management, maintenance & training purposes) to look after the equipment and community interest into the future. There could be two options here:

    - a joint community/private venture formed between the hotelier and the local community (with clear mandate and responsibilities agreed)
    - a community organization/committee with the responsibility for management (including sale of water – currently one litre sells for Kshs 2 in Matsangoni village, which is the nearest water point to the proposed project site), maintenance and training of community technicians.

Hugh Gibbon
Nairobi
8th Sept 2010

ANNEX B

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

TERMS OF REFERENCE NATIONAL EXPERT

Title: National Expert

Duration: 15 months

Duty station: Home-base, Kenya and travel to Watamu-Mida project site

Duties: The consultant will carry out the proposed duties within the following timeframe:

Duties	w/m allocated	Expected results
Assist PM in identifying and establishing the private venture/ community organization	2 w/m	Community organization/ committee or community/ private established
Monitor the installation and test run of the treatment units	7 w/m	Successful installation & operation of the equipment
Develop a payment system	0.5 w/m	Payment system established
Establish system for distribution of the water	2 w/m	Storage system (or alternative) successfully installed
Monitoring of raw and treated water	ongoing	Analysis results
Organize O&M training workshop	0.5 w/m	Workshop delivered
Develop a site-specific protocol for daily use and maintenance of units	1 w/m	Protocol document
Progress and Final reports	2 w/m	Report documents

The consultancy will be paid as a lump sum, to include costs of sampling and analysis of the raw and treated water, as well as field visits to the Watamu-Mida demonstration site.

Objectives and Scope of the Consultancy
The objective is to ensure the proper installation of the water treatment system and the successful establishment of the community organization that will run the equipment.

Products expected from Consultancy
Based on the above points, the consultant will provide a progress report and a final report detailing the implementation of the project, including problems encountered and lessons learned. The consultant will also provide a site specific protocol on the equipment's O&M, a proposal for the payment system and a design of the system to be used for distribution of the treated water (storage tank, piping, etc.)

Profile of the consultant
The selected consultant will have achieved a university degree in Environmental Sciences, Engineering or equivalent and will have extensive experience the analysis and monitoring of water quality. Experience in this region of Kenya will be an asset.

Background

The principal objective of the project is to provide a clean and reliable supply of drinking water in the Watamu-Mida community. The main outputs will be the installation of the drinking water treatment unit and the establishment of a community organization to run the equipment and give it long term sustainability.

UNIDO is currently implementing the "Collaborative Actions for Sustainable Tourism (COAST)" project in several countries in Sub-Saharan Africa. The COAST project initiated in November 2008 and has ongoing activities in Kenya. The "Demonstration and transfer of environmentally sound technology for water treatment" project will be linked to the Coastal tourism project. The COAST project has ongoing activities in the Watamu area and is working with the emerging eco-tourism sector to incorporate environmentally sound practices in their operations. The use of a water filtration treatment process to deliver clean and safe water, in combination with the use of a renewable energy source, is in line with the project's goals to use technologies that do not put undue stress on the delicate ecosystem. The technology transferred within the scope of this project is directed to the Watamu-Mida community; however, it will also benefit the emerging eco-tourism sector by improving the basic services infrastructure, which can in turn attract stronger eco-tourism to the area.

ANNEX C

Technical Specifications

Demonstration and transfer of environmentally sound technology for water treatment technologies in Kenya

Title: Subcontract for the supply, delivery and installation of one solar powered, drinking water treatment unit and provision of training services.

Duration: Must be completed by December 2011

I. Background

The principal objective of this project is to deliver clean and reliable drinking water to the Watamu-Mida community in Kenya. The main output will be the supply, installation and training on the use of the drinking water treatment unit.

The technology used for treating the water to drinking water grade must be proven in other similar applications and must be able to meet national water quality standards. The technology must have the ability to function using solar energy; however, it must have a back-up system for supplying energy to compliment the solar panels. The power supply must be able to adequately meet the energy demands so as to not cause interference with the treatment process. The technology must have a waste management plan that addresses the handling of by-products such as spent filters, non-potable water produced, etc. in an environmentally sustainable manner to assure that the waste products do not have a negative effect on the local environment.

II. Duties to be performed

The subcontractor will be responsible for the timely and full delivery of the duties outlined below.

- Supply, delivery and installation of one solar powered water treatment unit, as well as auxiliary equipment such as the solar powered energy source and necessary pumps;
- Trial run of solar powered water treatment unit to demonstrate compliance with national water quality standards and target production volumes;
- Delivery of training workshops on the operation and maintenance of the equipment, as well as waste management procedures.

III. Time Schedule (tentative)

The services must be completed before the December 2011

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AquaVallis
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Subject under Offer:

Supply of stand-alone mobile unit for water filtration NME 20.4.0

Dear Sirs,

Enclosed please find our offer for supply of stand-alone mobile unit for water filtration NME 20.4.0.
The Offer includes supply of NME, trial start-up (presentation of operation) and training of the user's personnel.

1 DESCRIPTION

Independent mobile unit (NME) for water filtration can be used for treatment of surface water –to the grade of drinking water. The unit can be used in various circumstances: natural disasters, camps, for military purposes, field works…

The unit consists of the following modules:

1. Solar power supply module
2. Filtration module AquaVallis
3. Solar immersion pumps with attachments.

The operation of the unit is automatic. The following parameters can be monitored during operation: water pressure in pipes, before and after each filter, water flow rate, solar modules supply, operation of the immersion pump, etc. Remote monitoring of data is also possible and the data reading is possible via PC.
The unit automatically reports (with alarms) eventual malfunctions or spent filter cartridge.

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1.1 Solar power supply module

By means of the solar power supply module the required energy for operation of NME is generated.

The primary electric energy source are the photovoltaic modules, using the enrgy from sun to produce electric energy. The solar energy is used to generate the immersion pump and for charging the lithium-polymer batteries (24 V).

An additional electric energy source may also be the cargo vehicle (24 V) via the power supply cable. Power supply is possible also via power supply cable, 220 V AC and power adapter which converts 230 V AC to 24V DC.

1.2 Filtration module AquaVallis

Water filtration in the filtering module is carried out in four stages:

- first stage: coarse solid particles are removed from the water by means of self-cleaning mechanical filter (particles larger than 50 μm)
- second stage: the smaller impurities (particles larger than 1 μm) are removed through the mechanical filter cartridge
- third stage: carbon filter cartridge partially removes the pesticides, unpleasant odour and taste is removed (in case of present pesticides, the KDF filtering cartridge can be used)
- Fourth or main stage: the nano-filtering cartridge AquaVallis removes the viruses and bacteria (99,999999 % efficiency) from water. The AquaVallis filter removes also heavy metals and colloid particles.

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1.3 Solar immersion pump and attachments

Solar immersion pump is a specialised pump, adapted for use with electric energy generated by photovoltaic modules. The pump is used to pump the water via flexible hose to the filtration module, where it passes through the filtration system. After treatment, the water is purified and can be used as drinking water.

2 TECHNICAL DATA

Length (operating– transport)	L = 1450 – 1450 mm
Width (operating– transport)	W = 940 – 420 mm
Height (operating– transport)	H = 1500 – 750 mm
Filtering capacity	Q_{max} = 7,4 l / min
Filter cartridges - 20 inch	Self-cleaning mechanical filter 50 µm
	Mechanical filter - 1 µm
	Carbon filter
	Microbiological filter AquaVallis
Solar power supply	U = 2 x 12 V = 24 V
	P = 2 x 62,5 W = 125 W
Battery capacity	Q = 2 x 30 Ah = 60 Ah
Weight	m = 92,0 kg

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Answers and explanations to the questions from Mr. Vagrghese

Our Stand-alone Mobile unit for Water Filtrastion NME 20.4.0 has capacity 7,4 litre/minute. This is the limitation according to solar immersion pump. Maximum capacity is 9 litre/minute. That is maximum operational capacity of AquaVallis microbiological filter cartridges. If the higher capacity is needed you can use several units connected parallel. Other option is that we use bigger setups, but with that we lose mobility.

Is the device rated for continuous operation or for intermittent?
The device could run in both ways. There is a pressure controller which stops the pump if you close water flow.

At any rate, what is the average daily out put of sweet water that can be filtered?
The maximum amount of filtered water thought 10" system is rated for 20 000L and for 20" is rated for 40 000L. We must take in the consideration that water with higher turbidity can lover the filter cartridge life time. We do use high quality pre-filtration with filtration rate of 1 μm (absolute), but if there are colloid particles in the water life time is lest then 40 000L.

What are the conditions of input water that can be allowed?

Characteristics of inlet water	Unit of measurement	Value, not more than
Hydrogen ion component	pH	6,5 – 8,5
Turbidity	NTU	0,5
Permanganate oxidizability of water	mg/l	5
Microbiological contaminants concentration	cfu/l	10^5
Mineral oil concentration	mg/l	0
Surface active agent concentration	mg/l	0
Oxidizing agents concentration (chlorine, free ozone, manganic-acid potassium)	mg/l	0,1
Iron concentration (Fe)	mg/l	0,05 – 0,1
Water salinity	mg/l	1000

In the above table are figures that are needed to achieve life time of AquaVallis filter cartridges

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Salty, murky, muddy, Sea water, pond water, etc and the limits of pollution that can be handled?

Key parameters of drinking water which should be provided by a filtration through the AquaVallis filter material (in accordance with statements of SanPiN 2.1.4.1074).

Indexes	Units of measure	Indexes of quality of the cleared potable water	
		Water before cleaning	Cleaned potable water
Microbiological indexes Bacteriological indexes			
GKZ at temperature of 37 °C	CFU/ml	10^5	No more than 20
GKZ at temperature of 22 °C		10^4	No more than 100
Total coliform bacteria	CFU/l	10^2-10^5	Absence in 300 ml
Thermo tolerant coliform bacteria		10^2-10^4	Absence in 300 ml
Glucose positive coliform bacteria		10^2-10^4	Absence in 300 ml
Pseudomonas aeruginosa		10^2-10^4	Absence in 1 000 ml
b) Virology indexes			
Coliphages	PFU/100 ml	10^2-10^3	Absence in 1 000 ml

What is the power rating required for the device?
The power generated from solar modules is 2 x 62,5 W, pump 24V / 4,1A . For the immerse pump 50 W is needed, all additional power is needed for battery charging and for operational needs.

Does it work on cloudy and rainy days?
It operates on cloudy and rainy days as long as the batteries are full, ~ 8 hours. Additional option is that NME 20.4.0 can be connected to other source of electricity (lary with 24 V batteries are diesel power generator (see attached Operation Chart - NME-AV-2007-01-001). ,

What are the parts that require frequent replacement or repair? How often?
When life time of cartridges expires, the exchange of cartridges is needed. The cartridge exchange is performed depended on the water quality.

What is the initial cost of the whole set up?
For complete setup (as it was in the send description) is 18.800 EUR (EXW HTZ Velenje). For les sophisticated devices you can see attached price list.

What is the cost of sweet water produced per litre?
Excluding the price of the system, for 20" size, the cost of the filtered water is 0,006814 €/L

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Where all can you install these devices?
You can connect the device on municipal water and use it on all surface and ground water.

What are the ground conditions to look for before installation?
There are no extra requirements for ground conditions. You need just 2 sqm of clear dry lend and best possible expose to the rays of the sun.

How hard should the installing platform be?
Surface pressure is approximately 3 kg/cm^2. We suggest that wooden platform is made.

What is the noise level during operation?
The device operates silently and meets all required noise operation standards. The only noise appears from immersion pump.

In addition to self cleaning mechanical filters, there are ordinary mechanical filters (1 micro m.), carbon filter, and microbiological filter etc. How often should they be cleaned and how simple is the cleaning operation?
You should clean self cleaning filter regularly, normally when water flow drops and when the cartridge of self cleaning filter holds to mach dirt. You do not clean: microbiological, mechanical or active carbon filter at any time, you have to replays them!

Is the weight of 92 kg, the full three module weight, and is the battery weight included in the system cost?
The whole weight of all components included in the mobile filter system is approximately 92 kg.

Can the power source be switched to a cheaper one for operations?
You can use different source of power: solar (24V), from electric power plant (220V), car (24V), and diesel aggregate.

How are the residues after filtration disposed off?
We collect them and have a recycle process for all materials used in the manufacture process. Filter material is thermally processed.

What is the standard module size?
For solar module: Length 915 mm, Width 460 mm, Thickness 35 mm
For mobile filtration system (transport): Length 1450 mm, Width 420 mm, Height: 755 mm
For mobile filtration system (operating): Length 1450 mm, Width 940 mm, Height: 1500 mm
Can it be produced in different sizes to meet local requirements?
The mobile filtration system can be modified on behalf on buyers' requirements.

Any comparisons with other filtering mechanisms on effectiveness, capacity, size and cost?
Main component of NME 20.4.0 is microbiological filter cartridge AquaVallis which is product of development on nanotechnology are. In principle it is mechanical filtration, but because of nanoparticles the positive potential appears on a surface of nanoparticles. Efficiency of this device can be compared with classical RO systems but with much less pressure needed.