

# CO-CREATE TO CONTRIBUTE

› TNO is committed to developing sustainable innovations that boost economic development and create social wealth. In order to empower the four billion people with lowest incomes in developing economies. Always in co-creation with local and European public and private partners.



# CHALLENGE





How to manage a household on an income below 2 dollar a day? How to handle the increased food demand of 70% in the coming 40 years? These questions are relevant on a daily basis for the people of Madagascar, Mali and many other developing countries. TNO aims to turn this daily basis into daily business by developing sustainable innovations. Relevant, because by 2040 the global population will have reached nine billion, which will raise consumption and result in scarcity of natural resources. Climate change, unsustainable use of finite resources and lack of agricultural and industrial infrastructures mean that many regions are unable to meet the demand for such resources.

The 21st century's challenge is thus to strengthen strategies for sustainable growth and livelihood. Sustainable innovations with a special focus on development are key in solving this challenge. But this is not a puzzle for any single player. Private companies, knowledge institutes, governments and non-governmental organizations in developing and industrialised countries all have to contribute to these sustainable innovations. Nor is it a puzzle that cannot be solved. Developing countries have the potential to utilise the huge economic and social power of the high number of people with lowest incomes.

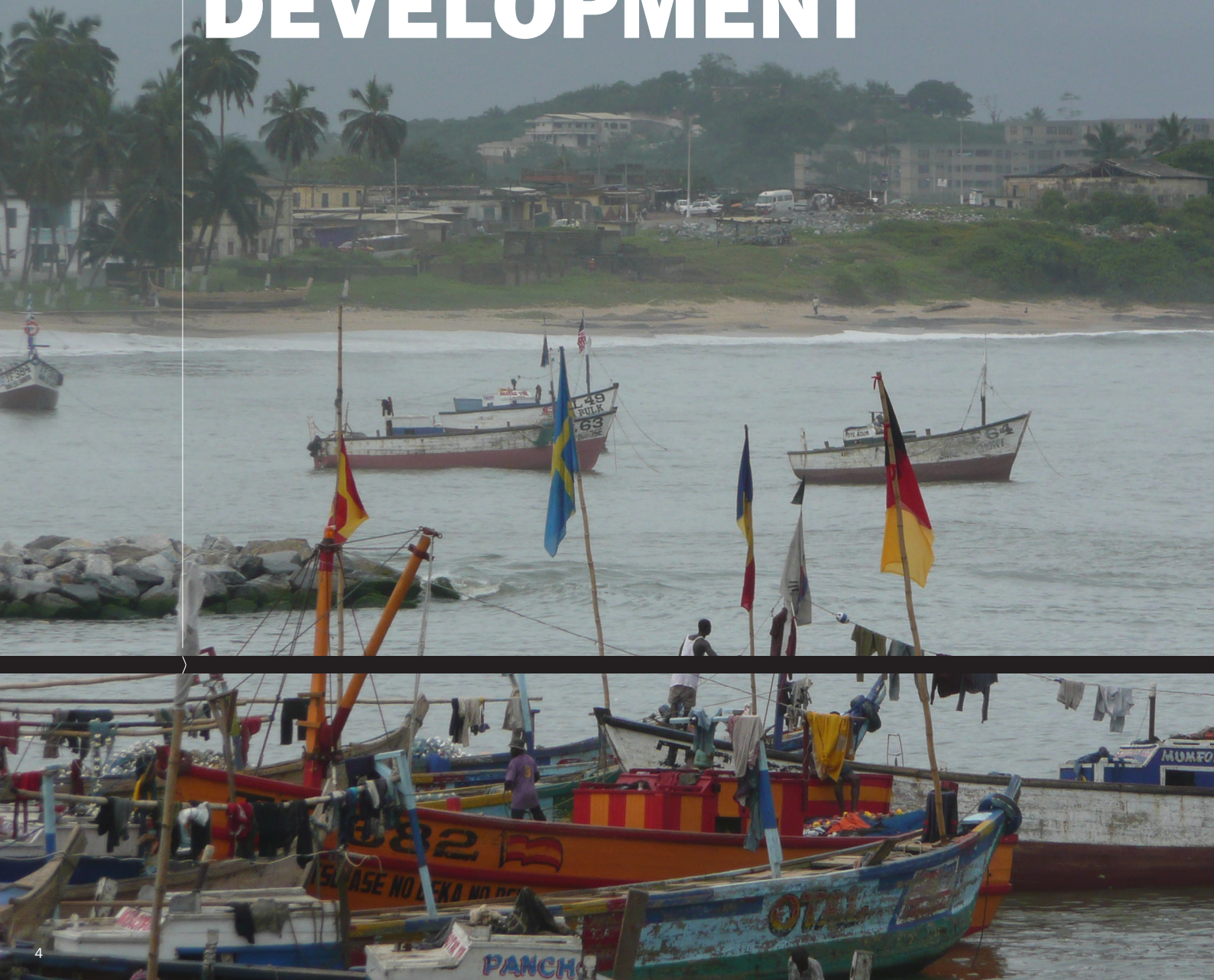
TNO is committed together with its partners to developing sustainable innovations that boost economic development and social wealth creation. This is a matter of combining technical applied innovations with sound business models and the right transition management. In this booklet our initiatives in developing countries are highlighted. Please, feel free to join us in our activities to create more equilibrium, safety and wealth in the world.



Tini Hooymans  
*Member of TNO Board of Management*



# INNOVATION FOR DEVELOPMENT





## ENGINE

Innovation is the engine of economic growth and prosperity. TNO envisions a world where poverty in developing countries is solved by local people using sustainable innovations.

## HIGH-TECH AND LOW-TECH

TNO develops these solutions in the Innovation for Development programme. Whether a high-tech development such as a biogas connection in Bangladesh or a low-tech innovation like custom hand tools for farmers in Ghana; all these solutions are affordable, adequate and will stimulate entrepreneurship.

## COLLABORATION

Do what you're good at. And work in collaboration. In public-private partnerships, we use market-based solutions. Our partners are the private sector, knowledge institutes, civil society organisations, social investors and governments. The TNO Innovation for Development programme provides them with high-level expertise in technical and social innovations. Our partners add their knowledge and their networks. Together we are agents for change.

## LEARNING BY DOING

Innovation for development is learning by doing. TNO is involved in numerous Base of the Pyramid business development strategies. Our involvement enables us to capture, process and share lessons about market-based sustainable innovations. Therefore, TNO is a strategic partner of the Base of the Pyramid Innovation Center. For more information: [www.bopinc.org](http://www.bopinc.org)

## TOPICS

TNO's Innovation for Development programme includes over twenty projects, mainly in Africa and Asia. Innovation for Development addresses four topics:

- Food & agriculture
- Renewable energy & climate
- Health
- ICT

## TNO APPROACH



[WWW.TNO.NL/I4D](http://WWW.TNO.NL/I4D)

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# SUNSHINE SOCKET

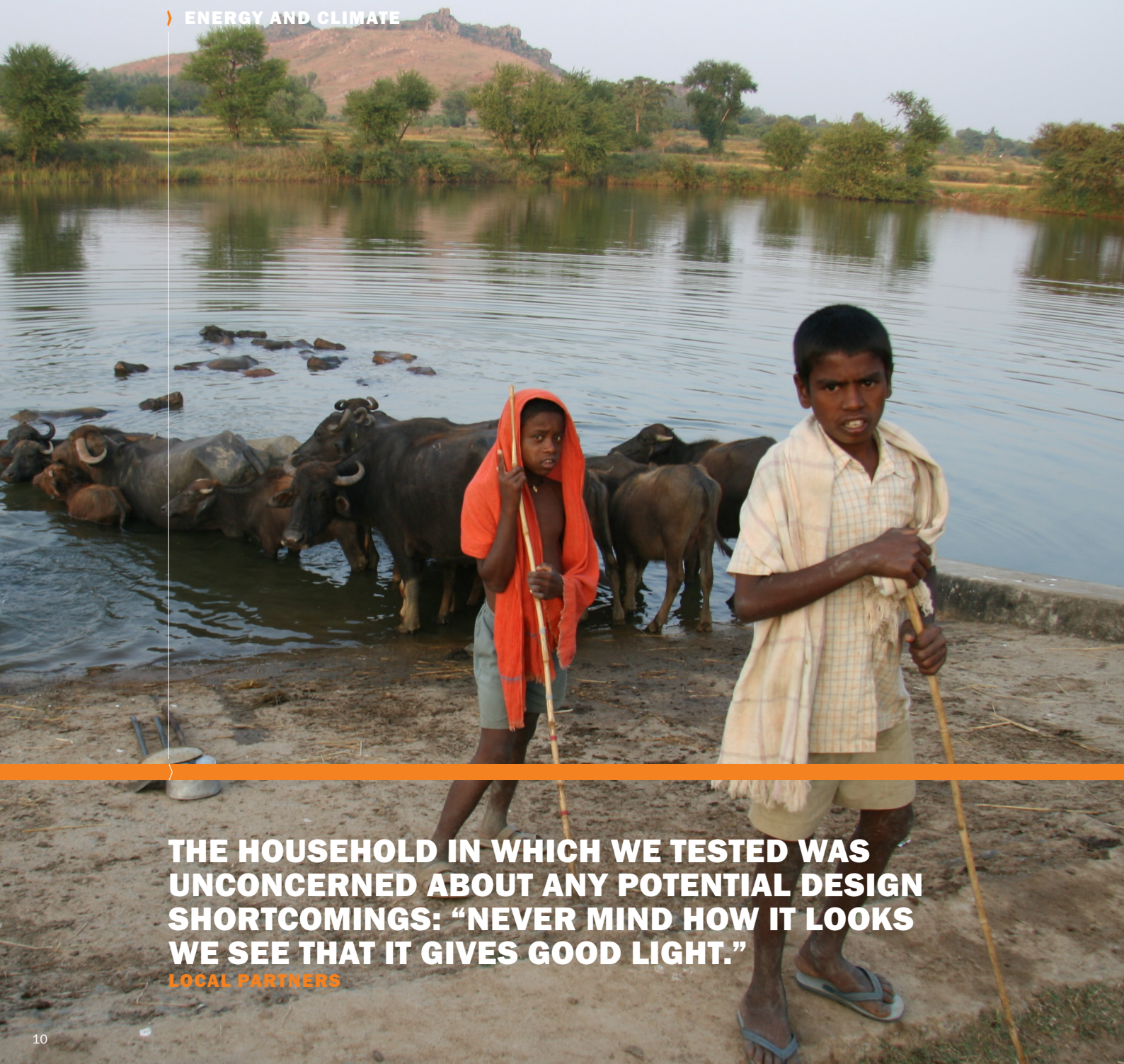
## POTS ON POWER STATIONS

Madagascar's precious primary forests are harvested for firewood for cooking. Solar cookers are an alternative to wood stoves. In co-creation with local Malagasy entrepreneurs and WWF, TNO is developing a new type of solar cooker. Success has already been achieved in generating electricity with the cooker. In the near future families will be able to charge mobile phones and batteries for lighting and radios while cooking. Choosing solar cooking as the way forward was never this attractive.

**“WITH THIS NEW SOLAR COOKER WE TACKLE TWO OF MADAGASCAR’S BIGGEST PROBLEMS: POVERTY RESULTING IN UNDERDEVELOPMENT AND DWINDLING NATURAL RESOURCES. WE BELIEVE IN SAVING THE ISLAND’S UNIQUE FORESTS BY IMPROVING LOCAL PEOPLE’S STANDARD OF LIVING.”**

**VOAHIRANA RANDRIAMBOLA — WWF**

<b>COUNTRY</b>	Madagascar
<b>PARTNERS</b>	WWF
<b>BUDGET</b>	450.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2009–2013



**THE HOUSEHOLD IN WHICH WE TESTED WAS UNCONCERNED ABOUT ANY POTENTIAL DESIGN SHORTCOMINGS: “NEVER MIND HOW IT LOOKS WE SEE THAT IT GIVES GOOD LIGHT.”**

**LOCAL PARTNERS**



# ELECTRIC FLAME

## ELECTRICITY FROM WASTE

› In Asia and Africa many rural houses are not connected to a grid. But more and more villagers are discovering the possibility to cook on biogas produced from dung or organic waste. This biogas can also be used to produce small amounts of electricity. TNO has developed a prototype of a biogas socket that transforms heat into electricity. As lighting and radio programmes reach the countryside, villagers no longer have to walk to distant charging points. There are better ways to spend your time.

**“THE PROTOTYPE WORKS! ELECTRICITY WAS GENERATED TO LIGHT THREE POWER LEDS AND IS PERFECT FOR CHARGING CELLPHONES.”**

**BERT NIEUWENHUIZEN — SNV**

<b>COUNTRY</b>	Rwanda, Bangladesh
<b>PARTNERS</b>	SNV, BoPInc, DGIS
<b>BUDGET</b>	880.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2009–2013





# PROFITABLE CO<sub>2</sub> REDUCTION MONITORING CARBON CREDITS

} The Kyoto Protocol enables developing countries to earn credits by selling emission rights to industrialised countries. Development projects that generate Carbon Credits therefore have major potential. However, time-consuming, hands-on monitoring of such projects is required. TNO develops sensor technology for reliable and cost-efficient monitoring of biogas projects. An important aid in funding sustainable energy projects in poor rural areas.

**“WITH PRE-FAB DIGESTERS AND  
AUTOMATED CDM MONITORING,  
BIOGAS BECOMES AFFORDABLE  
FOR HOUSEHOLDS IN EAST AFRICA.”**

**SANNE CASTRO — SIMGAS B.V.**

<b>COUNTRY</b>	India, Tanzania
<b>PARTNERS</b>	ICCO, FairClimateFund, SimGas, DGIS
<b>BUDGET</b>	270.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2009–present







# SMART ENERGY SCAN

## SOLAR PANEL OR SOLAR COOKER?

What type of renewable energy can maximise carbon reduction? To answer this question, TNO co-developed the Sustainable Energy Potential Scan (SEPS) that enables the smartest choice of renewable energy. It takes into account both the given physical and socio-economic situation in a region as well as the purpose of the project, e.g. cooking, lighting or heating. SEPS supports the goal of generating the most Carbon Credits.

**“THE SCAN OPENED OUR EYES. IT IS NOW USED BY A NETWORK OF PARTNERS THAT ESTABLISHES ENERGY PROJECTS IN DEVELOPING COUNTRIES.”**

**GERT DE GANS — FAIRCLIMATE PROGRAM / ICCO & KERK IN ACTIE**

<b>COUNTRY</b>	India (concept), Ethiopia
<b>PARTNERS</b>	ICCO, local partners
<b>BUDGET</b>	170.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2007–present





**“IT IS THESE SMALL  
INNOVATIONS WE NEED.”**

**AWUDU ABUKARI — CHIEF AND TEACHER UDS**

# HANDY HOE

## BETTER FARMING TOOLS

**“I COULDN’T MAKE  
A FARM BED FOR  
YEARS, WITH THE  
NEW TOOL I CAN!”**

**OLD FARMER**

› The use of traditional hand tools in Africa causes health problems and loss of harvest. Ghanaian farmers use short-handled hoes, forcing them to bend over continuously to reach the ground. In a co-creation project, TNO, local institutes and farmers developed the long-handled hoe. Local blacksmiths and carpenters manufacture these long hoes and generate income. Farmers can now work with an upright posture. This reduces physical stress and boosts sustained, higher productivity. The success of this project is the system innovation; to create a local business case and to convince traditional farmers to change their habits.

**COUNTRY** Ghana

**PARTNERS** UDS, CSP, Kalabash, UrbANet, FTC, Grameen Ghana, MoFA (Ministry of Food & Agriculture), DGIS

**BUDGET** 600.000 EUR

**STATUS** Completed

**PERIOD** 2008–2011







# ROCKWOOL ROCKS

## WATER-RETAINING SOIL

Due to the lack of water, tree-crop agriculture is a huge challenge in semi-arid areas. TNO develops methods to retain more water in the soil using rockwool. While TNO scientists have yet to demonstrate that rockwool actually stimulates crop growth, the local partner is enthusiastic and is proceeding. A local factory has also shown interest.

**“ALTHOUGH THE SCIENTIFIC  
PROOF IS NOT CONCLUSIVE WE  
THINK THAT THE ROCKWOOL  
TECHNOLOGY HAS A POSITIVE  
IMPACT ON SURVIVAL RATE.”**

**RAM ESTEVES — ADATS PRESIDENT**

<b>COUNTRY</b>	India, Ethiopia
<b>PARTNERS</b>	Adats, OilEA BV, ICCO
<b>BUDGET</b>	340.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2007–2012



**“NOW WE HAVE TO PAY TO GET RID OFF OUR WASTE, LIKE PEELS AND CHAFF. WE ARE DEFINITELY INTERESTED TO PROCESS THE WASTE INTO VALUABLE PRODUCTS.”**

**ERIC AMPADU — CHAIR FRUIT PROCESSORS AND MARKETERS ASSOCIATION GHANA**

# TASTE THIS WASTE

## PROFIT FROM PULP AND PEELS

After pineapples are processed into slices and juice, pulp is left over. In Ghana TNO managed to make food out of this 'waste'. The pulp becomes syrup and fibers. A next step will be the production of consumer products like bread, chocolate or cereal bars out of the syrup. The process will come fullcircle if the remaining leftovers are turned into biogas, an energy source that can be used for the production of profitable food products.

**“THE IDEA OF TNO IS INSPIRING  
AND IN CO-CREATION WE ARE  
CHECKING POSSIBLE VALUE  
CHAINS AND BUSINESS MODELS.”**

**ERIC AMPADU — CHAIR FRUIT PROCESSORS AND  
MARKETERS ASSOCIATION GHANA**

<b>COUNTRY</b>	Ghana
<b>PARTNERS</b>	CSIR Ghana, Fruit Processors and Marketers Association Ghana (FPMAG)
<b>BUDGET</b>	220.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2008–2013



**“IN HOLLAND INSECTS ARE GROWN, BUT NOT EATEN. IN AFRICA THEY ARE EATEN BUT NOT YET GROWN. TNO BRINGS THESE WORLDS TOGETHER.”**

**MARIAN PETERS — VENIK** (DUTCH BRANCH ORGANISATION OF INSECT BREEDERS)

# FLYING FOOD

## BREEDING BUGS

Increased food demand for a growing world population requires innovative and sustainable solutions. An often overlooked source of food is insects. Insects are highly nutritious. Crickets for example, can be bred easily as they demand little space and feed, and are an excellent source of protein, amino acids and minerals. TNO, Kenyan and Dutch partners, are developing small-scale insect farms for Kenya and creating a value chain. Breeding bugs stimulates local entrepreneurship and improves access to local nutritious food.

**“THE FLYING FOOD INITIATIVE HOLDS THE PROMISE OF DEALING WITH THE GLOBAL FOOD CRISIS IN TWO WAYS: INCREASING THE AVAILABILITY OF NUTRITIOUS FOOD AND INCREASING INCOMES FOR POOR FARMERS.”**

**MARIJKE DE GRAAF — ICCO**

<b>COUNTRY</b>	Kenya
<b>PARTNERS</b>	Kreca, Venik, Jagran, WUR, ICCO, INNsectOVATION, Food Factory Foundation, Bondo University College
<b>BUDGET</b>	Acquiring 800.000 EUR
<b>STATUS</b>	Starting-up
<b>PERIOD</b>	2010–2014





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**HAPPY NEW YEAR**

# SUCCESS AT THE BOTTOM

## BUSINESS FOR THE BASE

With partners, TNO analysed nearly three hundred existing ICT initiatives in developing countries, including projects in healthcare, financial services, education and agriculture. We discovered that success factors are a strong customer focus, keen entrepreneurship and good cooperation skills. Three successful ICT business models for the base of the pyramid were developed on the basis of these field experiences.

**“SCALING UP THE ICT BUSINESS MODEL  
INNOVATIONS WILL NOT ONLY GROW A  
FEW ORGANISATIONS, IT WILL CREATE  
NEW INDUSTRIES AND BRING KNOWLEDGE  
AND SERVICES TO WHICH THE POOREST  
NEVER HAD ACCESS BEFORE.”**

**FRANCOIS LEPICARD — HYSTRA NETWORK PARTNER**

<b>COUNTRY</b>	Developing countries worldwide
<b>PARTNERS</b>	Ericsson, Orange, ICCO, AFD, Hystra
<b>BUDGET</b>	100.000 EUR
<b>STATUS</b>	Completed
<b>PERIOD</b>	2010–2011





**“MOST STUDENTS LOOK FOR A JOB ONCE THEY GRADUATE. WE NEED TO TRAIN THEM IN CREATIVITY, DESIGN AND ENTREPRENEURIAL SKILLS TO ALLOW THEM TO SEIZE THE POTENTIAL FOR CREATING USEFUL AND USABLE MOBILE SERVICES.”**

**PROF. PAPA LAMINE SYLLA — ESMT**

# TALKING BUSINESS

## ICT FOR THE POOR

Even in the poorest parts of Africa, nearly one third of the people can make a phone call. The social impact of voice-based services is enormous. Mobile ICT bridges bone-rattling roads, inaccessible internet, unavailable banks, unaffordable teachers and unmet medical needs. Within the VOICES project TNO leverages this potential of voice-based service for sustainable development by creating a toolbox that will enable local entrepreneurs to develop their own viable voice-based services; a robust impulse is given to local economies, entrepreneurship and quality of life.

<b>COUNTRY</b>	Sahel countries with a focus on Senegal and Mali
<b>PARTNERS</b>	World Wide Web Foundation, France Telecom, VU Amsterdam, CRS4 – CSIR, ESMT – Sahel Eco, W3C, Fondation Mérieux, Portugal Telecom Inovacao
<b>BUDGET</b>	388.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2011–2013





# CONN@CT.NOW

## EMPOWERING CHILDREN AFFECTED BY WAR

When children survive war, the scars remain. Families and communities are disrupted, the social fabric and future prospects are destroyed. Conn@ct.Now empowers children and young people in fragile countries by innovative use of ICT and media. TNO supports ICT centres, child helplines and radio programmes so that more children can be reached better. We encourage children to claim their rights and create a better future for all.

**“IT HAS BEEN A FASCINATING EXPERIENCE  
TO EXAMINE WITH TNO NEW EFFECTS IN  
SUCH A STRUCTURED WAY AND WITH A  
FOCUS ON TECHNOLOGY.”**

**MARKT VOGT — DIRECTOR WAR CHILD HOLLAND**

<b>COUNTRY</b>	Uganda, Sudan, South Sudan, Burundi, Colombia
<b>PARTNERS</b>	War Child Holland, T-Mobile, RNTC, Child Helpline International
<b>BUDGET</b>	21.000.000 EUR for 2011–2015; TNO's part is 1.200.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2009–2015





# MIGHTY MOTHERS

## CARE DURING PREGNANCY

› The number of women and children in Sierra Leone that die during pregnancy or giving birth is unacceptably high. Working on solutions, TNO and partners detected a need for better transportation and access to health facilities. Furthermore, the quality of the emergency healthcare needs to be improved and programmes geared to changing community attitudes need to be implemented. A consultative body led by the Sierra Leone Ministry of Health is using the initial results to determine a programme of interventions that can be scaled up.

**“WITH THE TECHNICAL ASSISTANCE OF  
TNO WE ARE HELPING TO STRENGTHEN  
THE CAPACITY OF LOCAL RESEARCHERS  
IN SIERRA LEONE.”**

**KATHY HERSCHDERFER — ROYAL TROPICAL INSTITUTE**

<b>COUNTRY</b>	Sierra Leone
<b>PARTNERS</b>	20 international partners, KIT, DGIS
<b>BUDGET</b>	116.000 EUR
<b>STATUS</b>	Ongoing
<b>PERIOD</b>	2009–2012



# OTHER PROJECTS



HEALTH

WASTE MANAGEMENT  
AND SUSTAINABLE  
ENERGY

Problem

Waste management is no standard practice in Indonesia.

Approach

Development of a curriculum for Univeristy of Malang, setting up a pilot landfill site with energy utilization.

Impact

Capacity building towards better waste management. This can result in a reduction in the number of deaths per year as well as a reduction in the spread of disease, in greenhouse gas emissions and unnecessary waste of resources.

Role of TNO

Knowledge transfer.

COUNTRY	Indonesia
PARTNERS	UNESCO-IHE, Afvalzorg, BGP engineers, University of Malang & EVD
BUDGET	135.000 EUR
STATUS	Completed
PERIOD	2007–2009

ICT

BUSINESS MODELS  
FOR SATELLITE  
COMMUNICATION  
IN AFRICA

Problem

How to limit failure in rural ict projects from a non-technical point of view.

Approach

A free reference model that can help different types of stake holders has been published. This consists of a large interactive PDF with hyperlinks to countless checklists and templates with the document (it is complete without the need of internet access to get additional information).

Impact

Better project management performance by local actors, decrease in satellite tariffs for local NGOs.

Role of TNO

Consortium leader.

COUNTRY	Developing countries
PARTNERS	ESA
BUDGET	600.000 EUR
STATUS	Completed
PERIOD	2008–2010



ENERGY AND CLIMATE

BIOGAS: IMPROVING  
EFFICIENCY AND  
DURABILITY

Problem

Biogas units are clean technologies which can be financed with carbon credits. The technical durability of biogas units is yet unknown and financial deals therefore just short-term.

Approach

The durability of the material biogas units were tested and recommendations were given to enhance the durability. This information is direct input for financial contracts, which has positive impact on rural households in India.

Impact

An optimal sustainable way of cooking for 5.800 poor families in India.

Role of TNO

Research and consultancy to local partner how to optimize biogas use.

COUNTRY India  
PARTNERS ICCO, Adats India  
BUDGET 35.000 EUR  
STATUS Completed  
PERIOD 2007–2008

ICT

ELECTION MONITORING  
VIA ICT

Problem

Election Monitoring is to maintain Election Integrity: a socio-political condition characterized by principles of fairness, freeness, transparency and credibility of the electoral process. Information and communication technology tools are needed to effectively and efficiently monitor the electoral process.

Approach

Development of a concept for an election monitoring toolkit, containing multiple ICT tools that can be used in the election monitoring process. One of these tools is developed, implemented and used in the Namibian elections in 2009.

Impact

More transparent and efficient monitoring of elections in Namibia and Africa.

Role of TNO

Project leader, developer and implementor.

COUNTRY Namibia  
PARTNERS Hivos  
BUDGET 60.000 EUR  
STATUS Completed  
PERIOD 2009

ICT

RURAL INTERNET CONNECTIONS

Problem

Africa is urbanising, with young people drawn towards cities to find a job. It is perceived that it's difficult to improve the standard of living in rural areas. Subsistence levels of income prevent small-scale farmers from lifting their families and communities out of poverty.

Approach

Macha Works helps build the capacity of talented people within the community whilst simultaneously creating a learning environment for them. Internet connectivity to connect to peers and professionals and be part of the learning environment, lowers distribution costs and creates new business opportunities.

Impact

Improvement of the economic position of farmers and the quality of life of the inhabitants in two Zambian villages through improved information due to internet connection. Improvement of knowledge for LinkNet Zambia which implements the internet connections.

Role of TNO

Provider of technical and business support for the upscaling of connectivity solutions.

COUNTRY	Zambia
PARTNERS	LinkNet Zambia (Now Macha Works), University of Zambia
BUDGET	300.000 EUR
STATUS	Completed
PERIOD	2006-2009

ICT & HEALTH

MOBISCOPY:  
USING MOBILE PHONES  
FOR DIAGNOSIS OF  
MICROSCOPIC IMAGES

Problem

Rural health centres lack well-trained personnel who can accurately establish a diagnosis on the basis of the microscopic images. As a result, in developing countries many common diseases are often misdiagnosed and wrongly treated, with far-reaching consequences.

Approach

TNO has come up with the innovative solution of linking a microscope to a mobile phone equipped with a camera. Diagnosis can now be done by qualified personnel at academic hospitals using MMS.

Impact

Better health of people in rural areas.

Role of TNO

Development of connector and development of new value network.

COUNTRY	Uganda
PARTNERS	UIRI, Text to Change, Makerere University of Uganda & KIT
BUDGET	55.000 EUR
STATUS	In progress
PERIOD	2008-present



CULTURE

MONITORING COMMUNITY  
DEVELOPMENT  
PROGRAMMES

Problem

Gram Vikas wants to know the impact of their work on social and psychological factors.

Approach

We helped to develop a new framework for monitoring.

Impact

Scope for improved access to water & sanitation for 300.000 Adivasis (indigenous people) and Dalits through better measurement of the input and outcome of their community.

Role of TNO

Developer of questionnaire and training personnel.

COUNTRY India  
PARTNERS Gram Vikas, ICCO  
BUDGET 80.000 EUR  
STATUS Completed  
PERIOD 2007–2010

HEALTH

OCCUPATIONAL  
EXPOSURE IN SOUTH  
AFRICA PLATINUM MINES

Problem

Pilot study to determine the exposure to diesel exhaust (from engines and generators). In addition a health questionnaire will be applied to identify (acute) health effects.

Approach

CSIR perform a substantial exposure assessment study in 3 mines and the health survey. TNO does the exposure modelling and assists in the epi analyses.

Impact

Determine occupational exposure to diesel in the mines and get insight in the main determinants (and possible solutions). This study will potentially be the basis for a national wide study looking at diesel exposure including a thorough risk assessment and epidemiological study as well as an intervention study (for the mines).

Role of TNO

Knowledge partner on modelling occupational safety and health.

COUNTRY South Africa  
PARTNERS CSIR  
BUDGET 44.000 EUR  
STATUS Starting up  
PERIOD 2012

HEALTH

PREVENTION OF  
MORTALITY DURING  
PREGNANCY, DELIVERY  
AND FIRST YEAR OF LIFE

Problem

Compared with the Netherlands and other countries in the Caribbean Community, Suriname has a relatively high mortality during pregnancy and delivery, and in the first year of life. Knowledge about underlying factors on a population level is essential for prevention of mortality.

Approach

From September 2010 for every newborn (live or still) a registration form is completed including information on the newborn, their mother, her pregnancy and delivery, and socio-economic factors. Additional information is registered when an infant dies before the first birthday.

Impact

Primary aim is to identify determinants of mortality during pregnancy and delivery, and in the first year of life in Suriname. Knowledge about underlying factors on a population level gives insight in the development and implementation of preventive strategies, resulting in a decrease of mortality and achievement of MDG's.

Role of TNO

Initiator of project, developer of registration forms, project leader, data coordinator, statistical training.

COUNTRY	Suriname
PARTNERS	Suriname: Ministry of Health, Hospitals, Primary Health Care, Associations of Gynecologists, Pediatricians and Midwives, and Faculty of Medical Sciences of the Anton de Kom University of Suriname; NL: LUMC
BUDGET	210.000 EUR
STATUS	Implementation
PERIOD	2010–2014



# TNO.NL/I4D

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**Pictures**

Jenny de Boer (p. 20, 24 and 26), Anton Kaasjager (p. 8), Helma Luiten (p. 14), Mathilde Miedema (p. 2, 4, 22 and 32), Chantal Stroek (p. 18), War Child Holland (p. 28), Sander Zwanikken (p. 10, 16 and 30)

**Lay-out**

mariëtte jongen vormgeving





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**TNO.NL**

TNO CONNECTS PEOPLE AND KNOWLEDGE  
TO CREATE INNOVATIONS THAT SUSTAINABLY  
BOOST THE COMPETITIVE STRENGTH OF  
INDUSTRY AND WELL-BEING OF SOCIETY.