

19th April 2016: Taking a Global View



Research gaps

This forum reviewed the global off-grid energy situation and existing mechanisms for improving access to energy. Key challenges include the lack of available finance and awareness of opportunities; the need to be efficient with land and material use; and wider policy issues that can reduce renewable energy solutions.

There are over a billion people currently living off-grid. To address this challenge, [Sir Brian Heap](#) highlighted the concept of Smart Villages and the need to communicate with both local populations and various policy stakeholders to overcome technological, social and financial barriers. **Biomass represents a rapidly deployable off-grid energy solution. However, less developed countries tend to be highly bio-based and this can create overdependence, leading to unsustainable environmental consequences.** Thus there is a need for progress in other areas, such as novel and high quality crops, new crop rotations, disease management, improved market efficiency and affordable finance. In Europe there is a lack of consensus regarding the sustainability and feasibility of biomass. There are three main policy issues: the tension between the provision of bioenergy feedstock and food production; the threat of invasive species to food security; and rebound effects, such as the initial uptake of cheaper energy leading to increased consumption.

[Dr Heinz Ossenbrink](#) emphasised the need for a holistic view of the human energy footprint including food, water, energy and space requirements. Photovoltaic energy is an efficient and economic solution for energy production, and biomass is extremely important for food and material production. Using land and materials at the highest possible efficiency is necessary for a sustainable environment. The built environment and urban planning strategies should reflect this concern. Current market models are geared towards low initial investment and continuous cash flow. Consequently, a market needs to be created for renewable energy sources which need heavy investment but will yield long-term savings and benefits.

[Dr Muhammad Tayyab Safdar](#) also discussed the [Smart Villages Initiative](#) and a holistic approach to rural development. For example, rudimentary cooking stoves must be considered as part of the energy system. They can be inefficient and hazardous but overdesigning a solution may not meet the end-users' requirements. **Providing off-grid electricity must serve a function, such as improving access to jobs, healthcare or education.** There are big policy and business challenges to overcome when creating off-grid energy, particularly with regard to mini grids: companies require lots of working capital and developing countries lack access to finance; subsidies for fossil fuels remains a barrier to renewable energy uptake; and there is a lack of policy clarity in developing countries. **Additionally, much biomass usage is unregulated and better legislation is necessary to combat deforestation.**

Wicked problems and questions generated by the open discussion:

How sustainable are biomass solutions? There are indirect environmental costs from transporting fuel and conservation issues such as potential deforestation. As a result, **biomass is not always an appropriate energy solution, but for off-grid areas it has much potential and is rapidly deployable.** Increasing efficiency through a number of technological and behavioural changes is important.

Where does the investment come from? Often the technology exists to vastly improve energy efficiency but the high initial investment required discourages both consumers and businesses. Initial government subsidies, which demonstrate viable business models, may represent a solution but are not necessarily sustainable.

How can we encourage uptake of sustainable energy solutions? Understanding the 'demonstration effect' will help improve uptake at both ends of the energy chain. The demonstration of the long-term profitability of renewable schemes will encourage private schemes, and providing sceptical end-users with proof of a fully functioning and durable energy solution will stop regression to prior practices. Ensuring quality products is a crucial aspect of this process as, for example, sometimes non-branded solar panels will lack warranties and upon breakdown reduce confidence in the technology.



How can solutions be tailored for local contexts? There are a variety of challenges regarding land types and societal variations which mean that different off-grid energy solutions are required for different areas. At times, even end-users will not fully understand their needs or ability to pay. **Sometimes lower-tech and small-scale solutions will be more appropriate** and easier to maintain for a rural, developing population.

How can we use land most efficiently? There are approximately 1.6ha available globally per capita. With this in mind, it is important to understand how much land is needed for all human activities. Photovoltaic energy may be more efficient than biomass solutions, but it requires storage and does not fulfil all our high-end fuel needs or provide food and raw materials. **Balancing land usage, particularly with regard to biomass, in an economically fair and sustainable manner is a real challenge.** There have been major changes in the US concerning economic biofuel production but will Africa and other regions follow suit and what will be the resulting indirect land use changes?

How can we use material most efficiently? Using biomass to its highest value by extracting its most useful components and utilising as much residual material as possible is something that requires both research and behavioural change. Waste as part of the energy system is an important factor requiring consideration.

Are the problems surrounding photosynthetic energy solutions intrinsic to this technology? Many of the problems appear to be related to wider market forces that also affect other energy markets. Proper infrastructure and policy frameworks are required to support newly-implemented technologies and practices, which may be more difficult in developing countries. The green paradox, whereby fossil fuels can become cheaper if supplemented by other energy sources, must be countered by careful energy policy management.

Witness profiles

Professor Sir Brian Heap

Scientific Advisor at the Smart Villages Initiative, Research Associate at the Centre for Development Studies, University of Cambridge

Sir Brian is a biological scientist who has published extensively on endocrine physiology, reproductive biology and biotechnology. Amongst his many achievements, he was the past President of the European Academies Science Advisory Council and the former Master of St Edmund's College, Cambridge, and he is an Honorary Fellow of the Royal Agricultural Society and the Honorary Senior Scientific Consultant and Director of the Programme for Food Security and Sustainable Development at the Malaysian Commonwealth Studies Centre. He has been the UK representative on the European Science Foundation and the NATO Science Committee and engaged in public issues of biotechnology, population growth, sustainability and science policy, working with WHO, the UK-China Forum and the EC.



Dr Heinz Ossenbrink

Head of Renewables and Energy Efficiency Unit, Institute for Energy and Transport, European Commission, Joint Research Centre (JRC), Italy

Heinz has a PhD in Nuclear Physics from Hahn Meitner Institute, Berlin and joined the EC's JRC in 1982, developing their photovoltaic research. In 1995, he became the Head of the Unit for Renewable Energy and more recently he has been developing the Unit's portfolio to support Africa's efforts for a renewable energy supply, amongst other projects. His work covers measurement and testing methods for photovoltaic generators, global environmental impacts of extended biofuel and bioenergy use and the economic assessment of renewable energy and of energy efficiency policy as a means for climate change mitigation.



Dr Muhammad Tayyab Safdar

Affiliated Lecturer at the Centre of Development Studies, Member of the Tutor Panel at the Institute of Continuing Education (ICE), University of Cambridge

Dr Tayyab Safdar is currently working as a Post-Doctoral Research Associate at the Smart Villages Initiative, an innovative research project that focuses on improving energy access for people based in remote off-grid rural areas in developing countries. He has previously worked as an independent consultant for multilateral organisations including the World Bank, the Food and Agriculture Organisation (FAO) and the International Fund for Agriculture Development (IFAD). His research interests include renewable energy, agricultural policies in developing countries, agro-industrial value chains and globalisation, food security and the impact of renewable fuels.

