

NANO CIRCLE

INNOVATIVE TECHNOLOGIES AND TRENDS

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The Path to Sustainable Development



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The NGO RIDS-Nepal is achieving impressive success through holistic community development in Humla, Nepal.

Dear reader

Innovative technologies offer a wide range of solutions to practical challenges and needs. However, not every technology is accepted by end users. This is evident from current discussions of the safety and sustainability of new technologies, but also, and more generally, from experience in using technology to address the most urgent needs of the world's poorest people.

In this issue of the Nano Circle Newsletter, a review article by Equity Research outlines the challenges of using modern technologies to promote sustainable development. This is followed by an interview with Prof. Alex Zahnd of Kathmandu University and the non-governmental organization RIDS-Nepal, in which he discusses technologies and methods for permanently improving living conditions in the extremely inhospitable high-altitude environment of the Himalayas. As usual, you will also find an overview of noteworthy developments in innovative technologies in our news ticker.

I hope you enjoy this issue. If you have any questions, please email them to me at nano.circle@credit-suisse.com.

Dr. Arthur Vayloyan
Private Banking
Head of Investment Services and Products



NEWS TICKER

Innovative Technologies

RESEARCH

04.01.2011

Fuel from water, CO₂, and sunlight

Researchers from ETH Zurich and the Paul Scherrer Institute (PSI) developed a thermo-chemical reactor powered by concentrated sunlight that produces syngas (H₂ and CO) from water and CO₂ in a two-step cycle. Currently, the team is optimizing the reactor for its deployment in solar towers.

POLITICS & SOCIETY

27.01.2011

Five billion mobile phone subscribers, two billion internet users

According to the secretary general of the UN's International Telecommunications Union (ITU), the worldwide number of mobile phone subscribers has reached the five billion mark. Fixed telephone landlines declined below 1.2 billion. Further, there are now two billion internet users, of whom 57% are from developing countries. Currently, the world population exceeds 6.8 billion.

02.12.2010

New ISO Standard for inhalation toxicity testing of nanoparticles

The International Standard ISO 10808:2010 specifies requirements for, and gives guidance on, the characterization of airborne nanoparticles in inhalation exposure chambers for the purpose of inhalation toxicity studies.

MARKET

06.01.2011

Watt d'Or 2011 for Belenos and PSI

Belenos Clean Power and PSI receive the Swiss Watt d'Or prize 2011 for energy efficient mobility. They have jointly developed a hydrogen fuel cell system that has the potential to offer an affordable alternative for internal combustion engines in compact cars.

01.10.2010

Zambia: Better health comes in containers

The Zambia Aids-Related TB Project (ZAMBART), a local NGO that provides testing and treatment, has introduced easy-to-use digital chest x-rays and relatively cheap made-to-order laboratories to help close gaps in stepping up the fight against TB and HIV, which are common co-infections.



FACTS & FIGURES

1.1 billion people in developing countries have inadequate access to water, **2.6 billion** lack basic sanitation.

(Source: Human Development Report 2006, United Nations)



THE ROLE OF TECHNOLOGY IN DEVELOPMENT AID

Clean drinking water, sanitary facilities, and a functional energy supply are among the fundamental human needs. Today, the latest technologies are being used in the developing countries to ensure that the basic needs of the population are met—and they are showing success.

According to the World Bank, some 900 million people subsist on less than USD 1.25 per day (based on purchasing power parity). This figure represents roughly 25% of the population of developing countries. Another 1.1 billion people live on no more than two dollars a day. Although the past 30 years have seen remarkable progress in reducing poverty, much remains to be done. The poorest of the poor often need initial assistance from external sources to find their way out of poverty.

In analogy to Maslow's hierarchy of needs, it is essential to meet people's basic needs, including clean drinking water, sanitary facilities, and energy, before addressing such higher-level needs as telecommunications. In addition to conventional technologies, certain newer technologies hold great promise for meeting the needs of developing countries.

Clean Drinking Water

Water is one of life's most essential resources, and drinking polluted water has serious health consequences. Indeed, diarrheal illnesses result annually in the death of 1.5 million of the world's children under the age of five, making these illnesses the second most common cause of mortality among this age group. The LifeStraw is an ingenious invention for dealing with this problem. It is a drinking straw that contains a filter system to transform dirty water into potable water. It prevents the spread of disease by removing a large share of the bacteria and parasites found in contaminated water. Today the LifeStraw is used



The LifeStraw, a drinking straw that contains a filter system, transforms dirty water into potable water.



Solar technology makes energy available precisely where it is needed.

“The introduction of technology is only the starting point for cooperation.”



FACTS & FIGURES

1.4 billion people lack access to electricity, the majority of whom are in Sub-Saharan Africa.

(Source: World Energy Outlook 2010, International Energy Agency)

primarily in response to natural disasters, such as the Haitian earthquake and the devastating floods in Pakistan. However, it has to be replaced after roughly one year.

Another equally serious problem is that many people live far from the nearest water source. Women often have to walk for significant distances to fetch water for their daily needs, which takes up a great deal of time that could otherwise be put to more productive use.

Decentralized Energy Supplies

An advantage of solar technology and other renewable sources of energy (such as biogas) is that they are decentralized and independent of a power network, so energy can be provided wherever it is needed. This eliminates the need to create a central power grid, a process that takes many years.

Many of the world's poorest people live in regions with a great deal of sunlight, which reduces the need for efficiency in a solar power system; these people are the logical ones to benefit from the first breakthroughs in solar technology. A relatively small amount of energy would be enough to meet their basic needs. With energy-efficient LED lamps, for example, a small solar cell is sufficient to provide light for evening activities. Even small improvements can substantially improve the quality of life—such as reducing the harmful emissions of kerosene lamps, which are in widespread use.

Smokeless Cooking Stoves

Many low-income households use an open fireplace for cooking, which introduces a great deal of harmful smoke into living areas. According to estimates by the World Health Organization, 1.6 million people die each year from the effects of polluted indoor air. More efficient cooking stoves that produce low levels of smoke can help to alleviate this problem. Some of these stoves are fueled by pellets, which can be produced by local businesses using agricultural waste materials. This not only reduces emissions, but also saves considerable time that would otherwise be needed for gathering wood. Local pellet production creates jobs as well.

More than Just Technology

Successful technology transfer requires involving the local population in the development process. This applies not only to the process of finding a solution, but also to the creation of the resulting value chain. Far too often, donors provide costly installations that are ultimately used only for a short time. There is a tendency to forget the environment in which people live, and the need to integrate technology into society.

People may also need to be educated so that they can understand the significance of technological changes. Affordability is another basic requirement. Poor people are unlikely to have savings, and their resources tend to cover no more than their day-to-day needs. Yet solar heating systems and water

treatment plants require relatively large initial investments that take time to pay off. Loan-based financing has often proved successful in bridging a capital shortage.

Ultimately, the introduction of a new technology should be seen only as the starting point for many years of close cooperation; it certainly does not, in itself, fulfill the mission. The RIDS-Nepal project (see the interview in this issue) is an excellent example of a holistic approach that takes all of these factors into account.

Dr. Thomas C. Kaufmann
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INNOVATIVE TECHNOLOGY WITH A LONG-TERM HOLISTIC APPROACH

Development through technological solutions must always take the local context into account. The non-profit, non-government organization RIDS-Nepal affirms this paradigm with impressive success in a number of remote villages in the Himalayas. Alex Zahnd, co-founder and project director, talks about the opportunities and challenges of these fascinating programs.



The “Family of 4” holistic community development concept provides access to a pit latrine, a smokeless metal stove, basic indoor lighting (with white LED lamps), and access to clean drinking water. All technologies are developed and designed according to the local context.

Alex Zahnd, your development activities are focused on the district of Humla in Nepal. What are the most pressing needs of the population there?

Alex Zahnd: Humla's 41,000 people lack almost everything. Poor health, low life expectancy, barren soil with <1% of the land useful for farming, permanent food shortages, a high rate of malnourished children, no road access, no grid connection, low education levels, a harsh, high-altitude climate, and no or minimal health care services, are just some of the more obvious, visible signs of the desperation and needs of the communities in the high-altitude district of Humla in the north-west of Nepal.

This is where innovative technological solutions come into play.

People's identified needs demand a multi-faceted development approach. Thus, technologies make up only one part of holistic community development (HCD). With Humla's rich water and sunshine resources, renewable energy technologies can provide people's energy service needs, bringing enormous improvements to communities. Some of the technologies I have developed and built for a defined context as part of long-term HCD include: a smokeless metal stove, different village context-related solar PV systems, pico-hydro power plants built with no cement, high altitude solar water heater, slow sand water filter, and high altitude greenhouses.

Which achievements are most applicable for the Himalayan regions?

I think the "Family of 4" HCD concept, which I developed based on 15 years practical experience in community development, includes the most

"Any technology needs to be developed according to a defined context."

applicable technologies for the Himalayas. It consists of a pit latrine, a smokeless metal stove, basic indoor lighting, and access to clean drinking water for each family in a village. These technologies, all preventative health care measures, integrated alongside other programs such as awareness raising, non-formal education, skill training, increased food production, and nutrition programs, can be considered applicable, as they are developed according to users' context.

How do you win the hearts, minds, and hands of the local population?

Development takes place in a cultural setting and environment, which is an intrinsic part of each society. Thus, any technology, in order to be relevant, understood by and over time integrated into the users' culture, needs to be developed according to a defined context. Furthermore, programs that enable new skills, attitudes, and thinking about development and life have to be based on an HCD program in order to be considered sustainable.

RIDS-Nepal collaborates with the Kathmandu University, and you have good relationships with other academic institutions around the globe. How important is this for you?

Academic institutions are places where new knowledge is created, where initial ideas find the right environment to be researched, tested, and

HOLISTIC DEVELOPMENT



The “Family of 4 PLUS” holistic community development concept includes non-formal education for mothers and out of school children, a high-altitude greenhouse, hot water bathing centre, nutrition program for children <5 years of age, scholarships for apprenticeship training for Humla women and men, solar cooker, solar drier, and slow sand water filter (SSWF). All technologies are developed and designed according to the local context.



rids-nepal.org

RIDS-Nepal (Rural Integrated Development Services-Nepal) is a Nepali non-profit, non-government organization. Its vision is to improve the overall living conditions of the impoverished high-altitude communities in the Nepal Himalayas. All of its holistic community development projects and field-based research projects are financed by donations from individuals and charities. For questions or further information please contact Alex Zahnd at azahnd@rids-nepal.org.

refined. Then, it is key to establish important links between the initial idea (university), the manufacturer (local industry), the NGO (RIDS-Nepal) as the project facilitator, the end-user community, and the government (as the subsidy provider). This conscious process of establishing relationships between the various stakeholders, in order to address their widespread needs, is of vital importance to enable long-term sustainable development.

Knowledge sharing is one of your core competencies. Which role do digital media play in achieving this goal?

Our RIDS-Nepal website (rids-nepal.org), with videos, slide-shows, stories, and pictures of our

“Minimal access to improved energy services brings enormous improvements to communities.”

projects and village project partners, is our main communication tool with like-minded professionals, our funding partners, and researchers. As Humla is so remote, a 17-day trek from the next road head, not many come and participate hands-on in the work.

Which were the biggest challenges you have faced, so far?

Developing relevant HCD programs with people deeply rooted in a fatalistic belief system and poverty, working within the framework of long-term unstable political conditions and previously civil war (1996–2006). Further, raising the needed financial funding for our new concept of HCD is very hard, as most donor agencies support short-term, quick fix, single-pronged projects, rather than a long-term holistic approach.

What activities are you pursuing in 2011?

Besides extending the “Family of 4” and the “Family of 4 PLUS” to three more villages and following up on all previously implemented projects in 13 villages thus far, we are involved in various R&D projects: A solar photovoltaic-wind hybrid village power generation system; manufacturing, testing, and recycling of batteries for PV systems; solar radiation measurements at different altitudes and climates. Further, we intend, if funding can be secured, to start R&D projects in high-altitude biogas plants and a solar PV-electrolyzer-fuel cell village power generation system. However, this depends on the available funding, which has not yet come in for 2011.

Interview conducted by Dr. Oliver Gywat,
ISP Innovations and Initiatives, Credit Suisse AG



Alex Zahnd, a mechanical engineer (BSc, MSc), has worked in holistic community development projects since 1996 in the remotest and poorest high-altitude mountain communities in the Nepal Himalayas. He runs applied research projects and teaches renewable energy courses at Kathmandu University. As RIDS-Nepal co-founder and project director he leads holistic community development projects in Humla. He is a member of SATW and is also working on his Ph.D. on the role of renewable energy technology in holistic community development.

Symph^αsis

The SYMPHASIS charitable foundation is contributing a generous amount to the holistic community development project in Humla, a RIDS-Nepal initiative. SYMPHASIS is supported by Credit Suisse and provides Credit Suisse clients opportunities to donate assets for charitable purposes. symphasis.ch



FACTS & FIGURES

Every 20 seconds a child dies from a water-related disease.

(Source: Human Development Report 2006, United Nations)

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