

# Whole System Transformation:

## Accelerating the Revitalization and Development of Rural Economies

**An innovative project to combat economic disadvantage and bring prosperity to individuals, families, and communities in rural and remote areas in Central and South Europe, Africa, and Asia by building partnerships for deploying simple and affordable symbiotic water, sanitation, power, and food production eco-technologies; meeting seven of the UN Sustainable Development Goals; and contributing to the others**

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# 1. Revitalization and Development of Rural Economies Supported by a Whole System Transformation Interactive Group Process

“Ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, empowerment of women, and job opportunities, while tackling climate change and environmental protection.” This is the ambition of the UN’s Sustainable Development Goals, which came into force on January 1, 2016.<sup>1</sup>

Achieving this ambitious UN agenda for saving the planet by 2030 requires implementing sustainable development in ways that “harmonize three core elements: economic growth, social inclusion, and environmental protection.” This is because these three elements are interconnected and all are crucial for the well-being of individuals and societies. Community-based partnerships are created and enhanced to ensure ownership and relevance to the local culture.

Ending poverty while safeguarding the planet requires us to move away from the linear economy controlled and benefiting the few to one that is circular and shared. The transition requires ***Whole System Transformation to engage the local people in committed action*** for success and sustainable development over the long term. Community-based partnerships are created and enhanced to ensure ownership and relevance to the local culture.

**Whole System Transformation** is transformative exponential change rather than linear change. Linear change in 30 steps is 30. Exponential transformation doubles 30 times ending in 1 billion times the original step. The use of artificial intelligence as well our leading edge technologies enables connected exponential change.

Benefits must be tangible and local, allowing individuals, families and local communities to live better. This means local economies need to be revitalised to provide livelihoods for all in the whole-system-community level.

This system contributes to meeting seven of the UN’s Sustainable Development Goals and contributes to the others on a community-by-community basis, listed here in order of impact:

- Goal 6: Clean Water and Sanitation
- Goal 7: Affordable and Clean Energy

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<sup>1</sup> <http://www.un.org/sustainabledevelopment/>

- Goal 2: Zero Hunger
- Goal 12: Responsible Consumption and Production
- Goal 3: Good Health and Well Being
- Goal 4: Quality Education
- Goal 17: Partnerships for the Goals

Closed loop water, sanitation, and provision of energy are a starting point that further provides for improved and greater food production with a better quality product. Without safeguarding life-support systems (clean and safe water), individuals and communities will never succeed in revitalising their communities economically. This is why the project seeks to put together a modular system based on a configuration of specific eco-technologies (listed herein) that is co-created and adapted through a partnership building process to the needs, circumstances, resources, and opportunities of local communities numbering from 20-2,500 inhabitants (scalable for larger communities.) The Whole System Transformation approach assumes that the “Gestalt” of core eco-technology module, enabling a mega transformative shift includes:

#### **The Basic System**

- Gasifier (waste-to-energy)
- Bio digester (sanitation and waste-to-energy)
- TreeWell effluent to clean water - extended ecosystem services
- A biological, natural organic enhancement solution is used throughout the entire system. This solution signals beneficial bacteria to massively develop in an extremely short period of time. This keeps the entire system operating efficiently and at optimum performance with a total minimization or elimination of foul odour. Further, we are then able to develop Microbial Food Webs for increased quality of food and increased food production through the use of biologicals which save considerably on the use of fossil based chemical fertilizers.

## 2. Project Purpose

**The purpose is to build partnerships<sup>2</sup> for deploying closed-loop<sup>3</sup> water, sanitation, power, and food production eco-technologies as a basis for building a sharing economy<sup>4</sup> for combating economic disadvantage and the bringing of prosperity to individuals, families, and communities.**

The project will demonstrate the ways in which community-based partnerships can make use of decentralised circular or closed-loop systems for managing water, sanitation, power, and local food production as a basis for building a sharing economy. Closed-loop system solutions combined with advantages of sharing economy can build security and lasting prosperity for those involved, without compromising the quality of natural environments and in many cases improving water, soil, and air quality and enriching biodiversity resources. They also allow sustainable production (SDG.12) and reduce the cost of purchasing fossil-based chemical fertilizers.

Decentralised waste-to-energy, water, and sanitation eco-technologies offer whole communities living in rural areas the opportunity to revitalise their local economy by eliminating waste, saving costs, reducing environmental impact, improving food production, health, and education, and empowering women, while accessing local, regional, and even international markets more effectively.

To achieve this, new eco-technologies must be deployed in ways that translate directly to income generation/wealth creation for the communities that get involved. The value of these eco-technologies lies in their simplicity and their integration into economic development efforts undertaken by individuals, families and whole local communities.

The **Whole System Transformation** approach refers to the partnership building process used to nurture a circular and sharing economy that puts the local community in charge. A community building process repeats yearly using what was learned the previous year while updating the integration with our latest technology. It is projected that all that rural communities worldwide will have free fast internet

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<sup>2</sup> Partnerships are based on social processes where individuals and organisations share risks, costs, and benefits in order to achieve goals that no single individual or group organisation can achieve by acting alone or in isolation. Partnering is an alternative to command-and-control approaches that continue to dominate international development. Community-based partnerships are those in which locals or communities are active partners in shaping operations.

<sup>3</sup> A closed loop system, also referred to as a circular system, is an alternative to a traditional linear approach (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

<sup>4</sup> A sharing economy is an economic system in which assets or services are shared by joint agreement between private individuals, either free or for a fee, in order to reduce unit costs while assuring individuals access/use when needed.

E. Hugh Pettman, Australia  
Rafal Serafin, Poland  
Stanislaw Lazarek, Sweden  
Anthony R. Michell, South Korea

connections along with free smart phones sooner than later. Dependence on consultant facilitation is reduced to the point where the locals can sustain their own learning, positive change, and transformation.

The benefits to a village from installing this system are that it receives clean water both for human health and wellness and safe food production, methane gas, electricity, and water which is practically free, so that even where mains electricity is available, the cost of power to villagers is much less expensive than can be provided with conventional systems. In such villages, the inability to pay for conventional systems, even when provided, is a major issue. A fully quantified account of the monetary, as opposed to social, benefits will be calculated in the first phase of the project, paying due attention to the different economic circumstances of each sample village and validated in the second so that funding can be assured for a major initiative.

### 3. Short Food Chain Systems

#### **SHORT FOOD CHAIN SYSTEMS (SFCs)<sup>5</sup> ARE PARTNERSHIPS<sup>6</sup> THAT CAN BRING NEW LIFE TO REMOTE RURAL AREAS AND NEW BENEFITS TO GLOBAL VALUE CHAINS**

*“Ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection.”* This is the ambition of the UN’s Sustainable Development Goals, which came into force on January 1, 2016.<sup>7</sup>

To be meaningful, rural development must deliver benefits that are tangible so that individuals, families and local communities live better (food and water, shelter, safety, education, health). This means local economies need to be revitalised in ways that provide livelihoods for individuals, families, and whole communities, while making them attractive also to outsiders.

To achieve this, we will work with the community to build a production infrastructure through the SolEco/TreeWell technologies deployed on a shared economy basis. This is clear, but there is a need to focus also on the sales and marketing aspects.

**Whole System Transformation** includes an education and learning aspect that brings the Internet and an understanding of the use of the Internet to a community for use in developing skills, competences, trade and further education. IT technologies assuring traceability, as well as collaborative logistics solutions, offer new opportunities to access markets more cost-effectively.

The key activity is to develop a method or system for supporting community-based revitalization through building short-chain food systems, i.e. food systems that mobilise and integrate all those in the community in collaborative small-scale food

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<sup>5</sup> Short chain food delivery systems or local food systems are those where the (social) distance between the producer and consumer is as direct as possible, cutting out intermediaries. SFC systems come in many forms. They are seen as organizational innovations for situations where subsistence or smallholder farming dominate and need to collaborate in order to gain market access, whereas consumers must collaborate to access the authentic, quality food of traceable origin that they increasingly desire as an alternative to industrially-produced food.

<sup>6</sup> Partnerships are based on social processes where individuals and organisations share risks, costs, and benefits in order to achieve goals that no single individual, group, or organisation can achieve by acting alone or in isolation. Partnering is an alternative to command-and-control approaches that continue to dominate international development. Community-based partnerships are those in which locals or communities are active partners in shaping operations. We refer to partnerships in line with the standards and methodology developed by the Partnership Brokers Association – [www.partnershipbrokers.org](http://www.partnershipbrokers.org)

<sup>7</sup> <http://www.un.org/sustainabledevelopment/>

production, processing, logistics, marketing with sales *directly* to consumers. Short Chain Food systems (SFCs) are food systems that shorten the (social) distance between producer and consumer. Consumers gain access to authentic, quality products of known-origin (traceable) and build a personal connection to the products and their places-of-origin. The idea is for the producer/consumer to capture the premium, which today goes to a multitude of intermediaries. All benefit.

### Three Basic Steps:

- 1) Eliminating wastes, conserving natural resources and maintaining (and improving) water, air, biodiversity, and soil quality so that life support systems are maintained – using closed-loop eco-technologies;<sup>8</sup>
- 2) Involving as many people as possible in generating shared benefits so that nobody is left out or has to leave – a sharing economy based on local food production and processing;<sup>9</sup> and
- 3) More spending power for individuals, families, and communities generated in the place where they live.

### How can local communities connect into global value chains? This is the missing part in our project.

The answer lies in developing a **Short Food Chain (SFC) support system** that can serve all the WST communities, connecting them to each other & to the global, while keeping unit costs down to a minimum. The SFC support system will:

- 1) Revitalise (remote) rural communities through income, skills, and connections and food security. Each Whole System Transformation community is both an expert/contributor to the wider group, and also a beneficiary. Each Whole System Transformation community is a shop window and a source of expertise. In this way, the initial outlay to initiate the Whole System Transformation process is an investment, which will have a tangible return that will benefit also other WST communities.
- 2) Keep natural and cultural values alive in remote rural areas. Solutek/TreeWell will provide the basis for local circular economy, which in turn provides a basis for keeping cultural/natural values alive, adding in this way to the “value” of the food products generated.

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<sup>8</sup> A **closed-loop system**, also referred to as circular, is an alternative to a traditional **linear** approach (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

<sup>9</sup> A **sharing economy** is an economic system in which assets or services are shared by joint agreement between private individuals, either free or for a fee, in order to reduce unit costs while assuring individuals access/use when needed.

- 3) Introduce unique products from (remote) rural areas to the (global) marketplace. This is a key thing we can do: if WST communities get to produce high-quality products for their own use and for external sale, they can be packaged/branded into “collections” for sale in the global marketplace. An example might be a Buyers’ Club in Melbourne, Krakow or New York. We can provide unique, traceable, high-quality products, which are not available in any other way.
- 4) Grow rural community-based business initiatives. Engaging with the global generates all sorts of opportunities for local business development. The key ambition, after all, is to generate quality jobs and livelihoods in the WST communities.
- 5) Reveal rural communities as talented and positive contributors (not as problems); this an important point. Although many communities are poor, and people are desperate, especially after wars, earthquakes, and other calamities. They are opportunities, not problems. They are assets, not liabilities. What they need is opportunity, and that is what Whole System Transformation is all about. Global value chains have an appetite for the local, which we can help satisfy. No single Whole System Transformation can do this alone, but a self-organising network may just be able to deliver.

To achieve the above goals, we must develop a support structure to serve all the Whole System Transformation communities participating in our scheme, which will include:

- 1) Technical expertise related to SFC systems in rural areas, including production and processing, design, communications, marketing, logistics, IT, business training, and technology.
- 2) Eco-technologies that minimise or eliminate waste, especially water, sanitation, and power, and provide the basis for agri-production and agri-processing (reducing production costs, while ensuring quality), especially Solutek/TreeWell.
- 3) A marketing platform for introducing consumers to collections of origin-based food products. It will brand, define, launch, and manage the collections. It will link producers to markets. This is key, of course. Uber, Amazon, and others have shown that this can be done globally. In our model of shared economy, the platform will be also operated as a shared economy enterprise (i.e., not mimicking this as does Uber and Amazon). This is a subtle, but fundamental, difference.
- 4) Local or community-controlled enterprises to manage orders, production, and logistics for product lines, which in some cases can also become incorporated into the operations of other distribution systems.

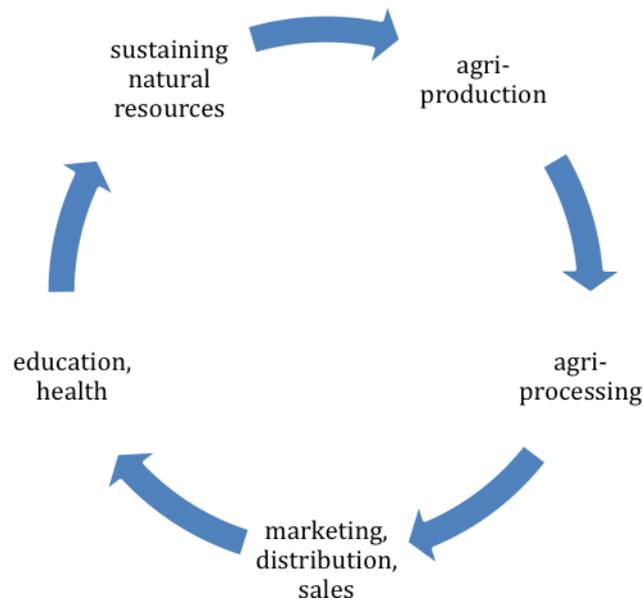
- 5) Business tool kits and business development coaching to give local communities the acumen and resources to set up and manage their production and product lines. Introducing standardized business practices will help manage risk and ensure local control.
- 6) Collaborative technologies. Rural areas face numerous hurdles in trying to supply distant customers, which can seem insurmountable. Introducing IT technology offers a multitude of solutions. Apps can be built to track production, manage logistics, attract financing, manage orders, and control quality.

The support structure is needed to provide a rapid and sustainable pathway through which locals can supply attractive, market-ready products to the customer locally, regionally, and at the global level.

Working out this pathway offers interesting collaborative opportunities with strategic partners (e.g. corporates). For us, the key measure of impact is, and has to be, the prosperity of the participating rural economies and the extent to which rural communities remain in charge and life support systems sustained.

## Whole System Transformation, Initiating a Virtuous Circle

Whole System Transformation is a process that initiates a virtuous circle or spiral with five key steps, building upon each other, with each requiring collaboration of many geographically-dispersed actors:



Building the short-chain food system – together with the community [as opposed to for and on behalf of] – is all about moving away from a linear economy controlled and benefiting the few to one that is circular and shared by many. Collaboration is not an add-on or ‘nice-to-have’ but the basis for generating efficiency gains and competitive advantage in the marketplace.

The focus is on communities numbering around from 50 25.000 people, located in rural areas. Scale can be achieved through replication – integrating several villages in a region.

The key innovation for ensuring market competitiveness lies in making use of eco-technologies, IT solutions, collaborative logistics and innovative financing to generate efficiency gains through collaboration, which in turn ensures financial surpluses accumulate as capital within the shared economy of the community – generating prosperity for individuals and families

### Where to Start

Closed loop water, sanitation and provision of energy [sustaining natural resources] are a starting point that further provides for improved and greater food production with a better quality product. Without safeguarding life-support systems (clean and

safe water), individuals and communities will never succeed in revitalising their communities economically. This is why the process must start with collaboration on deploying (and subsequently maintaining) ecosystem service eco-technologies, which at their most basic need to include:

- SolEco Gasifier (waste to energy) & Bio digester (sanitation and waste to energy)<sup>10</sup>
- Biological effluent to clean water (TreeWell)<sup>11</sup>

The approach of focusing on local infrastructure as something tangible, generating immediate benefits, is intended to set into motion a partnership-building process that will nurture a circular and sharing economy that **generates local leaders and puts the community in charge** right from the start.

The benefits to a village or a group of villages deploying the core eco-technologies is that the villages receive clean water both for human health and wellness and for safe food production/processing, methane gas, and electricity which is practically free, so that even where mains electricity is available, the cost of power to villagers and smallholder farmers is much cheaper than can be provided with conventional systems. Rural communities can in the first instance, turn their waste into energy, gaining or regaining local control over the energy supply. For rural economies in more developed situations, the main benefit is cost-reduction in provision of food and energy security, whereas in less-developed situations, the main benefit is about securing basic needs.

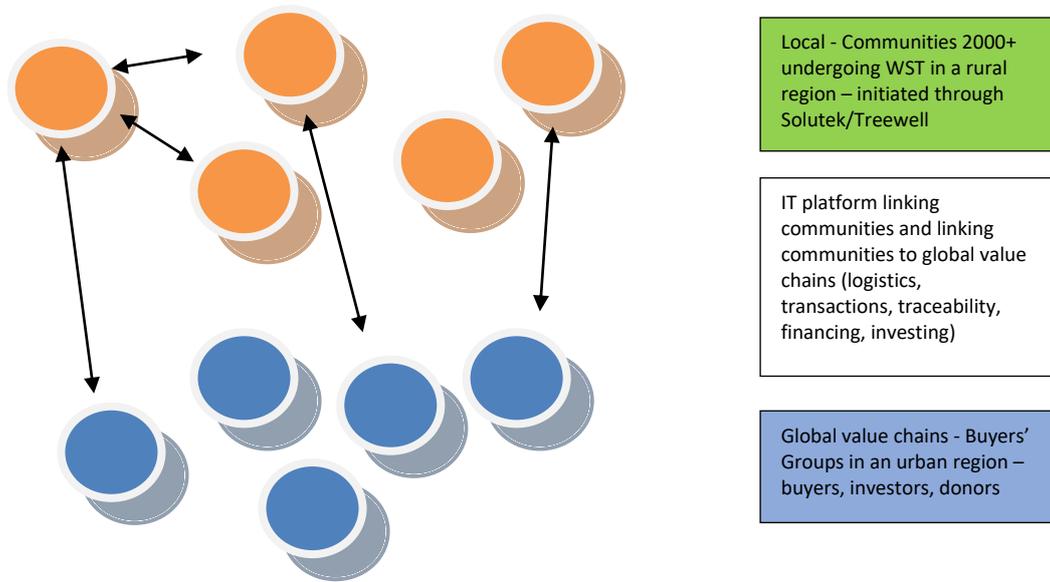
With community-based production capability in place, there is a basis for developing the access to market component, growing community-based businesses in the process, which will always have two dimensions, one local and the other through the platform through to consumers participating in regional and global value chains.

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<sup>10</sup> Solutek includes an array of tried & tested eco-technologies (see listing).

<sup>11</sup> TreeWell is a proven SLUDGE-FREE and practically maintenance-free biotechnological invention, scalable from 1 to 300 m<sup>3</sup> of wastewater a day in any climatic and socio-economic conditions. Provides many added values and boosts local micro economy while contributing to local water and food security. Systems may be clustered. TreeWell technology is available to us.

### Schematic Showing SFC Market Access Network



## 4. Our Eco-Technologies

### 1. WasteMaster – patented downdraft design to maximize fine bio-char production

- ◆ Converts a wide variety of agricultural, industrial, or municipal cellulosic waste into either heat or electricity. It has been proven as an integrated system after it was installed by the University of Iowa's combustion engineering department for integration with a campus boiler system for academic purposes.
- ◆ Emits environmentally responsible, clean-burning emissions, which have been certified by the EPA as environmentally appropriate clean combustion.
- ◆ Produces BioChar as a by-product for reuse in agriculture or sale.
- ◆ Has a feedstock capacity of 2 tonne to as much as 7 tonne per day with 15-20% BioChar production. BioChar, proven over millennia as a natural soil fertilizer and the most efficient carbon sequestration medium, will be produced locally. BioChar, enriched with beneficial microbes and EM consortium, will enhance and restore soils destroyed by abuse of chemicals and mechanized agricultural practices. BioChar works to make available to root systems an enhanced ability to take up carbon, nitrogen, and phosphorus as needed.
- ◆ Utilizes Swedish Sterling Engine power/electricity generators or other suitable technologies depending on feedstock, for 160 to 600 kw output per system installation.

### 2. RAPAD – Rapid Anaerobic Digestion

- ◆ Significantly reduces holding time for solids, RAPAD's footprint, delivery time, and capital costs.
- ◆ Produces biogas containing high concentrations of methane, up to 90% in some trials depending on feedstock.
- ◆ Features configuration flexibility, reducing construction with easy maintenance of optimal operating conditions.
- ◆ Has lower annual operating costs. It is simple, straightforward, and easy-to-maintain.
- ◆ Is easy to construct and install, with no specialised equipment and onsite or centralised locations to reduce transportation costs.

- ◆ Results in major valuable by-products such as fertilizer and irrigation or potable water.
- ◆ Has a capacity of 0.5 tonnes per day to as much as 3 tonnes a day per digester unit which may be coupled to additional digester units.

### **3. Solutek – concentrated organic extract for cell-to-cell molecular communication in complex microbial biofilms and for boosting growth of beneficial bacteria**

- ◆ Utilizes organic sea kelp flour at the core of a proprietary formula & production process.
- ◆ Employs “cell signalling,” designed to activate beneficial bacteria and massively enhance their growth and reproduction, helping them breakdown contaminants and protecting the dissolved oxygen in effluent streams.
- ◆ Stimulates beneficial bacteria to out-compete damaging bacteria
- ◆ Results in a substantial reduction in:
  - BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand)
  - TSS (Total Suspended Solids)
  - FOG (fats / oil / grease) in the effluent
  - Or elimination of hydrogen sulphide (malodour)
- ◆ Lowers corrosion, infrastructure repair, and maintenance costs.
- ◆ Has multiple applications:
  - Sewage treatment plants
  - Dairy and meat processing wastewater remediation
  - Slaughterhouse effluent
  - Aquaculture / agriculture
  - Commercial food preparation kitchens and grease traps
  - Clarifying standing bodies of water
- ◆ When mixed with bio-char, creates an agricultural tool which:
  - Enhances soil through microbial action which breaks down clays to improve soil quality
  - Acts as a plant root stimulant
  - Reduces/eliminates the use of artificial fertilizers

- Improves water retention and levels of humic material in the soil
- Stimulates greater plant health, growth, and crop yield by the enhancement of microbial action and rapid growth of micro biota that works to break down naturally occurring humus.

#### **4. TreeWell System by Carex**

- ◆ Is a proven SLUDGE-FREE and practically maintenance-free biotechnological invention, scalable from 1 to 300 m<sup>3</sup> of wastewater per day in any climatic and socio-economic conditions. It provides many added values and boosts the local micro economy while contributing to local water and food security. Systems may be clustered.
- ◆ Allows for market-tailored solutions for efficient treatment of wastewater, regeneration of usable water, and the restoration of heavily polluted surface waters and despoiled land.
- ◆ Benefits from use of SOLUTEK, supplementing with Carex-biome consisting of natural isolated microbial communities and plants.
- ◆ Benefits from our global network of internationally respected scientists and inventors united by a common goal – switching from linear use of water to decentralised circular solutions based on principles of natural ecosystems, emphasizing reuse of water and the development of green infrastructure.

#### **5. Aquaculture Tanks/Protein Production**

- ◆ Are cleaned by Solutek
- ◆ Can be an integral part of a water recirculation system that allows for the production of protein for the community.
- ◆ May be coupled to a TreeWell system to take advantage of availability of suitable clean water.
- ◆ May employ Solutek as a fish food for some aquatic species.

The above eco-technologies have been tried and tested in the field.<sup>12</sup> They need to be coupled together in new ways to produce a closed-loop, self-sustaining, and powered system that provides a community with gas and electrical energy from waste and integrated with asanitation system while further producing clean recycled water and valuable by-products.<sup>13</sup>

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<sup>12</sup> Case studies and references can be supplied.

<sup>13</sup> Coupling has been applied, but the full system is only just being tested and refined.

## 5. Benefits for Rural Communities

According to the UNHCR, we are now witnessing the highest levels of displacement on record. An unprecedented **65.6 million** people around the world have been forced from home. Among them are nearly **22.5 million refugees**, over half of whom are **under the age of 18**.<sup>14</sup>

**There are also 10 million stateless people** who have been denied a nationality and access to basic rights such as education, healthcare, employment and freedom of movement. In a world where nearly **20 people are forcibly displaced every minute** as a result of conflict or persecution. Those who have been displaced usually retain links with their homeland, while at the same time connecting with their diasporas.<sup>15</sup>

Thinking ahead, beyond the short-term humanitarian disaster that this situation represents, two fundamental solutions are needed: first, helping those displaced return to their homes and helping them rebuild their communities; and, second, where this is not possible, helping those displaced to resettle and integrate into new places, supporting them to make them to become part of new communities. In both cases, **Whole System Transformation** offers a practical solution that can engage diasporas and homeland in positive ways.

**Whole System Transformation is an ENABLING PROCESS.**

It is a process that takes the negative of **Diaspora** and turns it into a positive by showing how diasporas can be a resource for those displaced forcibly or economically to rebuild lives and communities. Diasporas are a resource for re-establishing roots in new places in ways that gives new hope for the future, but also in the homeland.

The opportunity lies in deploying of eco-technologies and tapping diaspora skills, competencies and financial resources, in order to work with those seeking to revitalise their places to return land back into a fully productive state. The key is working with those displaced as partners to restore land so that it can bring forth high quality produce and in such quantity as has never been done before. The task at hand is not just to assure food security, but to create a situation where surpluses generate new and additional income that brings prosperity to families and communities. It is those who have been displaced and are seeking to rebuild their lives and livelihoods who must be in the driving seat. Those returning bring with them an understanding of different places and will have acquired new skills and experiences, such as the use of the internet and modern media communications.

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<sup>14</sup> [www.unhcr.org](http://www.unhcr.org)

<sup>15</sup> Ibid.

**Whole System Transformation** can give the initial impetus for rebuilding communities by providing the tools and power and education, clean water, and sanitation and a release of a new energy, especially among young people and strengthening the role of women.

Put simply, the basic necessities of life that in so many areas have been degraded by years of neglect or war or disruption of society can be restored. Combining eco-technologies with people skills and resources provides a way for individuals, families and communities to take back control of their future, establishing a common purpose of creating new livelihoods that make places vibrant and liveable, strong, and healthy, where education is available to children and grandchildren.

Young people and women become key to growing in communities that are growing themselves because of **Whole System Transformation**.

**Whole System Transformation is about engaging or reengaging young people with their homes and local regions through locally produced food and new jobs that bring prosperity and the 21<sup>st</sup> century to their communities.**

*"...the soul of the family is in the soil beneath the feet of the parents and between the toes of the young"*

Rural areas, in both developing and developed countries, are seeing an **OUTFLUX** of young people, as young people do not see a future for themselves, and especially not in farming.

The reasons for this may have different causes. But often it is a combination of lack of jobs and business opportunities locally, the lure of the big city and a rejection of the way of life of their parents, subsistence farming is hard work with no future.

This situation is problematic for us all, if we consider three facts reported by the FAO<sup>16</sup>:

1. 80% of arable land is used by smallholder subsistence farmers, mainly for their own use, but selling surpluses for extra cash where possible. Worldwide 500 million smallholder farmers support a total of 2 billion people.
2. The average age of farmers is about 60 and the farmer populations are ageing rapidly across the globe. Yet 60% of people in developing countries are under 25. Few see a future in farming.
3. By 2030, 60% of the world's population is projected to be urban (by that time there will even fewer subsistence farmers, if we don't reverse the trend),

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<sup>16</sup> www.fao.org

living in a situation where food security cannot be assured and the life-support systems of nature will be degrading further.

The demise of smallholder farming will leave us with only the high-tech option of industrial food and agricultural food production giants caring only for profit even though worldwide we want access to safe, real food of known or traceable origin. Humanities' common problem is whether there be the same capability for maintaining and restoring the life-support capability of nature.

Dealing with migration, assuring food and nutrition security, and bringing prosperity to rural areas means that rural areas need to offer incentives and opportunities for young people to stay and to support women in taking on a more prominent role. Agriculture and farming must be seen as something sexy and exciting for young people, with prospects for the future. What will it take for this to happen?

Our answer is **Whole System Transformation**. WST can turn smallholder farming into a resource and opportunity for real food supply, which brings prosperity to the places where the food is produced. This is because Whole System Transformation can solve the challenges of:

- a) assuring optimal local conditions for food production with eco-technology by providing locally clean water, sewage treatment, and energy, to enable food production and processing and safeguarding the life-support systems of nature in an increasingly turbulent environment due to climate change;
- b) organising access to market through collaborative logistics and short food chains, enabled through IT solutions and engaging the informal social networks that already link urban to the rural, cutting out intermediaries;
- c) engaging young and old in new ways to co-create new forms of food system based on people (and not just technology) and connecting producers and consumers in new types of relationships. Shortening the food chain increases the profit of the producers/communities and makes consumers happy by knowing where their food comes from and that they are contributing also to safeguarding planetary life-support systems.

Making agriculture sexy, exciting, and a real prospect of a good life for young people and women is about deploying Whole System Transformation as an endeavour based on co-creation of all those involved and affected. Deploying Whole Systems requires not just a focus on farming/agriculture, but also completely new skills, and represents an opportunity for defining completely new types of work and income generation, all with food production/processing as the basis for re-uniting and re-invigorating families in rural areas by having young people and women choose the rural life as their preferred space, not second best.

The practical benefit or result of deploying eco-technologies with a supportive **Whole System Transformation** robust process are numerous as described below and could be extended to most of the other SDG. The starting point is the provision of energy/electrical power and clean water, as well as fertilizer and mulch, including soil rejuvenation products such as BioChar, and a 100% pure biological bacterial stimulant. Small- to medium-sized rural communities can in the first instance turn their waste into energy, gaining or regaining local control over the energy supply.

For small and remote rural economies in more developed countries, the main benefit is cost-reduction and self-reliance in the provision of food and energy security, whereas in less-developed countries the main benefit concerns securing basic needs.

In many cases the provision of electrical power makes refrigeration a standard service in a community, allowing women to save valuable time by not having to go to market daily for fresh foodstuffs for their families, leading to the **empowerment of women**. Time can then be put to practical use by a family to increase food production, undertake processing, bottling, and preserving food, or making other products for sale. New types of food crops for local and regional markets may be grown thanks to the addition of the fertilizer and soil enhancement substances. **In addition, women make up more than 40% of the agricultural workforce in developing countries.**<sup>17</sup>

In less-developed countries, introducing electric lighting means that a village may now run classes for children and adults at night; this increased education has a trickledown effect that provides reasonably quick returns. A village lighting system provides safety for village women and children to venture out at night for various purposes.

Sewage is a problem, and in many locations open defecation or open latrines or pit toilets are a major issue both from a direct hygiene prospective and from the contamination of ground water that is often used for human consumption. The use of the connected and simple total system takes sewage and turns it into energy that can be used as heating for hot water, which is a major need especially when it comes to personal hygiene and the health of a community.

**Educating village women** with new knowledge regarding family health and the making of soaps and liquid cleaners and antiseptics from produce they can grow in a village will save lives and in many cases in numerous territories the eyesight of adults and children. For example, twenty thousand people a year in sub-Saharan Africa have major medical problems that could be obliterated or drastically reduced just by the provision of hot water and soap and the use of gas to cook food indoors.

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<sup>17</sup> [http://foodsustainability.eiu.com/international-womens-day-2018-empowering-women-smallholders/?utm\\_source=Organic%20Social&utm\\_medium=Facebook&linkId=100000002030069#InternationalWomensDay](http://foodsustainability.eiu.com/international-womens-day-2018-empowering-women-smallholders/?utm_source=Organic%20Social&utm_medium=Facebook&linkId=100000002030069#InternationalWomensDay)

The use of wood, dung, and other matter for cooking in small open fires inside houses in rural villages encourages various lung conditions which contribute to shortening life spans and affect the overall quality of life and health of a community. The overall connected system gives us a loop that starts with using waste and making power, which is then used to develop services such as lighting, heating, and cooking, all saving precious time and strengthening the overall quality of life of villagers.

The system will increase food production and further an increase in the quality of food produced by the supply of soil rejuvenation substances made from the use of the system and the addition of a biological solution to soils.

Clean water saves lives, time, and gives an upgraded life outlook and hope for many who know that their children no longer will suffer from water-borne disease and be malnourished because of lack of food and clean water.

Increased food production in a village can lead to new business growth and exports of foodstuffs to neighbouring villages and larger towns in a region. With this newfound prosperity it is essential that the village provides an upgraded health service made possible by having refrigeration and electrical power available for lighting and the storing of medicines.

As a result, villagers will now be able to afford to increase maintenance on their own homes and add a much-needed room or two or even build new homes and village halls, or even a small factory in a village that can then provide part-time and full-time employment for some in the village.

The village hall/school rooms can be connected to the Internet, thus connecting the village to the outside world of knowledge and by this means opening the eyes of villagers and their children to the possibilities and showing a whole new panorama of life.

These circumstances will vary from country to country and locale to locale, and the purpose of proposing a wide range of sample communities is to explore the difference in benefits between different environments.

## 6. Whole System Transformation in Practice

In practical terms, the Whole System Transformation approach is first about empowering local leadership. Then leadership becomes one brain and one heart with a community core group between 30 and 70 individuals taking on the role of local partners. Together with the guidance and support of our project the four actions integrated by working with individuals, families, and communities as a whole as active, co-creating partners (and not passive beneficiaries). The project implementors provide the content. **Whole System Transformation** is the human process to make the vision in reality a co-creating effort with local community leaders.

### Sanitation & Clean Water • Power • Food Production • Health & Education

These four actions are the supporting structures that underpin and set the scene for a more sustainable form of rural development in a specific community that can be replicated and scaled-up in a controlled manner in other villages and towns in order to embrace a larger region and then villages and towns in other regions. Powering Internet connections and thus upgrading communications allow a village to enter a whole new world of business.

### SANITATION & CLEAN WATER



Clean, accessible water for all is an essential part of the world we want to live in. There is sufficient fresh water on the planet to achieve this. But due to **mismanagement, poor conservation, and distribution infrastructure**, every year millions of people, most of them children, die from diseases associated with inadequate water supply, sanitation, and hygiene.<sup>18</sup>

Water scarcity, poor water quality, and inadequate sanitation negatively impact food security, livelihood choices, and educational opportunities for poor families across the world. Drought afflicts some of the world's poorest countries, worsening hunger and malnutrition.

To provide clean water for a small village or rural community, one must first take care of sanitation problems. **Sanitation and clean water go hand-in-hand.** One or more community toilets with washing and shower facilities can have a huge effect on the feelings of self-worth and strengthen the want of a village for improvement

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<sup>18</sup> <http://www.un.org/sustainabledevelopment/water-and-sanitation/>

overall. Available water must be cleaned by one method or another and all water used in toileting must be recycled for use at a minimum as irrigation/agricultural water. TreeWell accomplishes this recycling of water.

The TreeWell solution leverages natural aquatic ecosystem processes for onsite treatment of sewage and heavily contaminated waters. This small, yet scalable solution purifies water safely and effectively for a variety of uses. The purified water is free from pathogenic and parasitic microorganisms, can enrich local freshwater resources and improve local water security, or be applied for household needs, irrigation, and green infrastructure development. The solution is furthermore completely sludge-free because it imitates complete microbial food webs with efficient energy and nutrient transfer from microbial communities via micro-grazers to plants and insects.

A wide variety of multidisciplinary knowledge and techniques combine to make the system work robustly in many conditions. For example, microbial biofilm structures, cell-signalling and interactions between aquatic and terrestrial ecosystems help the system operate in any climatic conditions as a robust, maintenance-free and simple system for reclaiming usable water from a variety of wastewaters. Furthermore, these techniques make the TreeWell system a circular economy for decentralized management of water resources. This is an alternative to traditional linear use of natural resources and centralized sewage systems which are investment intensive and expensive to maintain. From the perspective of environmental economics, these costs are too inefficient to be sustainable.

TreeWell employs a multi-stage continuous treatment process. To support this staging approach, the system consists of two cylindrical thermostatic tanks of the same external dimension. The tanks are made of a light-weight expanded polymeric material certified for storage of food and water.

In the first stage, wastewater is pre-treated as it flows through anaerobic compartments designed for efficient microbial biodegradation of organic material, sedimentation of inorganic particles and oxidation of hydrogen sulphide. This stage achieves advanced de-ammonification and reduction of nitrates by immobilized denitrifying microbial biofilm and through optimized recirculation of a specific volume of the purified effluent from the second highly aerobic tank.

The next stage takes place in the second tank where the bulk of the treatment and purification is performed. Pre-treated water from the first stage is transferred by a dosing pump to the second tank, which is open to the atmosphere and designed for biochemical processes in the plant-root zone in aerobic conditions. This stage ensures efficiency of biodegradation by specific high velocity water circulation and vertical stratification of oxygen and temperature conditions. An air-lift pump creates vortex dynamics and ensures high water turbulence.

Continuous release of organic carbon (exudates) by root system of selected local plants sustains healthy growth conditions for rhizobacteria and function of microbial food webs. Molecular mechanisms of cell-signalling and allosteric regulation of enzymatic biodegradation of organic compounds ensure break down of persistent organic pollutants originating from cosmetics, drugs, and food additives. The system is supplemented with efficient microorganisms (EM), microbes preventing build-up of ammonium and sulphides, beneficial fungi and Carex-biome consisting of organisms isolated from natural aquatic ecosystems.

Final aerobic polishing of water in the second tank correlates well with water turbulence, oxygen saturation and efficient particle flotation. Broken down pollutants become nutrients for bacteria. They are in turn consumed by ciliate protozoans and become a nitrogen-rich food for metazoans and insects. These food-web interactions in the treated wastewater allow for return of nutrients into the surrounding environment via intimate trophic links between bacteria and insects.

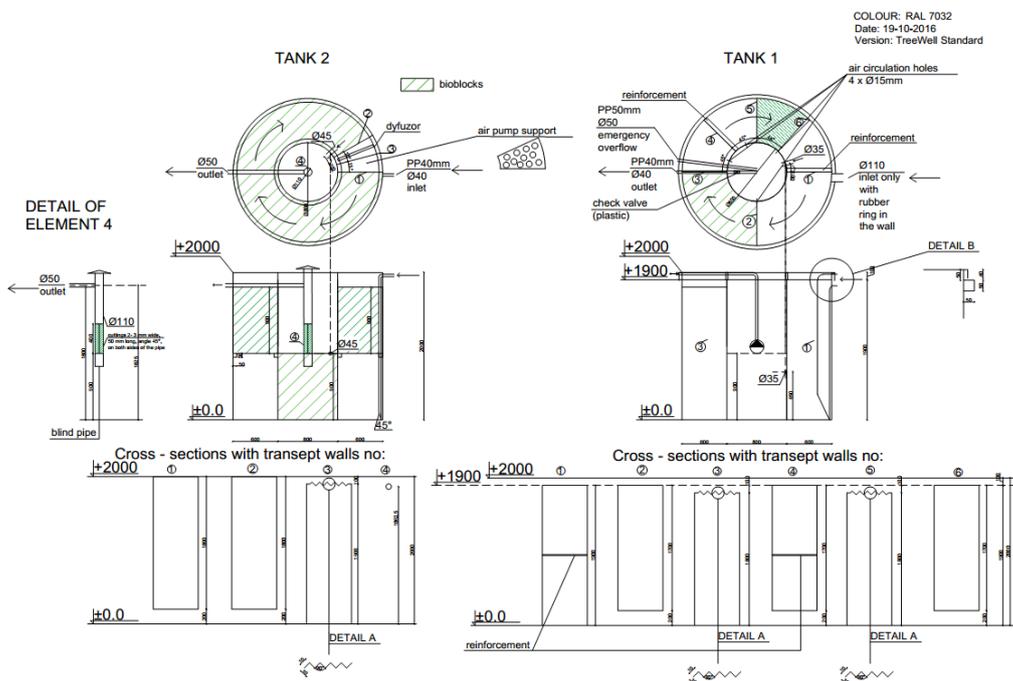
Regenerated water leaves the system gravimetrically and is ready for reuse. In areas highly sensitive to phosphorus influx, a mechanism of biological P-uptake and P-adsorption on regenerable natural media are applied. The purified water meets national and WHO quality standards for A-class water. The micro-fauna contained in the purified water indicates that quality of water leaving the system is similar to water in unspoiled oligotrophic lakes.

The system can serve households, schools, public WC, communities, and small industries in urban and rural areas. The decentralized treatment can facilitate four new housing developments, remote and temporary settlements. It will bring many added values with timeless aesthetics and local water-food security. It will improve local micro-climate and increase biological diversity. In this way, the system can promote green infrastructure, the cultivation of plants for living and recreation. It will generate economic and health benefits.

The decentralized approach to management of water opens up new possibilities for local business development and offers a living room for environmental education. It provides extended ecosystem services to public gardens, sport and tourist facilities, harbours and marinas, castles, schools, hotels, and highway service stations including car-wash. Treated water can be reused onsite for landscaping and gardening, irrigation of cultivated land and for recharging natural and man-made retentions and groundwater aquifers. This highly efficient year-round treatment of wastewater does not create any waste or new problems often associated with traditional sewers and treatment methods.

## TreeWell Facts & Figures

- ◆ Treatment capacity: 1 – 25 m<sup>3</sup> day<sup>-1</sup> can be scaled up using parallel or cluster installations.
- ◆ Minimum retention time: 10 hrs
- ◆ Energy consumption: Less than 300 kWh year<sup>-1</sup> based on daily wastewater flow range 6-10 m<sup>3</sup>. The system can be powered off-grid by a solar-wind system.
- ◆ Compliant with national and WHO water quality standards
- ◆ CE-certified mechanical parts and construction material
- ◆ CE-certification of the entire biological system not required in Sweden
- ◆ Usable water can be disinfected without using chemicals or UV and stored in a cylindrical tank of the same construction and dimensions.
- ◆ Safe for children and animals with no direct or potential contact with contaminated water
- ◆ Earthquake and flood proof - self-stabilizing system



- ◆ Construction: Lightweight polymeric material certified for food and water purposes
- ◆ Footprint: 0.1 – 0.2 m<sup>2</sup> PE<sup>-1</sup> (PE = person equivalent, in the EU, PE = 200 litres water per person per day)

- ◆ Dimensions: Two cylindrical tanks H:200 x DIN 200 cm, each with internal cylinder H:200 x DIN 80 cm. Optional: Third tank for storage of regenerated disinfected water may be used for surface irrigation, hand-wash.
- ◆ Weight: Cylindrical tank alone 160 kg. Total weight of the complete system – two tanks: 450 kg or less.

In the poorest countries, clean water and sanitation are a fundamental challenge. Albeit to a lesser degree, assuring access to clean water and sanitation in an ongoing way is a challenge also in middle-income countries and rural areas of high-income countries. This is especially the case in areas affected by drought and water deficits.

Decentralised technologies that are simple to install and maintain, do not generate waste or other undesirable environmental impacts, and are above all, affordable are needed. These include bio-digesters for reprocessing organic waste into resources that can be used for agriculture, power generation, and other uses and biological water purification systems that reprocess waste or contaminated water into forms that can be re-used for irrigation, washing, or even drinking. The use of gasification systems provides power and takes care of village trash/garbage and turns it into a valuable commodity.

## POWER



Energy or power is central to nearly every major challenge and opportunity the world faces today. Be it for jobs, security, climate change, food production, or increasing incomes, access to energy for all is essential. Sustainable energy is opportunity – it transforms lives, economies, and the planet. It is essential to ensure access to affordable, reliable, sustainable, and modern energy for all.<sup>19</sup>

The provision of power, whether methane for heating and cooking and for powering hot water systems or electrical generator sets or from the gasification of community waste and the production of energy therefrom, is a must have. While solar and small-scale wind power is a great and wonderful adjunct they do not and cannot provide base load power.

Just one or two or three good refrigerators and other food processing facilities in a village may save many women hours of walking to and from markets on a daily basis to obtain the family needs for fresh food. This saved time can then be apportioned to other work that could provide income for a family. Power can make a small medical clinic a vital part of a community whether or not it is full-time or part-time.

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<sup>19</sup> <http://www.un.org/sustainabledevelopment/energy/>

## FOOD PRODUCTION



"The success of rural economies and small holder farms is critical to global food security."<sup>20</sup> It is time to rethink how we grow, share, and consume our food. If done right, agriculture, forestry, and fisheries can provide nutritious food for all and generate decent

incomes, while supporting people-centred rural development and protecting the environment.

Our soils, freshwater, oceans, forests, and biodiversity are being rapidly degraded. Climate change is putting even more pressure on the resources we depend on, increasing risks associated with disasters such as droughts and floods. Many rural women and men can no longer make ends meet on their land, forcing them to migrate to cities in search of opportunities. How food is provided is central to development and eradication of for hunger and poverty.<sup>21</sup>

Production of quality, locally-produced food will lead to better overall health, and better overall health will give greater man hours that can be applied to increased food production, more community jobs, and total community income.

An increase in the cropping of produce can be assisted by the application of **Biochar** developed as a side product from a waste to energy gasifier system. Biodigester systems will further produce fertilizer and garden mulch. **TreeWell** systems will provide clean agricultural grade water, which could be enhanced as a soil rejuvenation agent by the addition of biological microbial development agents.

## HEALTH & EDUCATION



The final pieces of the transformation process relate to the provision of health and education services.

Ensuring healthy lives and promoting the well being for all at all ages is essential to sustainable development. Significant strides have been made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality.

<sup>20</sup> <http://foodsustainability.eiu.com/international-womens-day-2018-empowering-women-smallholders/>

<sup>21</sup> <http://www.un.org/sustainabledevelopment/hunger/>

Major progress has been made on increasing access to clean water and sanitation. But much still needs to be done. Only half of women in developing regions receive the recommended amount of health care they need.<sup>22</sup>

Educating local mothers in the use of antiseptics and washing products derived from produce and fruit that could be grown in their own gardens or in village plots can have a huge effect on health. Coupled with the availability of hot water, any infections that could lead to major health breakdowns and in some cases death can be attended to with success. Simple hand washing in hot water saves lives.

Eye infections and skin infections that in some cases lead to sepsis can all be looked after and prevented from developing by the use of village or homemade antiseptics, cleaning compounds, soap, and hot water, heated by either gas or electricity produced by the recycling system.

Education on hygiene can and should be extended -first to the women of the community, then the children, and finally the men. Positive impact levels result when women and their children learn about cleanliness and the treatment of infection.

## **BUILDING COMMUNITY-FOCUSED PARTNERSHIPS BY DEVELOPING COMMUNITY COMMUNICATIONS ON NUMEROUS LEVELS**



Revitalising local economies requires a focus on mobilising people. Identifying and overcoming barriers requires engaging with those with the stake in success as partners – not as nameless and passive beneficiaries.

To make all of this happen, it is individuals, families, and whole communities who must benefit in a direct and tangible way that is based on becoming part of the **Whole System Transformation**. This means participating in a PARTNERSHIP that is about combining local resources/assets of knowledge, skills, enthusiasm, networks, and traditions with external resources of money, technology, and knowledge in ways that enable a sharing of risks, costs, and benefits – and not a shifting of risk and cost onto others.

You find interested people by communicating with everyone the needs and thoughts and ideas in and around **socio/economic development**. If they know nothing about what must be done and needs to be done, they will not become involved. They will never become effective partners with a capability for taking advantage of external opportunities.

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<sup>22</sup> <http://www.un.org/sustainabledevelopment/health/>

Engaging meaningfully with the local community means asking individuals, families, and groups to get involved as partners. A few will volunteer, but most need to be asked to become involved, sometimes more than once and always in a way that develops excitement for a better future for them as individuals, for their families and for the places in which they live and work.

This means investing the time with village elders, governing groups, associations, clubs, and special interest groups, getting them all excited about being a part of the solution to the economic woes of their families and community, as well as individuals.

Community, family, and individual meetings, printed handouts, regular community newsletters, radio, and other communications are essential to getting local people involved and keeping them involved as active partners. They must co-create the development project to ensure that it can be sustained over the long run. This means talking to any individual or groups that will listen, and turning them into not just stakeholders, but also into shareholders with an interest or stake in maintaining and upgrading the eco-technology solutions deployed.

The world over, every father and mother have the exact same basic needs and wants for themselves, their families, and the places in which they live and work, first for the children, health, and education and then for themselves. They want health and a job and food on the table, and of course a safe place to sleep. This covers the basic wants, needs, and aspirations of most of the people of the world. Safe places to sleep, including low-cost housing, can become an increasing reality for a village that wholeheartedly takes on **Whole System Transformation**.

## 7. Our Proposal

To realise the project as outlined above, we propose establishing a fit-for-purpose consortium that will focus on:

1. Offering a modular configuration of sanitation and clean water technologies adapted to the needs, resources, circumstances, and opportunities of rural communities varying from 20 - 2,500 inhabitants and even higher where up to 5,000 inhabitants is possible with additional clean water handling procedures. Building community-focused partnerships and enterprises exploit the transformational potential of technologies for revitalising a local economy to increase incomes, wealth, and health of the individuals, families, and the community as a whole.
2. Attract a combination of grant-aid and investment to instigate Whole System Transformation “on the ground” with local communities as partners in Europe, Africa, and Asia and opportunities for first world companies to become involved in the benefits of whole system transformation while demonstrating an amortization mechanism on a sliding scale depending on the degree of poverty of the overall economy.

## 8. Phasing and Funding Needs

We are looking for an initial development grant of approximately USD\$250,000 to prepare a business/action plan for deploying the modular approach in 5-6 communities in selected regions in Central and East Europe, Sub Sahara Africa, and Asia.

On the basis of the initial development phase, we envisage rolling out the project through 4 implementation phases, each of which will require securing financing. These are:

Phase	Activities	Expected outcome	Estimated cost	Return
Organizing (concept)	Putting into place organizational/ delivery systems, assuring intellectual property rights, identifying pilot locations, and securing agreement	Delivery capability in place	US\$250,000	
Piloting (proof of concept)	Deploying WST approach in 5-6 communities in Asia, Europe, Africa	Pilots (demonstrations operating)	US\$80,000 per pilot = US\$500,000	
Commercialising	Based on pilots, developing a scaling/replication model that can be deployed on a commercial basis	Commercial product developed	Basic cost plus training or technical support	
Implementing	Marketing and delivery of WST product	Building partnerships with international aid organizations, governments, NGOs, communities, and companies	As required	

**Note on costs.** Each village will have slightly different costs profile depending on size and dispersal of population, type of dominant agriculture, livestock, and other activities, and the demand level for electricity which is the expensive part of the equipment. The more power needs are met by methane, bottled from the project, the less electricity generation will be required.

Villages as small as 50 people can be served with the equipment, but in general 500 may be the most practical, and where the maximum economies of scale can be achieved with an equipment cost of between US\$1,200 and US\$1,500 per person. The processes are scalable up to 20,000 or higher at these per capital rates. The system provides its own power so the monthly running costs are only about US\$250 to US\$750 for biological organic product (Solutek). The study will demonstrate the amortization potential of the investment based on each local economy.

E. Hugh Pettman, Australia  
Rafal Serafin, Poland  
Stanislaw Lazarek, Sweden  
Anthony R. Michell, South Korea

Our project development group which includes but is not limited to Rafal Serafin, Stanislaw Lazarek, Anthony R. Michell, and E. Hugh Pettman and their associates which include Col.(Ret) Barrie A. Town now intend to move forward with the establishment or acquisition of a suitable entity/vehicle and to actively seek start-up funds and mezzanine finance as required and established by initial business plan development.

Please contact in the first instance:

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*This is an exciting venture that will have huge benefits to very small to large rural communities globally, both in developing countries and first world countries with small remote communities.*

*This is a "MUST HAPPEN" situation for the much needed and timely uplifting of regional and remote communities.*

*Futurists, namely Gerd Leonhard, tell us that we will see more progress in technology in the next 20 years than we have seen in the past 300. SolEco Ltd. and BioPhysics Research Pte. Ltd. have discovered the technological seeds that will blossom at the speed of imagination.*

*This timely **uplifting** will, in turn, lead to an overall break-through transformation to a "**whole world economy**" as the spending power and economic involvement of so many will gradually then quickly evolve and increase markedly over time.*