Integrated Energy Settlement Wierthe (IEW), Lower Saxony, Germany

A project for the Sustainable Development, Reduction of
Poverty, Plight and Exodus

For the first time, and in the world: Full implementation of the UN concept

N. El Bassam
2015

International Research Centre for Renewable Energy
Fabrikstr. 6, D-38159 Vechelde, Germany; info@ifeed.org/www.ifeed.org
International Offices: USA und India
Preface

Sustainable development requires an integrated approach to policy, science, technology and entrepreneurship. Adequate and affordable energy availability is essentially needed for all living beings in all walks of life. Renewable energy sources, being eco-friendly and distributed globally, offer our planet a chance to reduce carbon emissions hence mitigate problems due to climate change. It also cleans the air, and serves as an essential input for an overall strategy of sustainable development in agriculture, animal husbandry, industry, transportation, domestic uses such as water supply, sanitation, environmental quality, education etc. The major renewable energy sources include solar, wind, hydro, geothermal, sea waves, biomass and biofuels etc. In order to achieve the maximum utilization of renewable energy sources and supplies, the primary task, therefore, is to integrate the various forms of renewable energy.

Many countries in the developing world are acclaimed for their sunny areas and sunny days per year. Likewise, a long sea coast and large plains where wind velocity for most part of the year remains high, enable production of wind energy. Globally huge quantities of cattle dung can serve as a source of bioenergy. Also, energy parks can be created by planting trees and shrubs in waste and marginal lands and even in deserts. Low lands can be used to produce energy from blue green algae etc. This calls for concerted efforts, political will, sound and pragmatic planning, and appropriate technology for effective tapping of vast renewable energy sources in an integrated manner. With shifting paradigms geologically, sociologically and environmentally, there is an urgent need to address the issue of right to energy.

Integrated Energy Wierthe is such an exemplary project which integrates most elements of sustainability of an ecosystem. It provides communities and settlements pragmatic ways to usher into sustainable development, poverty alleviation, livelihood and food security through education, training and application of science and technology for energy generation and energy utilization for holistic socio-economic development.

The intelligence, knowledge, wisdom, sincere and consistent efforts and hard work put in by visionaries and researchers at IFEED, Vechelde Community, Municipality and Government are laudable and appreciable. I hope this project being carried out under the able guidance of Professor Nasir El Bassam and his colleagues will prove a trend setter globally and I congratulate all stakeholders and wish this flagship project great success to be emulated globally.

Prof. Rishi Kumar Behl
Professor Research Academics (IFEED)
Director (Res & Dev), Universal Institute of Technology, Garhi, Hisar, India
Formerly: Associate Dean, College of Agriculture, CCS Haryana Agriculture University,
Hisar, Haryana, India, E mail : rkbehlprof@gmail.com
Contents

Foreword 6

1. Basics of the project ....................................................................................................... 6

2. Strategic direction: Strategy 4.0 (4 cornerstones): ..................................................... 8

3. Project Location .......................................................................................................... 8

4. Cornerstone Of The Project ....................................................................................... 11

4.1 Cornerstone 1: Energy (100% from renewable sources) ........................................... 11

4.1.1 Electricity: .............................................................................................................. 11

4.1.2 Heat: .................................................................................................................... 11

4.1.3 Mobility ............................................................................................................... 12

4.1.4 Cooking .............................................................................................................. 13

4.1.5 Desalination ........................................................................................................ 14

4.2 Cornerstone II: economic, social, research and education ........................................ 14

4.2.1 Commercial ......................................................................................................... 14

4.2.2 Education .......................................................................................................... 15

4.2.3 Research and Development ............................................................................... 15

4.3 Cornerstone III: Environment and climate ............................................................... 16

4.4 Cornerstone IV: Food and Agriculture .................................................................. 16

5. Conclusion: ................................................................................................................. 20
List of Figures

Figure 1: Cornerstone of the UN concept: energy, environment, food and economy (El Bassam 2004) ................................................................................................................................. 6

Figure 2: Model of an Integrated Energy Development (UN / IFEED concept), energy, climate and energy forest, agriculture, animal husbandry, industry, infrastructure etc. .......... 7

Figure 3: Schematic representation of the whole project "Integrated Energy settlement Wierthe": production areas, the participants and the planned orchard (design: El Bassam, Design: Ghada H. Rh, 2014) ......................................................................................... 7

Figure 4: District Wierthe, Town Vechelde, District Peine, Lower Saxony, Germany ........ 9

Figure 5: Front gate to the project site ............................................................................. 9

Figure 6: Current development of solar systems (outdoor and rooftop) with businesses, research and training workshop for students and various facilities ........................................ 10

Figure 7: Field solar system ............................................................................................. 10

Figure 8: Heat generation from biomass (pellets) ............................................................. 11

Figure 9: An electric car is recharged with solar power ..................................................... 12

Figure 10: Biomass - Turbo - Universal cooker ................................................................. 13

Figure 11: IFEED solar cooker .......................................................................................... 13

Figure 12: Solar water desalination plant on the project site ............................................. 14

Figure 13: Sign board of the resident companies .............................................................. 15

Figure 14: Offices and workshops of some companies ...................................................... 15

Figure 15: Climate school forest in the 2nd year ............................................................... 16
Figure 16: Layout of orchard (Mrs. Helling, City Vechelde; Design Ghada H. Rh 2014, 2015.)
............................................................................................................................................. 17

Figure 17: Orchard with shrub-hedge (May2015) "And if I knew that tomorrow the world
would end, I would still plant my apple tree." (MartinLuther)..............................................18

Figure 18: Horse farming...................................................................................................... 18

Figure 19: Bee keeping.......................................................................................................18

Figure 20: Sheep farming ..................................................................................................19

Figure 21: Project overview.................................................................................................20
Foreword

The basis and guiding principle of the project is to realize the vital role of rural communities to maintain their lives as well as livelihood, especially in Third World countries. In this context, the project presented on the subsequent pages aims to contribute to sustainable management. Sustainable economic systems taking into account ecological, economic and social objectives in a reasonable proportion. Note that in addition to the pursuit of economic efficiency and ethical principles that ensure a balanced use of resources and the nature, the development of an independent perspective and the development of endogenous potential must be at the forefront.

The key to this lies in providing adequate, environmental friendly and affordable energy. Because energy is the basis, among others, for existence of life, light, heat, mobility, transportation of people and goods, training and employment and for the provision of water and food.

The concrete, dynamic project presented here combines these strategic concepts with future-oriented technologies.

The project could be implemented due to the commitment and the trusting cooperation of IFEED, Solar Park "Old Sugar Factory" and the municipality Vechelde. Thanks to all stakeholders.

Prof. Dr. N. El Bassam
IFEED, 2015
1. Project Basics

The structure of the IEW is based on the implementation of the UN concept of „Integrated Energy Settlements" initiated by IFEED in 2004. It provides a viable and sustainable development of rural areas in Europe and worldwide. The aim is to provide the population with energy, water and food and their decoupling from the consumption of fossil resources through the use of renewable domestic energy sources and in the same way, the creation and preservation of jobs through the integration of small and medium enterprises for the rural population. Overall, it includes environmental, socio-economic, energy and developmental elements. Parts of the concept have been implemented indifferent places.

![Diagram of the UN concept: energy, environment, food and economy](ElBassam2004)

*Figure 1: Cornerstone of the UN concept: energy, environment, food and economy (El Bassam 2004)*

This is a ground breaking plan for sustainable development of rural areas, poverty reduction, creation of decent livelihoods in Europe and particularly in developing countries, as well as avoidance of plight and drudgery. The approach stands for real-time, horizontal and vertical networking of people, nature, objects, equipment and systems for dynamic management of complex contexts.
Figure 2: Model of an Integrated Energy Development (UN / IFEED concept), energy, climate and energy forest, agriculture, animal husbandry, industry, infrastructure etc.

The model illustrates an idealized but realistic version of the implementation of the UN concept as a guideline approach to realization and implementation of projects in rural areas. In 2014, IFEED had internationally renowned architect, Ms. Ghada H. Rh, to create the necessary designs with reference to the maps. She made the specifications on the basis of available documents and corresponding drawings.

Figure 3: Schematic representation of the whole project "Integrated Energy settlement Wierthe": production areas, the participants and the planned orchard (design: El Bassam, Design.: Ghada H. Rh, 2014)
1. **Strategic direction: Strategy 4.0 (4 Cornerstones):**

The structures of the IEW consist of four pillars that complement each other and are to be considered holistically:

- Energy supply
- Socio-economic area (employment, education)
- Environmental and climate protection, resource management
- Food and raw material production

A project for the preservation of the vital role of rural communities: Use of forward-looking technologies for sustainable development and poverty combating by means of a holistic and comprehensive approaches and strategies to improve the livelihoods of the local population.

3. **Project Location**
The project is located in the district Wierthe, town Vechelde, county Peine, Lower Saxony, Germany. Wierthe lies on flat land between the stream “Aue” and the creek “Bruchgraben”. The place was up to the second half of the 20th century a dominantly agricultural village and has retained its village character. Wierthe was mentioned in 1178 as "Wirite" in a document of Aegidienklosters Braunschweig, later as "Wirete" (1318). Its population currently counts to a total of 378 people. From 1866 to 2005, the village was the site of a sugar factory. In December 2005, the production facility was last owned by Nordzucker AG, and was then decommissioned.

Mr. Frank Ziegeler acquired in 2010 the former site of the unused sugar factory and installed on an approximately 4 hectare site an industrial park, the "Solar Park Old Sugar Factory" and the "Kraftfeld Vechelde". Operator of the system is the Kraftfeld Vechelde GmbH & Co. KG. Also in 2010, IFEED opened its office there.

Through mutual exchanges and good cooperation with the municipality, the individual cornerstones of the project could be developed. Since spring 2015, it has been completed and will be presented to the public.

Figure 4: District Wierthe, Town Vechelde, District Peine, Lower Saxony, Germany

Figure 5: Front gate to the project site
Figure 6: Current development of solar systems (outdoor and rooftop) with businesses, research and training workshop for students and various facilities

Main administration and business building
4. Cornerstones of the project

Cornerstone I: Energy (100% from renewable sources)

4.1.1 Electricity:
Since 2010, more than 7,000 photovoltaic modules have been installed and optimally aligned with the sun on approximately 4 hectares of land and on the roof tops of the buildings. The core of the project is a Photovoltaic Power Station, now with more than 1.6 MW peak power. The solar modules were built with the latest technology arrangement which calculated the annual electricity needs for about 460 households.

![Figure 7: Field solar system latest technology arrangement which calculated the annual electricity needs for about 460 households.](image)

Since each inverter constantly logs an abundance of measurements and yield data to the system monitoring center, obstruction of individual sub-systems is immediately recognized.

4.1.2 Heat
The required heat (350kW) is produced entirely from biomass (wood and pellets) on the grounds. With its specific annual yield of more than 909 kWh / kwp, it avoids the release of more than 1130 tons of CO₂ per year. In addition, a block heating plant is operated by the processed biomass.
4.1.3 Mobility

The complex includes electric vehicles and electric bikes are also available, which are charged by solar power. In addition, hybrid vehicles are in use.
4.1.4 Cooking

The research center IFEED has developed 2 cookers. These optimal alternatives provide for the preparation of meals in rural areas of developing countries: A way out of fuel poverty! The biomass turbo oven is based on the principle of gasification technology, with low emissions; smoke release is minimal. In confined spaces, the flue gases are removed by means of a duct to the outside (built by Firm Forstinger, Austria).

1 Biomass Turbo Stove BAFOB 5KW

![Biomass Turbo Stove BAFOB 5KW](image1)

*Figure 10: Biomass - Turbo - Universal cooker*

2 Solar cooker

To cook directly with solar power is fascinating: inexhaustible, clean, free energy! Worldwide, about 2 billion people are currently affected with firewood shortage. IFEED has argued for the development of a robust, handy solar cooker. Depending on the sunlight, the temperature of the insulated cooking chamber can reach 250° C.

![Solar cooker](image2)

*Figure 11: IFEED solar cooker*
### 4.1.5 Water Desalination

The "solar desalination" system enables everywhere the access to potable water. With systems for drinking water from highly saline seawater or groundwater, the people that suffer most could be supplied with clean drinking water. This is especially true for people in rural areas in Asia, Africa, Australia, South America and Southern Europe. The system is solar powered and independent of any power source. It instantly cleans drinkable water without chemical treatment. The system works regardless of location; the clean water output is about 50 liters per day.

![Figure 12: Solar water desalination plant on the project site](image)

Through combinations of modules, the system is scalable up to a requirement of 30m³/month. The simple technique does not require specialists for operation or maintenance and would be a reliable system for decades.

### 4.2 Cornerstone II: economic, social, research and education

#### 4.2.1 Commercial

The arrangement of the production facilities and bio-heating plant manages and supports sustainable economic development, employment and training. A number of enterprises are located at the project site employing some 80 employees. Services of the commercial enterprises are not limited to Wierthe or Vechelde, but also are in Lower Saxony, as well as offered nationwide.
It is undeniable that training must be demand-driven and can only contribute to corresponding effects on employment when it is placed in the context of an integrated strategy for economic and employment promotion. The project highlights the importance of promoting employment for poverty reduction through an integrated approach. The implementation of only some aspects has to date barely developed the economic growth especially in the developing world. Germany has a long tradition in the area of vocational training, to which this project is based.

4.2.2 Education

The local companies offer ongoing internships, part-time and full-time positions for temporary workers and student work; requests for more positions are welcome. The Julius Spiegelberg-Gymnasium has already entered into a project partnership for this purpose. The solar education center (solarBiZ), was established in 2012 after long preparatory work and is housed in a former workshop and seminar room. In addition, the International Research Centre for Renewable Energies Germany (IFEE) increasingly allows students from Germany and abroad internships and help with completion of diploma and doctoral dissertations and organizes trainings for foreign organizations.

4.2.3 Research and Development

The International Research Center for Renewable Energies Germany (IFEE) was founded in 1999 in Germany, under close cooperation with the UN. Other branches of the Research Centre are currently in India and the US. It has a seat on the Council for Renewable Energy.
(WCRE), and has been awarded by EUROSOLAR as a "Centre of Excellence" to promote renewable energy.

The main objectives are the integrated use of all information presented on a site of renewable resources in rural areas. This information includes the combination of food, water and energy production as well as improving the social, environmental and economic structures in the developing countries.

The center works in collaboration with DLR, the Club of Rome and the FAO on preparation of studies and develops strategies to determine the expected demand for electricity, water and food by 2050 and to develop concepts to meet these needs. The Research Centre organizes and conducts events such as international, national and regional conferences and training workshops, publishes application-oriented books and articles in newspapers and journals and advises government bodies.

4.3 Cornerstone III: Environment and climate

The “Stiftung Zukunft Wald” provided financial resources to the Julius-Spiegelberg High School in cooperation with the town of Vechelde for the opportunity to implement a forest school. The required field was left to the school by the community. Climate change, nature experience and academic research projects are the focus of at least a 30 years’ project.

Approximately 4,000 oak, beech, wild cherry, elderberry, hawthorn, etc. were planted by the pupils in a planting campaign. It also involved the high school in Vechelde, which planted part of the school forest.

![Figure 15: Climate school forest in the 2nd year](image)

The fruit trees in the orchard and the numerous shrub species serve as food sources for bees and birds. They also offer nesting and breeding places and by doing so make a contribution to protecting our nature. The ground surface under and between solar systems is planted with grass and provides the resident sheep and ponies a food source. All these measures thus feature excellent ambient and soil conditions, which are considered optimal benefits for the purpose-built land.

4.4 Cornerstone IV: Food and Agriculture
Agriculture is the foundation of human life, cultural and any other type of economic development. Adequate nutrition is the basis for human existence and development, and helps to avoid social conflict. Naturally, the supply of adequate nutritional food for the global population is the pillar of the UN concept. At the end of 2014, orchard soil samples were drawn in an area of about 5000 m² and soil analysis was carried out. The town of Vechelde created the legal conditions for the use of the area in early 2015.

The design of the orchard, technical work and the planting list of fruit trees and shrubs was established in cooperation with a horticulturist and IFEED. The plantation covers 33 tall fruit trees (apple, pear, cherry, plum, and quince) and 160 shrubs of seven species.
Figure 17: Orchard with shrub - hedge (May 2015)

"And if I knew that tomorrow the world would end, I would still plant my apple tree." (Martin Luther)

Vegetables can be grown in the orchard if necessary, extending the surface area. For a water supply, a well was drilled and a water and powerline were established.

Figure 18: Horse keeping
View into the future:

It's no secret that we have reached the turning point, and perhaps have already crossed it, as far as the indiscriminate use of fossil fuels and the related technologies. A few technologies help to strike a balance, while many other available options in vogue have to cope with the consequences.

Tackling the problem of poverty that influences one-third of the world population and significantly affects their existence and dignity should be our priority. We have the knowledge and the technology to achieve these goals.
**Energy poverty:** The lack of adequate energy supply leads to a lack of development. Among them are health and safety risks, dwindling public services, lack of access to the most basic means of livelihood, water, life and educational opportunities that do not satisfy the world in which we live.

**The context:** We, citizens of the world from Africa, Asia, Europe, North and South America, are at a crossroad on our home planet: the earth.

*Figure 21: Overview of the project IEW (solar field, orchard, commercial complex, education, research and seminar, and meeting rooms)*

5. **Conclusion:**

By the Wierther project we have succeeded for the first time to implement all elements of the UN concept in one place and be able to demonstrate it as a realistic option for a sustainable development.

Here, further technical options are used in order to combine pioneering production methods and technologies of energy generation from renewable sources together so that from the existing resource potential of the selected location a model "energy mix" is created. This is used for a sustainable and environmentally sound energy supply providing the population with heat, electricity and fuel. It can be used for food production and to improve the economy, agriculture, mobility, education and job creation.

This concept can be short, medium and long term and make an appropriate contribution to provide the rural population in Third World countries to have a future in their homeland, thus reducing the pressure to emigrate. This will have a positive input and provide relief to the refugees. The decentralized nature of the project makes its implementation suitable for different regions. Thus a structural change for all economic sectors could be achieved, which is also the central idea of the energy transition.

Prof. Dr. N. El Bassam  
IFEED, 2015
Integrierte Energiesiedlung November 2015

- Forschung Internationales Forschungszentrum für Eneuerbare Energien (IFEE)
- Kraftwerk Vechelde Eneuerbare Energie auf 4 km Küstenauf, Fläche 7.000 M2, 1.460 kWp, Jahresenergie 1.282.424 kWh, deckt den Strombedarf von ca. 460 Haushalten
- Streuobstwiese
- Pferde und Schafe
- Schulen: Grundschule, Realschule, Gymnasium
- Wohnungen
- Firma Ziegler 14 Mitarbeiter, davon 3 Auszubildende
- Gewerbebetriebe: Handwerk, Handel, Dienstleistungen, Yoga, Fachhandlung, Naturspiele, öffentlicher Biergarten, Kommunikationszentrum für Beförderung und Kultur