Proposals to finance energy projects of developing countries by the voluntary compensation of greenhouse gas emissions

Global cooperation to overcome poverty and the lack of prospects

Dr.-Ing. Dieter Seifert

9. Solar Conference of INTERSOL, Salzburg Society to promote international solidarity
25. May 2019

http://solarcooking.org/Seifert
“The market system fails to solve four fundamental classes of problems: ecosystem functions (the bio-geophysical commons); population; extreme poverty (because of the very real dynamics of poverty traps); and technological pathways needed for sustainability. These are solvable problems. They require collective action, as they are fundamentally in the character of the public good. Yet for the same reason they are not solved. Part of the barrier is the ideology of market economics itself, which often denies these problems and therefore is short on producing practical tools and solutions.”

Jeffrey D. Sachs

Contribution to:

Cooperation with technologies for sustainable development

and

To overcome the poverty trap of developing countries
Create a solution for the two major global challenges:

Poverty in developing countries and the climate change

Collaborations for financing emission reduction projects

Create millions of jobs per year by Appropriate Technology (AT) and spreading of garden culture

Documentation: http://solarcooking.org/Seifert
“Sometimes I would like to scream”*

“Of course, we climate scientists have been aware for a long time that the escape door of climate change is open only at a hand's breadth. This door could shut forever very soon, for example, by the just mentioned release of methane gas from terrestrial and marine sources. And if we, indeed, achieve a global warming of five or six degrees in this century, then on this planet there will be no high-civilization as we know it today.“*

* Translation from German, original see Appendix 5

Hans Joachim Schellnhuber
Direktor of Potsdam-Instituts für Klimafolgenforschung

Interview with „DIE ZEIT“, 26. 3. 2009
http://www.sonnenseite.com/Interviews,Manchmal+koennte+ich+schreien,20,a12631.html
„do inform yourself!“
Luisa Neubauer, invited article, DIE ZEIT, 9. May 2019

„We expose ourselves, at first slowly, than with a great bang, to the greatest catastrophes of the planet and allow by non-action ecological collapse which is a greater threat to our life than the costs and consequences of any measures for environmental protection today.

* Translation from German, original see Appendix 5
“High costs due to failure to protect the environment”

“A ton of CO\textsubscript{2} causes damage of € 180 Federal Environmental Agency sets updated cost rates”*

* Translation from German, original see Appendix 5

https://www.umweltbundesamt.de/presse/pressemitteilungen/hohe-kosten-durch-unterlassenen-umweltschutz
About 25 euros are needed to avoid 1 ton of CO$_2$ in household energy projects of developing countries

Domestic equipment:
1 Efficient fuelwood stove, 1 Parabolic solar cooker, 2 Thermos-baskets, 1 Thermos jug, PV-Panel 40 W and 3 LED-lamps (if possible create of local workplaces)

Investment e.g. 280 Euro, depreciable time 7 years
Service costs: 40 Euro/year
CO$_2$ emission saving: 4 tons/year
Calculation of costs for saving 1 ton of CO$_2$-emission by (a) cooking and (b) PV in households

**Example:** household appliance (a) + (b): 280 €

(a) thermal energy: 1 efficient fuelwood stove (30 €), 1 paraolic solar cooker (100 €), equipment for cooking with retained heat (50 €): 2 heat conserving baskets, 1 termos flask

(b) panel PV 40 W and 3 LED lamps (100 €)

Local production (OSAT) if possible

Spreading and service by non profit institutes (proposal: ARTIS)

| Investment A per household (HH) for (a) and (b) | 280 €/HH |
| Depreciation life T | 7 year |
| Depreciation $K_{1} = A/T$ | 40 €/year/HH |
| Runnig costs $K_{y}$ (witout spreading and service) | 20 €/year/HH |
| Annual costs per household: $K_{HH} = K_{1}+K_{y}$ | 60 €/year/HH |

**Saving $E_{1}$ of CO$_2$e emission per household (a) 3,5 t/year, (b) 0,5t/year**

| 4 t/year/HH |

**Annual costs per ton of saved CO2-emission:** $K_{CO2} = K_{HH}/E_{1}$

| 15 €/t |

**Annual costs for spreading and service per ton of saved CO2-emission**

| 10 €/t |

**Total costs of saving the emission of 1 ton of CO$_2$e**

| 25 €/t |

with the proposed conditions
Overcoming poverty and lack of prospects in developing countries

A) Transfer of know-how: Open Source Appropriate Technology (OSAT)

B) Innovation Institutes for the realization of opportunities (proposal: African Research and Technology Institutes for Sustainability - ARTIS)

C) Financing: Opportunities by compensation of emissions

D) Garden cities instead of slums and "reception centers"

Solares Kochen in Mali
Süddeutsche Zeitung LKR, 30. Mai 1994
Artikel: „Wunder dauern etwas länger“
Equipping households in developing countries with sustainable technology can be financed by compensating the approximately 800 million tons of CO$_2$e savings per year from 200 million households.

At a price of 25 € per ton of CO$_2$e, the compensation cost would be 20 billion euros per year (2 billion euros in the first year in a 10-year build-up phase).

Voluntary compensation can make a significant contribution.
Opportunities of combining poverty reduction and climate protection with voluntary compensation of emissions

For voluntarily offsetting greenhouse gas emissions of households and small enterprises, it seems sensible to replace the "official", very lengthy CDM procedure, which has not proven successful.

Reliable organizations can support projects to connect poverty reduction and climate change mitigation of developing countries.

It may be used as a simplified but transparent process to generate Voluntary Emission Reductions (VERs).

It seems important to avoid trade with the VERs.
Proposals for principles of voluntary compensation of greenhouse gas emissions for poverty reduction and climate protection

1. The projects are funded, prepared and published by charitable organizations and their partners in developing countries.

2. Focus is on projects for households, small businesses and schools in developing countries.

3. The Voluntary Emission Reductions (VERs) are issued to the donor. They are not traded.

4. Evidence of emission savings or permanent carbon storage is provided through transparent presentation on the Internet.

5. Because of the voluntary nature of compensation, no UNFCCC-CDM procedure is necessary.
Why not trade with the Voluntary Emission Reductions (VERs)?

Payment of the VER price serves the intended project and creates the desired personal relation.

By trade the clear relation of the buyer of the VERs to the social benefits of the project would be lost.

Trade would only make sense if it were value-adding, It is not, but creates uncertainty and the risk of loss of value.

Very bad experiences with CDM should not be repeated. There is no need for this market.
Compensation of air travel emissions: Example INTERSOL

"With the transfer of the proposed amount, you promote the use of solar technology and the organic farming of our southern partners"*
Voluntary climate neutrality, better yet climate positivity of “Top Emitters”, especially through global compensation projects, is an essential key to achieving the two-degree goal. This can be done, for example, through projects of the "no-use" type, such as the laying up of certificates of the European certification system, as well as the payment of compensation for the laying up of coal-fired power plants ... “*

* Translation from German, original see Appendix 5

Examples of recommended compensation projects: household equipment, small businesses, schools

• Household energy equipment
• Household biogas plants combined with solar cookers
• Small businesses: preserving food and water sterilizing
  • Solar bakeries/cafés
• Gardens and nurseries with biochar sinks associated with soil improvement
  • Equipment of school kitchens
Steps to determine the CO$_2$ emission savings

1. Define project (project region, project scope, data collection)

2. Arrange cooperation

3. Create project documentation: Project Design Document (PDD)

4. Determine baseline emissions $EB_y$ in year $y$

5. Consider "Suppressed demand" (rising $Eb_y$)
   https://cdm.unfccc.int/methodologies/Workshops/cdm_standards/s3_wb.pdf

6. Calculate expected project emissions $PE_y$ after implementation of the project

7. Difference of project emission to baseline emission including suppressed demand is annual emission savings $ER_y$
Example 1: Household energy equipment

One-third of humanity uses wood or charcoal for cooking - with catastrophic consequences, in particular by cooking in urban households with traditionally produced charcoal (see “Traditional charcoal in Africa – A continent in danger”) https://solarcooking.fandom.com/wiki/Dieter_Seifert

Equipping 300 million households with around 1 kW of household energy means 300 GW of installed capacity. This corresponds to more than 200 nuclear power plants, but without their disadvantages and with less than 5% of the investment costs.

Each household can save about 4 tons of CO₂ emissions per year, a total of 1,200 million tons annually, more than the emissions of Germany and Austria together.
Adaptation of Ben-Stove

As an Open Source Appropriate Technology, the construction of the Ben-Stove (bottom left images) can be easily adapted to local requirements. The pictures on the right show an adapted design in Sri Lanka (to avoid welding the tripod).

Ben 2 and 3 Ben Firewood Stoves

Fotos: Seggy Segaran, Sri Lanka
Annual fuel consumption of a household and possible savings

Comparison with traditional three-stone fire (with 10% efficiency)

### Fuel Consumption per Year

<table>
<thead>
<tr>
<th>Equipment</th>
<th>3-Stones-firewood</th>
<th>Ben 2</th>
<th>Charcoal tradit.</th>
<th>Charcoal improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>Firewood</td>
<td>Firewood</td>
<td>Charcoal</td>
<td>Charcoal</td>
</tr>
<tr>
<td>Unit</td>
<td>Assumptions</td>
<td>03.02.2015</td>
<td>Assumptions</td>
<td>Assumptions</td>
</tr>
<tr>
<td>Net Energy Demand $E_{\text{eff}}$ per Household per Year</td>
<td>MJ/Year</td>
<td>6.000</td>
<td>6.000</td>
<td>6.000</td>
</tr>
<tr>
<td>a) Fuel Consumption B per Household per Year</td>
<td>kg/Year</td>
<td>4.000</td>
<td>985</td>
<td>1.101</td>
</tr>
<tr>
<td>Percentage of Saving $f_{\text{thermo}}$ via Thermos Technique</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>Percentage of Saving $f_{\text{solar}}$ via Solar Technique</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>b) Fuel Consumption including Thermos Technique</td>
<td>kg/Year</td>
<td>2.200</td>
<td>542</td>
<td>550</td>
</tr>
<tr>
<td>c) Fuel Consumption including Thermos- and Solar Technique</td>
<td>kg/Year</td>
<td>1.210</td>
<td>298</td>
<td>303</td>
</tr>
</tbody>
</table>

### Conversion to Fuelwood Consumption per Household per Year:

<table>
<thead>
<tr>
<th>Mass Ration Wood/Charcoal (IPCC default value)</th>
<th>Short rotation plantation</th>
<th>Thick stems and branches for charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Without Thermos- and Solar Technique</td>
<td>kg Wood/Year</td>
<td>4.000</td>
</tr>
<tr>
<td>b) Including Thermos Technique</td>
<td>kg/Year</td>
<td>2.200</td>
</tr>
<tr>
<td>c) Including Thermos- and Solar Technique</td>
<td>kg/Year</td>
<td>1.210</td>
</tr>
</tbody>
</table>

Result: The annual consumption of wood per household can be reduced from 4000 kg to approx. 300 kg. Higher savings are possible with the replacement of traditional charcoal.
Traditional charcoal in African households – A danger to the continent

http://solarcooking.org/Seifert /Publications

For traditional kilns, each household consumes about 6 tons of logs and thick branches each year. To reduce this wood consumption with the help of Appropriate Technology corresponds a saving of approx. 8 tons of CO₂ emissions per year, avoiding the emission of a car ride of about 53,000 km, i.e. 1.3 times the length of the equator (53,000 km * 0.15 kg CO₂/km) per year!
Example 2 for possible compensation projects: Household biogas plants with solar cookers

The "Smokeless Villages" in India are examples of this type of projects

Photos: Deepak Gadhia and Jagadeeswara Reddy: „Smokeless Villages“

Example 3 for possible compensation projects: Preserving food and water sterilizing

- Boiling water with the solar cooker (about 40 liters per sunny day with SK14) (1)
- Solar drying of food (2)
- Producing fruit juices (3)
- Canning and preparing jam, baking … (4)

Source: Dr.-Ing. J. Blumenberg, Lehrstuhl für Thermodynamik, TU München (German-Indian-Solar-Drying Project)
Example 4 for possible compensation projects: School kitchens (with school workshops)

Equipping school kitchens in developing countries with highly efficient firewood stoves, solar cookers and thermos technology is an urgent task that has a particularly high potential for reducing emissions.


Sama Shrestha, CTR Nepal

Renée Schulz: “Sonne macht Schule”; Mohrvilla München
The investment costs per workplace according to the Appropriate Technology (AT) are in the range of a few thousandths of the cost of a workplace in the high-tech area. Misleading would be the attempt to create cheap industrial jobs in Africa. This work is easily transferred to robots in today's industrial world (Industry 4.0).

The picture shows the cutting of high-gloss aluminum sheets in a workshop in Bolivia for production of SK-type solar cookers.

Projekt SOLIN of J. A. Garrido Vázquez, Madrid
Example 5 for possible compensation projects:
Biochar production and storage in gardens and nurseries

Not just emission reduction projects, but also sink projects where biochar is made from biowaste or invasive plants (such as water hyacinth) and biochar is permanently stored in the ground.
Biochar storage in the soil for soil improvement and as a carbon sink

The "carbonization" of the soil through the permanent incorporation of bio-carbon (biochar) can help decarbonize the atmosphere.

This allows financing of garden settlements as carbon sinks.

s.a. Ute Scheub, Stefan Schwarzer:* The Humus Revolution "How we heal the soil, save the climate and create the nutritional turnaround". oekom-Verlag München, 2nd edition 2017
Backyard Gardening
Sustainable yield improvement through soil improvement

Agric Society Switzerland Ghana - ASSG
https://assg.info/125/projekte/ertragssteigerung-backyard-gardening

"The situation is quite different in the villages behind the houses. In the village there is usually only a rudimentary water supply by means of wells or using roof water. This provides a modest amount of water throughout the year for Backyard Gardening. Depending on the plant variety, it takes between weeks and 4 months between sowing and harvesting. This means that a minimum of 3 harvests per year is possible."*

* Translation from German, original see Appendix 5
Gardens in drylands

Prevent desertification and reverse it

Günther and Mary Anne Kunkel:
JARDINERÍA EN ZONAS ÁRIDAS / Gärten und Gärtner in Trockengebieten. ed. Alhulia, Salobreña/Granada
Proposal for a pilot garden community financing by credits for permanent storage of biochar in the garden soil

Pilot garden community with 2000 family gardens, each 500 square meters united to a city core. Area requirement of the city core is about 1 sq. km.

In addition, a 35 times as large common and professional area (commons, trade, etc.).

On an area of the size of Zambia (about 750,000 square kilometers), about 1/3 billion people could lead a sustainable life in garden communities.
Creating millions of new jobs each year in Africa

In efforts to overcome unemployment, we should follow the recommendations of E.F. Schumacher, considering: Small is Beautiful, chapter “Social and Economic Problems Colling for the Development of Intermediate Technology”.

Suggestions for OSAT and ARTIS can be found in "OSAT: Open Source Technology for Africa“
http://solarcooking.org/Seifert

It is the humane solution to social issues where funds from the compensation of greenhouse gas emissions can make a decisive contribution.
Summary

• To overcome the climate and poverty crisis, take advantage of the opportunities to voluntarily offset emissions

• Voluntary compensation can overcome the disadvantages of CDM, especially in household, small business and school projects

• Using Appropriate Technology to create millions of jobs each year in developing countries

• Ensure equitable, sustainable development through public-committed innovation institutes (proposed: ARTIS)

• Recognize garden cities as a breakthrough innovation
Thank you

The future belongs to the gardens and the sustainable technologies, not to the slums

Garden on the edge of the desert of G. and M.-A. Kunkel in Vélez Rubio/Almería

See http://solarcooking.org/seifert
Appendix 1

Statement of
UN Secretary-General Antonio Guterres
UN Secretary-General Antonio Guterres from his Davos speech (Jan. 2019)

“And then the climate risk, and I think the climate risk is the most important systemic risk for the near future. I believe we are losing the race. Climate change is running faster than we are. And we have this paradox: the reality is proving to be worse than scientists had foreseen, and all the last indicators show that. We are moving dramatically into a runaway climate change if we are not able to stop it, and at the same time, I see the political will slowing down. This when technology is on our side and we see, more and more, the business community ready to respond in a positive way, and the civil society more and more engaged. But the political will is still very slow, and we see lots of subsidies to fossil fuels, we see carbon pricing in a very limited way, and we see many still putting into doubt whether climate change is a threat. But in my opinion, it's the most important global systemic threat in relation to the global economy.”

https://www.weforum.org/agenda/2019/01/these-are-the-global-priorities-and-risks-for-the-future-according-to-antonio-guterres/
Appendix 2
Extracts from:

The Age of Sustainable Development
International Growth Centre public lecture
Professor Jeffrey D. Sachs

Director of The Earth Institute, Quetelet Professor of Sustainable Development,
Professor of Health Policy and Management, Columbia University

and

The Food Crisis
Sustaining growth is the century’s big challenge
By Martin Wolf

Financial Times Comment, June 11, 2008
Response to Martin Wolf by Jeffrey Sachs
Challenges to Meet the Sustainable Development:

- Rapid Technological Transformation
- Equity in Social Service Provision
- Community Protection of Natural Resources
- Strengthening of Local Governance
- Sharing Work, Learning, and Leisure
- Restraining Arbitrary Corporate Power
- Responsible investing and Financial Markets
- Re-Democratizing Our Democracies
- Identifying Shared Global Values
CRITICAL “SUSTAINABLE SYSTEMS” PRIORITIES:
• SUSTAINABLE ENERGY SYSTEMS
• SUSTAINABLE AGRICULTURE AND NUTRITION
• SUSTAINABLE URBANIZATION (“SMART CITIES”)
WILL NEED TECHNOLOGICAL BREAKTHROUGHS
The Food Crisis

Sustaining growth is the century’s big challenge

By Martin Wolf

Financial Times Comment, June 11, 2008

Response to Martin Wolf by Jeffrey Sachs

“The market system fails to solve four fundamental classes of problems: ecosystem functions (the bio-geophysical commons); population; extreme poverty (because of the very real dynamics of poverty traps); and technological pathways needed for sustainability. These are solvable problems. They require collective action, as they are fundamentally in the character of public goods. Yet for the same reason they are not solved. Part of the barrier is the ideology of market economics itself, which often denies these problems and therefore is short on producing practical tools and solutions.”

Jeffrey D. Sachs

„Are the vitally needed sustainable technologies within reach? Probably at modest cost. Many are already on the horizon, a „future that is already present.“ Are we making such investments? Plainly no.”

„We have yet to master the full „value chain“ of research, development, demonstration, and diffusion (RDD&D) to mobilize sustainable technologies at anything close to the necessary global scale and speed.“

Jeffrey D. Sachs

Learn about the Food Crisis –
Sustaining growth is the century’s big challenge
Financial Times Comment, June 11, 2008
Response to Martin Wolf by Jeffrey Sachs
Appendix 3

About Suppressed Demand
Suppressed Demand

Definitions

- “Suppressed demand” is the situation where energy services provided are insufficient – due to poverty or lack of access to modern energy infrastructure – to meet the needs of stakeholders given their human development needs (CDM Gold Standard biogas digester meth).

- “Satisfied Demand” the level of energy services that would be reached with access to better quality and more affordable services, and that would be —adequate and —reasonable for, in this case, rural households to meet their basic needs. I.e. satisfied demand is when the income effect and energy cost effect are overcome. Therefore: Satisfised Demand = level of service suppressed by income effect + level of service suppressed by energy cost effect.

https://cdm.unfccc.int/methodologies/Workshops/cdm_standards/s3_wb.pdf
Suppressed Demand as service levels suppressed by energy cost effect and income effect.
Minimum service level to address Suppressed Demand

- “Minimum” service level is a proxy for satisfied demand established as a “minimum level of service” which would result in an adequate service to meet basic human needs.
- Minimum service levels exists for many types of technologies and services e.g. Millennium Development goals clean water, adequate comfort levels (e.g. Space heating and cooling), nutritional levels etc.
  - Define minimum standard level based on literature
  - Convert this to emissions by identifying baseline technology
  - This then eliminates the need to monitor baseline while providing reasonable, objective baseline
- Not appropriate for all sectors/technologies and still have to agree the level.
Appendix 4

Examples for income generation with SK14 and Phases of Innovations
Boiling water is a major task for the solar cooker

On a sunny day, with the parabolic solar cooker more than 40 liters of water can be boiled.

Second International Solar Cooker Test of the European Committee for Solar Cooking Research ECSCR: “boils 48 l of water a day”

Photo: Solar Cooking Course at ICNEER of Dr. Shirin und Deepak Gadhia, with Imma and Dr. Dieter Seifert, Valsad/Gujarat (2004)
Income Generation with the Parabolic Solar Cooker

Examples of salable products prepared by Imma Seifert
Phases of Innovation

1. problem perceived?

2. Idea, Concept
   - is there a solution?

3. Invention, Hypothesis
   - does it work?

4. Prototype
   - is it practicable?

5. Pilot project

6. Difusion
   - solution of the problem?

7. Transformation
   - solution of the global challenge?

Source:
Appendix 5

Original cited German texts

Fuente: D. Seifert: En el camino a la sostenibilidad – Reflexiones sobre la Exposición “Ciencia y tecnología para el desarrollo”, Coloquio Internacional, Parque de las Ciencias, Granada
„Manchmal könnte ich schreien“

„Uns Klimawissenschaftlern ist natürlich schon lange bewusst, dass die Fluchttür beim Klimawandel nur noch eine Handbreit offen steht. Bald könnte sich diese Tür ganz schließen – etwa durch die eben angesprochene Freisetzung der Methangase aus terrestrischen und marinen Quellen. Und wenn wir tatsächlich in diesem Jahrhundert eine globale Erwärmung von fünf, sechs Grad zustande bringen, dann wird es auf diesem Planeten eine Hochzivilisation, wie wir sie heute kennen, nicht mehr geben.“

Hans Joachim Schellnhuber
Direktor des Potsdam-Instituts für Klimafolgenforschung
im Interview mit „DIE ZEIT“, 26. 3. 2009
http://www.sonnenseite.com/Interviews,Manchmal+koennte+ich+schreien,20,a12631.html
„Informiert euch!“
von Luisa Neubauer, Gastbeitrag DIE ZEIT 9. Mai 2019

„Wir setzen uns wissentlich, erst langsam, später ruckartig, den größten Katastrophen des Planeten aus und sorgen durch Nicht-Handeln dafür, dass die Disruptionen des ökologischen Kollapses unser Leben weit mehr einschränken werden, als das jegliche Umweltauflage vermag.“
Pressemitteilung des Umweltbundesamtes vom 20.11.2018:
„Hohe Kosten durch unterlassenen Umweltschutz“

„Eine Tonne CO₂ verursacht Schäden von 180 Euro – Umweltbundesamt legt aktualisierte Kostensätze vor“

https://www.umweltbundesamt.de/presse/pressemitteilungen/hohe-kosten-durch-unterlassenen-umweltschutz
Kompensation u.a. von Flugreise-Emissionen: Beispiel INTERSOL

"Mit der Überweisung des vorgeschlagenen Betrags fördern Sie den Einsatz von Solartechnologie und den Biolandbau unserer Südpartner"