The parabolic solar cooker as a pedagogic instrument

Encuentro Solar 2007
Parque de las Ciencias, Granada

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Challenges

We live in a time of crucial challenges: through the poverty in the world, climate change, environmental destruction, shortage of resources....

But there are almost unlimited resources as the creativity, the virtue of the cooperation and the solidarity

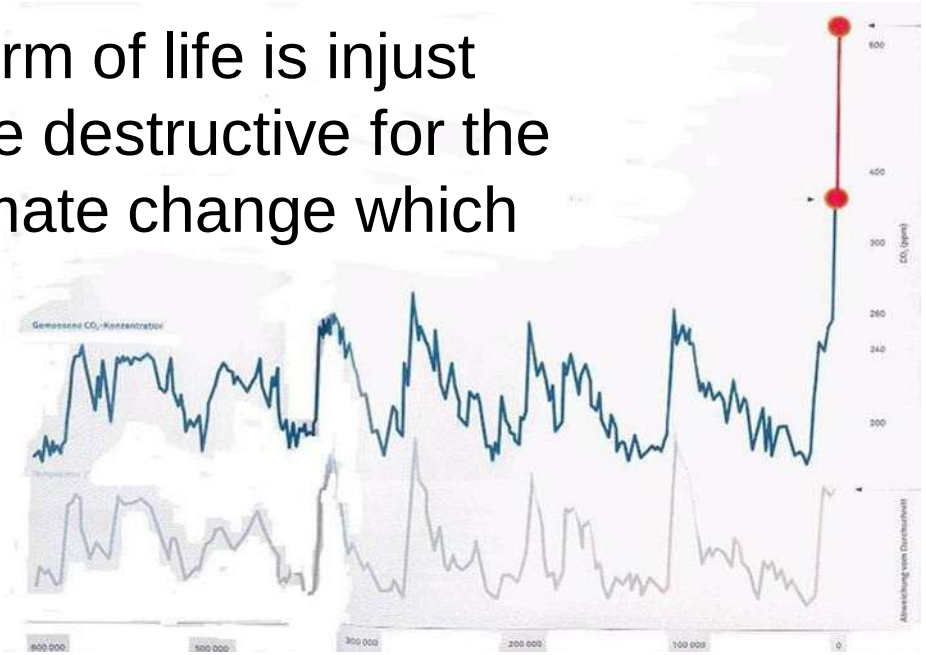
Photo: Michael Hoenes, Lesotho

Challenge through Climate Change

- The life on our planet takes off from a thin layer, that protects it and supports it - the atmosphere
- We attack it instead of caring it
- We have only still few years for the transition to sustainable form of life
- We can combine climate protection with the support of the UN millennium development objectives

Goals

- Showing that we must change our life towards sustainability, that is onto a life in accordance with the resources of the planet
- Showing that our present form of life is injust because it is more and more destructive for the base of life, primarily by climate change which we provoke
- Showing, that everyone has responsibility, because we all have possibilities and influence



Al Gore: An Inconvenient truth.
Publ.:Rodale, Emmaus, PA, USA

Chances

- There are gigantic chances for the creation of resources and the decrease from damages for a lasting life on our planet
- We must show the ways towards sustainability
- An example as we can broaden the resources is the solar cooker

Solar cooker H. Tabor, Jerusalem

Project “Education through experience with the sun”, Renée Schulz, Munich

More than a technical device

- We must refute the opinion that the use of solar energy is expensive. Quite the opposite: Not to use it is extremely expensive if we consider the consequences onto the environment
- For an intense use the solar cooker must be adapted well onto the wishes of the users
- Security and high lifespan are important criteria

Sama Shrestha, Kathmandu

Escuela Taller, Bullas/Murcia

Experiences in the educational system

Workshops with solar cookers:

- Afghanistan (Kinderhilfe Afghanistan)
- Germany (Munich, …)
- Austria (InterSol Salzburg)
- Spain (Barcelona, Fundación Terra, Murcia, Escuela Taller Bullas)
- India (Barli Institute, Indore)
- Indonesia (Pilot project CDM Aceh 1)

Subjects education through experience

- Practical skills
- Environmental education
- Social behaviour
- History
- Physics and mathematics
- Mechanics and materials
- Geography
- Ethics
- Health care
- Nutrition and housekeeping
- Worldwide cooperation for sustainable development

Fundación Terra, Barcelona

Klaus Trifellner, Indonesia

Practical skills

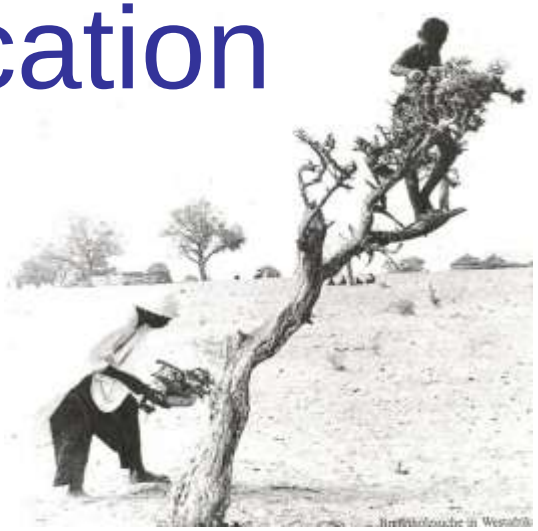
- Manufacturing a complete device which works well
- Using it with success
- Developing skilfulness
- Organizing the work

Photos: Klaus Trifellner, Indonesien

Environmental education

Topics:

- Climate change
- Emission saving
- Exhaustible and renewable resources
- Desertification as consequence of deforestation...



Gaia Oeko Atlas
unserer Erde
Fischer Taschenbuch
Verlag

Farchana, Chad

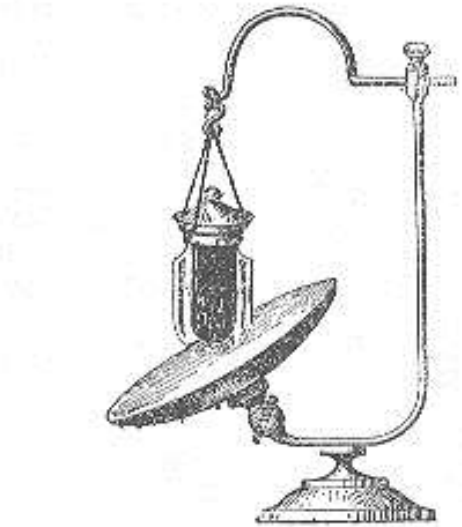
Social behaviour

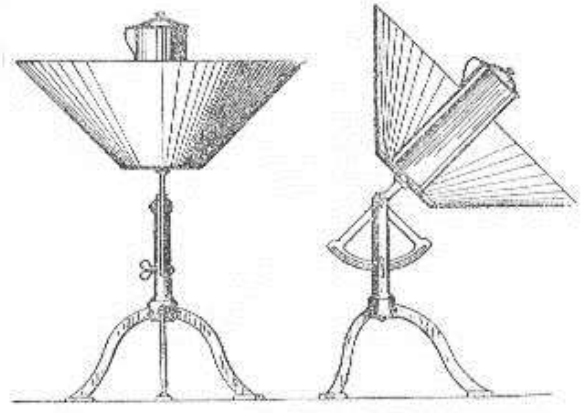
- Cooperation in groups and mutual help
- Discussing solutions
- School partnerships
- International and intercultural cooperation

Klaus Trifellner, Indonesien

History

- Theories
- Developments
- New materials
- New methods and changing habits

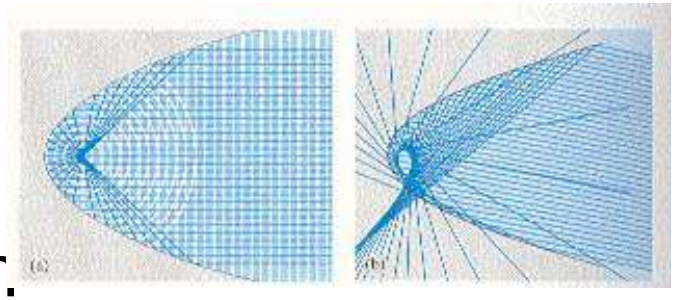




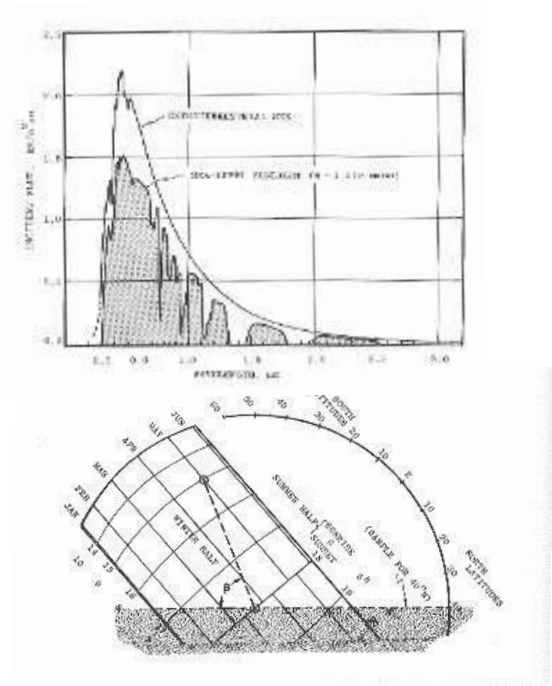
Augustin Muchot: La Chaleur et ses Applicacions Industrielles. 1879
(German edition: Olynthus Verlag, 1987)

Physics and Mathematics

- Optics of the reflection
- Concentration of solar radiation
- Solar energy
- Transformation of energies
- Temperature and power
- Properties of the paraboloid
- Calculations about geometry and physics



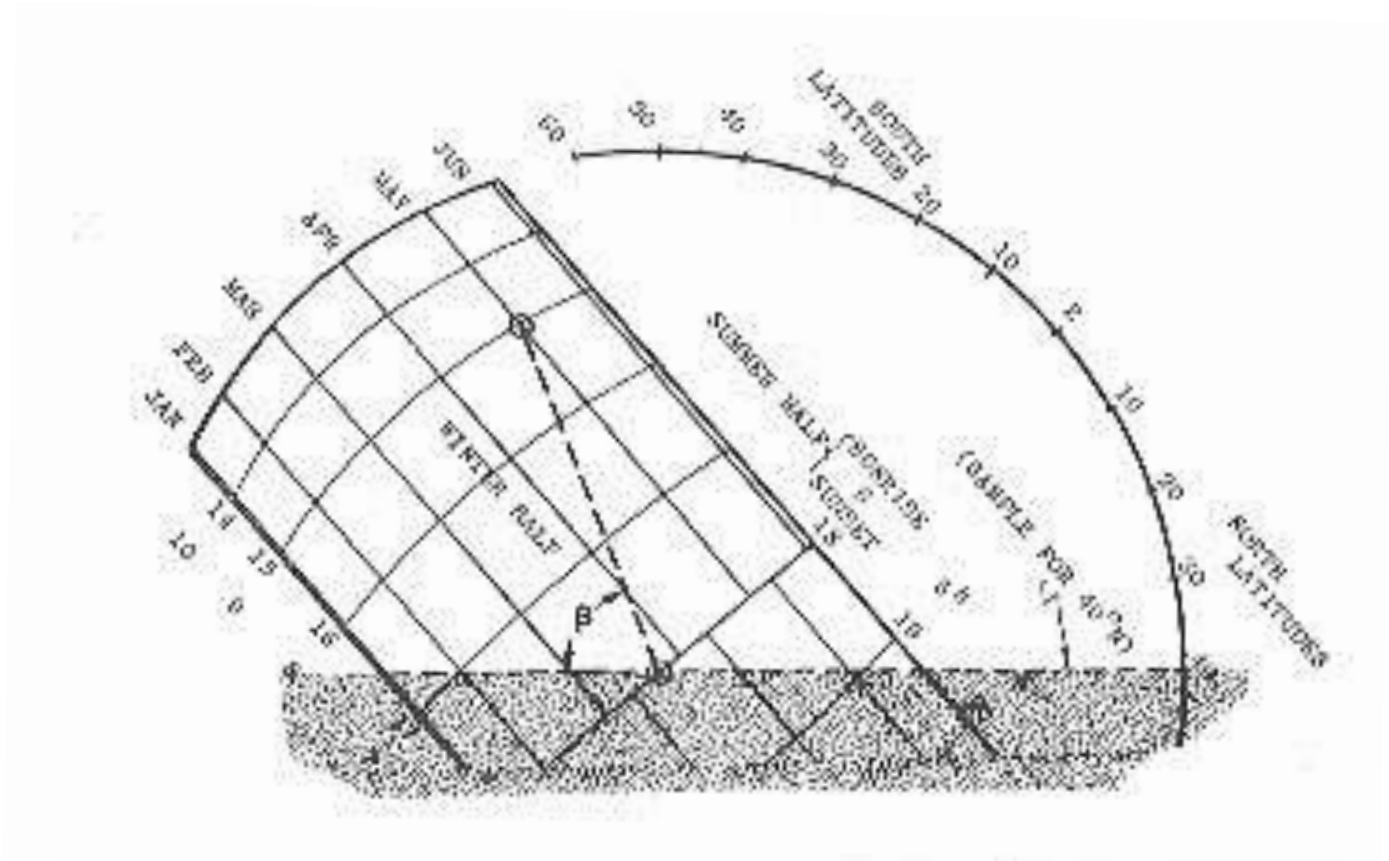
D. Meschede: Gerthsen Physik.
Springer Verlag, Berlin



A.B. Meinel, M.P. Meinel: Applied Solar Energy.
Addison Wesley Pub.Comp. Reading MA

Solar energy – a way out of energy crisis

- Types of energy
- Radiation
- Transformation
- Heat transfer …



Position of the sun as function of latitude, month an solar time (example: 40 °N; May; 9:00 or 15:00 h)

A.B. Meinel, M.P. Meinel: Applied Solar Energy. Addison Wesley Pub.Comp. Reading MA

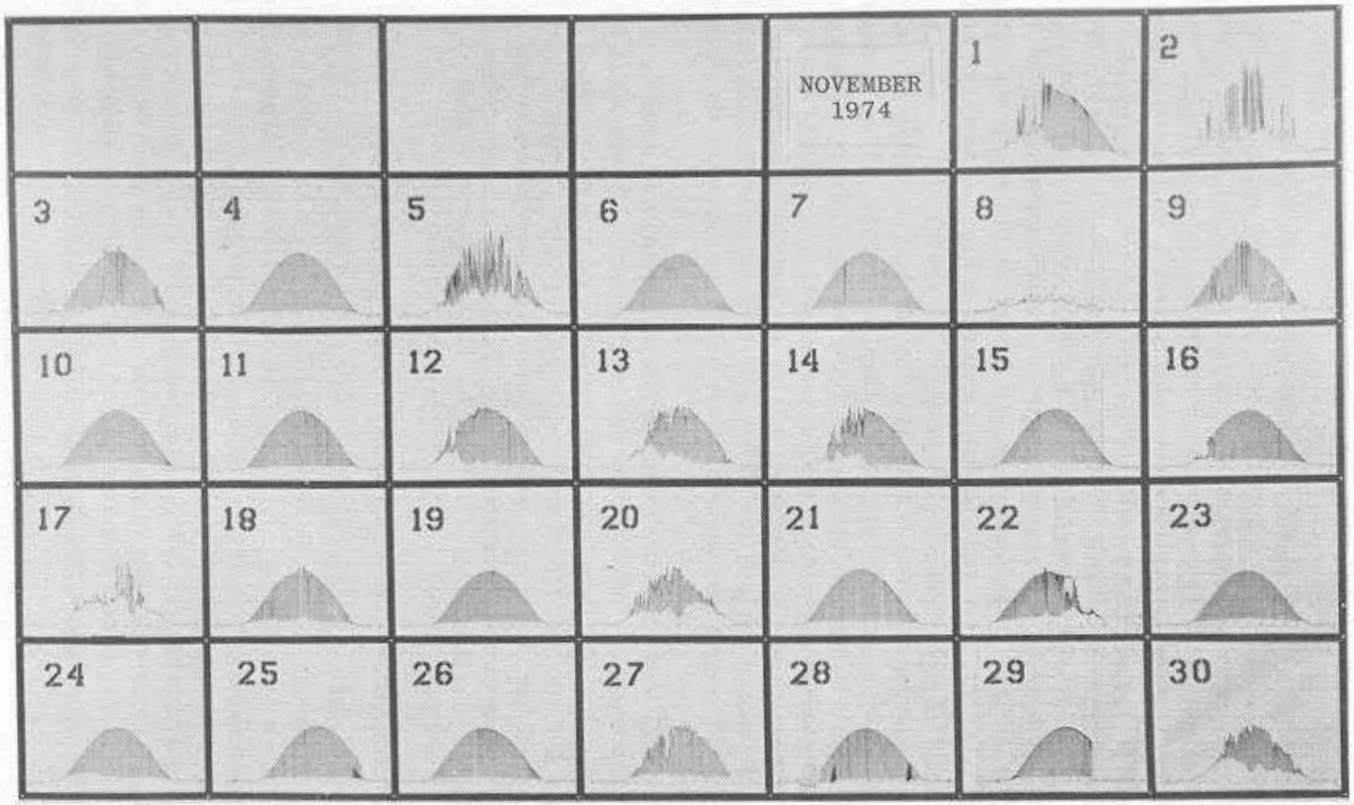


Fig. 2.17 Solar flux data by days for the month of September 1974 for Tucson, Arizona. Recordings were made by McKenney (1974) using a Helio moving shadow-bar pyrheliometer. Note the number of days having considerable total energy but consisting of frequently interrupted direct sun plus enhanced scattered light.

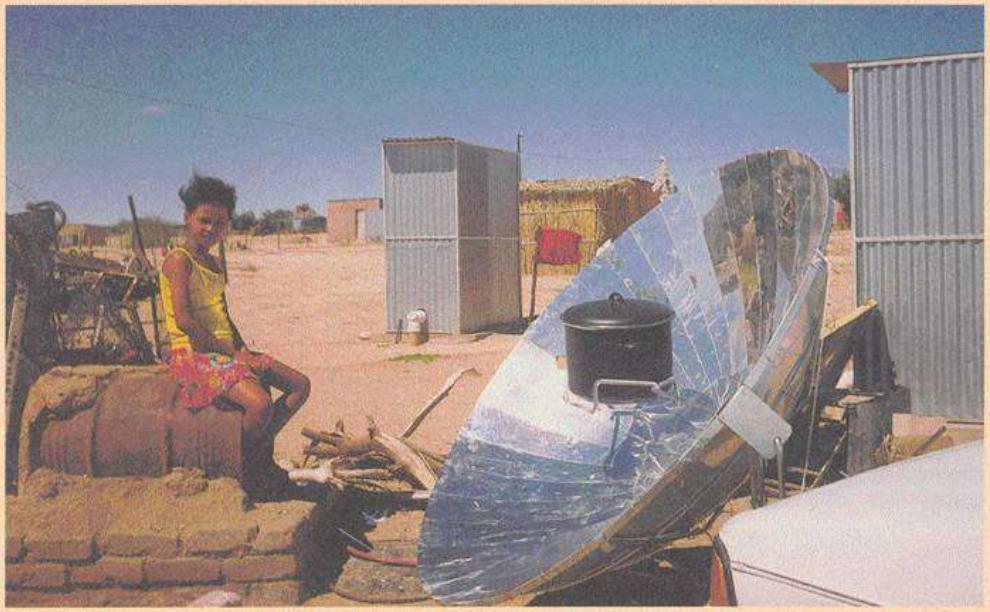
Solar flux data for Tucson/Arizona in September 1974

A.B. Meinel, M.P. Meinel: Applied Solar Energy.
Addison Wesley Pub.Comp. Reading MA

Results of
ECSCR-Test for SK14
Plataforma Solar Almería, 1994

SK14 (SK12)
reflector diameter: 1,4 m

Boils 48 liters of water in a day
reaches 198 °C …



Selected Results of the 1994 ECSCR Comparative Solar Cooker Test and 1998/99 Tests in South Africa

Dimensions (cooking pos.):	143 x 163 x 125 [cm]
Number of pots and nom. volume:	1 removable pot (12 l)
Test pot content:	6 l
Aperture surface:	1.54 m^2 (reflector)
Heating time (water):	
- cold start (40 - 80°C)	*27 minutes/**27 minutes/***30 minutes
- cold start (40 - 96°C)	*44 minutes/**38 minutes/***39 minutes
- hot start (40 – 80°C)	-
- hot start (40 – 96°C)	-
Max. temperature (oil):	*198°C after 130 minutes
Continuous cooking:	*boils 48 l of water in a day
Heat loss with lid open:	*cools from boiling temperature to 83°C in 15 min
Comments:	excellent thermal performance for a concentrator-type cooker; small nominal pot content for this size of aperture; requires regular tracking
Handling:	easy, one-step access to pot; easy tracking, but level ground required; acceptable operation, but difficult to relocate
Application:	cooker for large families and, in modular application, for small institutions; suitable for cooking and roasting
Evaluation for technology transfer/local production:	easily reproducible; reflector material must be protected against corrosion; a folding type of steady stand is under development; transport and assembly require optimization
Contact address:	Dr. D. Seifert, Siedlungsstrasse 12, D-Neuötting, Germany Tel./Fax: +(49)867170413, Email: bdiv.seifert@t-online.de
Legend:	*ECSCR; tested in SA; **European model, *** prototype built in SA

Geography

Sustainability

Fuelwood crisis

Poverty

Desertification

Risks

Chances

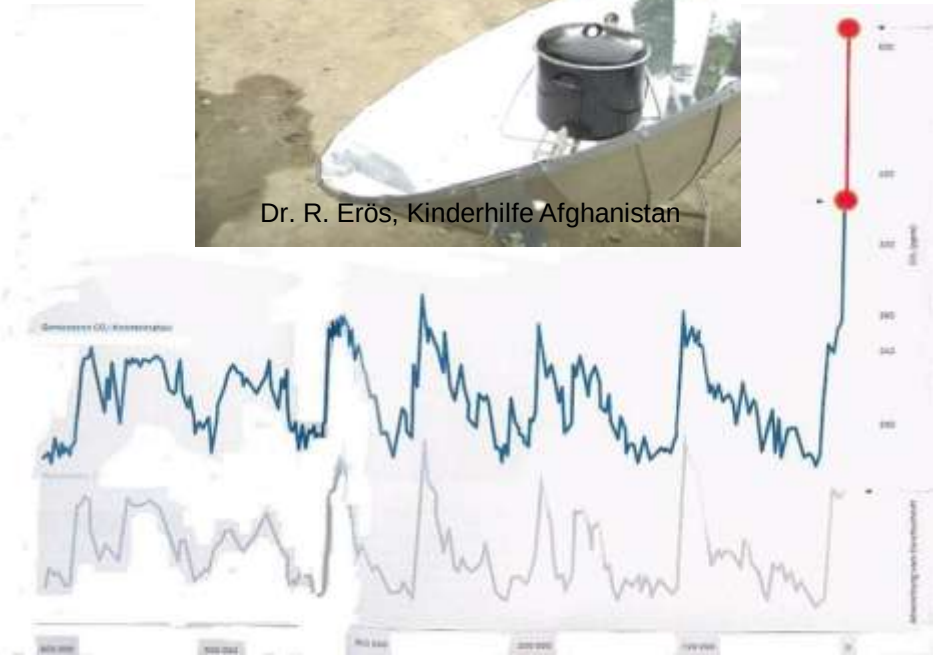
Sama Shrestha, Nepal

Klaus Trifellner, Indonesien

Ethics

- To participate in the fight against the poverty and at the realization the further objectives millennium development of the UN
- Intercultural cooperation
- Environmental protection
- Responsibility for the life conditions of future generations

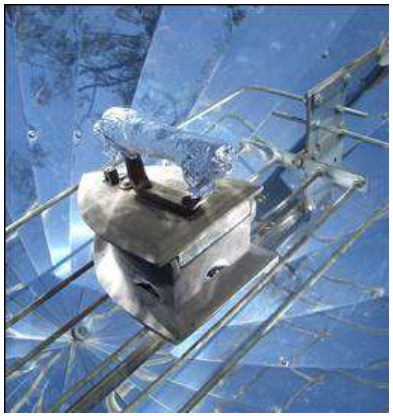

Dr. R. Erös, Kinderhilfe Afghanistan



„If we accept this, it would be unpardonable and deeply immoral."
Al Gore: Un Unconvenient Truth Publ. : Rodale, Emmaus, PA, USA

Health care

- Cooking
- Boiling water
- Sterilizing instruments
- Avoid smoke
- Unburdening women and children



D. Seifert, Indien

Nutrition and housekeeping

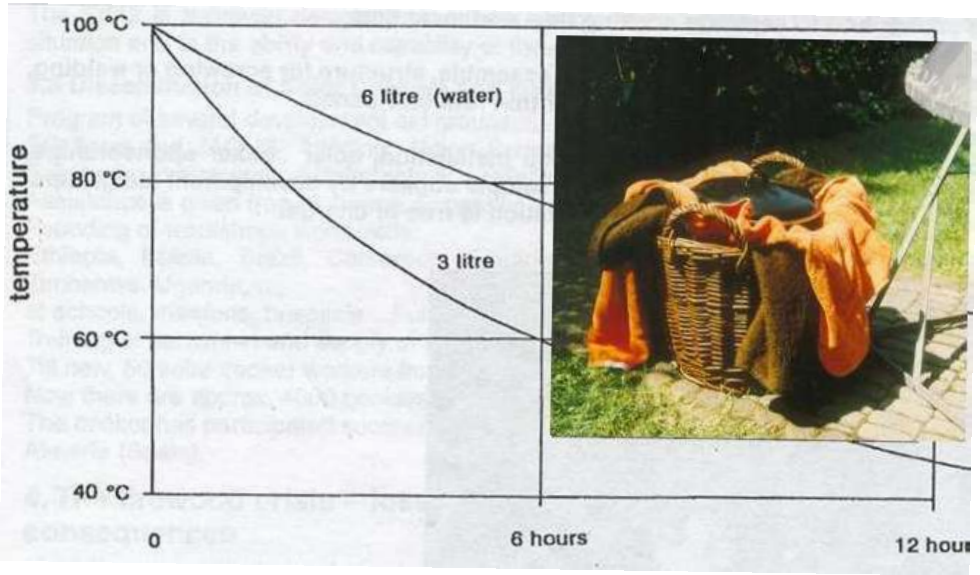
- Solar cooking
- Baking
- Conserving fruits and vegetables
- Produce juices
- Avoiding expenses and creating income

Imma Seifert, Neuötting

Solar cooking

Use of hay basket

Cooking with retained heat



Solar baking

Solar frying

Solar conserving

World wide cooperation for sustainable development
(Goals 7 and 8)

Dr. R. Erös, Kinderhilfe Afghanistan

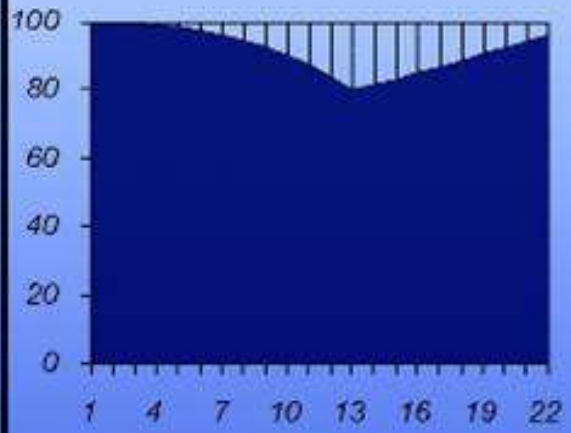
- Training of awareness about the challenges and chances
- International and intercultural cooperation
- The solar cooker as a symbol for hope and peace

Klaus Trifellner, Indonesien

Clean Development Mechanism CDM

(article 12 of Kyoto Protocol)

We can combine climate protection with the observation of the UN Millennium Development Goals



Example of action

- CDM Solar Cooker Project
  Aceh 1 (Klimaschutz e.V. Bonn)
- First Solar Cooker CDM Project registered by UNFCCC
- Financed by
  Alcan Inc. Montreal und
  Alcan Singen GmbH
- 1000 solar cookers for families, institutes and small enterprises

Klaus Trifellner, Indonesien

UN Millennium Development Goals 2000 - 2015

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

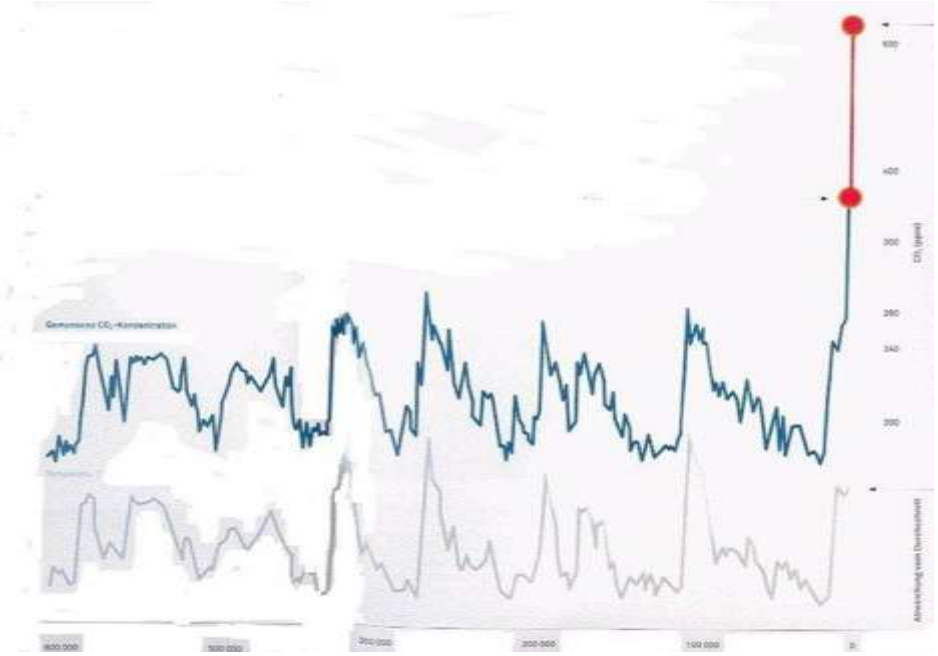
Goals 1 to 3:

Poverty eradication, education, gender, by transfer of solar cooking equipment and know-how:

- Minimising expenses for fuel and generating income
- Avoiding burdens from waterborne diseases and sufferings from smoke in the kitchen Increasing productivity
- Attending school instead of collecting firewood.
- Making school fees affordable
- Alleviating food preparation and food preservation
- Using women's skills for the opportunities of the new technologies

We shape the future of the children.

We are responsable



Getting started

“On the search of the last tree in Lesotho”

(Michael Hönes, Lesotho)

Altiplano Bolivia, Project Solin
José Angel Garrido Vazquez, Madrid

For more information:

www.terra.org

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