Report of the ZASEA SOLAR School Program

2010 - 2012

Zanzibar Solar Energy Association

2010/ 2012

Ramadhan Said Omar – ZASEA Executive Secretary

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1. Zanzibar Solar Energy Association (ZASEA)

The NGO ZASEA was founded by teachers in 2003 and registered officially in 2006. Its head quarter is situated since 2008 in Stone town of Zanzibar/Tanzania.
According to the profile of ZASEA, its mission is to *"develop Zanzibar society to have knowledge about and to provide opportunity of using sustainable solar energy that may allow people to have access to electricity and to fight for poverty."* In practical this means that ZASEA educates the population of Zanzibar through solar technology presentations in villages, schools and to the saving groups. ZASEA work focuses particularly on rural areas without grid power.

2. Aim of the School Program

Since 2007, Village Presentations of Solar Home Systems have been carried out through ZASEA to inform adult village population about function, uses, prices and financing of Solar Technology.
Since January 2010 ZASEA developed and implemented an additional Solar School Program for Zanzibar schools and students. The ZASEA Solar School Program focuses on technical issues as well, encouraging new teaching and learning techniques to the school teachers and students and revising format of school curriculum. The main intention behind the program is to incorporate community members about solar technology and other sources of alternative energy at the earliest possible age.

3. Development of the ZASEA Solar School Program

Before starting the programme ZASEA contacted the Ministry of Education and Vocational Training. They presented the idea of Solar School Program. After discussion, planning and getting permit to start the program in the school environment ZASEA teachers visited schools. They asked the school's headmasters for permission of implementing a Solar School Program. If they agree, a date is set and the ZASEA team organizes the demonstration material and the transport to the village. At the day of the presentation, the team arrives at the school in the morning. A presentation takes about 4 hours.

4. Implementation of the Pilot project

Five Schools have been taken as a pilot school for the program between September 2010 and March 2011: Mwakaje village (22.09.2010), Mahonda (09.11.2010), Kiboje (15.11.2010), Mkwajuni(14.01.2011) and Paje (01.03.2011). Till end of August 2011 ZASEA did eight more School Programmes in Secondary Schools: Unguja Ukuu, Chuwini, Mwakaje, Pete, Pwani Mchangani, Muyuni, Nungwi, Langoni and Michamvi which summarized to a number of 13 School Programmes.

Each lesson the class is big with 30 to 40 students; the students selected were between 16 and 19 years old. This is the level of secondary students of Form III or Form IV. The teachings have been integrated into the regular physics, geography and mathematics lessons as well as the studies of environmental conservation.

The Solar School Program usually is held by five ZASEA members: Ramadhan Said Omar, Executive Secretary of ZASEA – Project Director, Mohammed Salum Ali - technician, Mussa Abdi Khamis, Assistant Headmaster of Haile Selassie Secondary School and Coordinator of the School Program, and two German weltwärts-volunteers of dtp as assistants.

5. Teaching process

After the introduction, the program start with practical studies by installing the "solar home demonstration system" in the school yard, which demonstrates, how a small solar system is installed and how it can be used.
Afterwards the theoretical part starts in the classroom. ZASEA teachers explain:

- the basics about solar energy and how it is related to physics, geography and mathematics lessons, environmental conservation studies as well as how solar systems work;
- the relationship between climate protection and renewable energies and the importance of sustainable energy;
- the advantages and disadvantages of solar energy;
- finally both facilitators and school teachers relates the lesson of the day and school curriculum.

The lesson ends by pupils doing class test, which serves as a feedback to the teaching team. The two top students are given the chance to get further education as a Local Technician. The Program closes by asking the pupils about their opinion and do class exercises to evaluate their understanding. (attachment 1)

6. Solar School Program I in 2011

Since April 2011, some modifications of the School Program have been done. The ideas from the feedback of students and teachers, independent observers of the presentations and the team members have been collected, discussed and implemented.

A new timetable has been set up, which puts the practical part in the middle after the theoretical explanation of the physics of a solar home system and therefore serves as a “break” as well. The choice of topics has been shifted slightly; a stronger focus than before lies on Global Warming and how solar energy or other renewable energy forms can be used in the whole world and in Zanzibar/Tanzania. 8 Solar School Programs took place in 2011.

8. Students for Local Technician Training

Throughout the time of the first school programs 10 young students have been selected to continue the technical training sponsored by dtp. Regarding in gender 4 students are girls and 6 are boys. After the training the young student became ZASEA Local Technician.

9. ZASEA Solar School Program II in 2012

In 2012 the Solar School Program was enlarged: every school can apply to get 40 student lamps (THRIVE Energy, India) for special price of 9000 TSH. 3 lamps are given for free for every school. Also 4 booklets “Renewable Energies” and “Nishati Rafiki”, to make aware for ALL possibilities of using Renewable Energies, written in English and in Kiswahili. 2012 a total of 21 schools are visited in Unguja and Pemba with ZASEA Solar School Program in the villages: Muyuni, Paje, Mwera, Chuini, Pete, Matemwe, Uzini, Mfenesini, Kibele, Nungwi, Mwenge, Chukwani, Chaani, PwaniMchangani, Mkwajuni, Mahonda, Cheju, Mchangani, Kizimkazi, K. Dimbani,
MONITORING of all 21 schools are done by ZASEA and the German volunteers. From August 2012 to December 2012 all school where visited again to repair broken lamps and to collect data about the uses of the lamps with questionnaire.

School Programme with One Child One Light
Done by ZASEA in Zanzibar - 2012

School Programme with One Child One Light
Pemba Island 2012

9.1 Assembling of THRIVE Energy student lamps from India in Zanzibar

To bring technical know how from India to Zanzibar, THRIVE Energy was ready to sell the first 1000 lamp SETS. The assembling was done by five women who are taught by ZASEA project

manager Ramadhan Said Omar and administrated by Dalila Omar, Kikwajuni Zanzibar Solar Shop.

9.2 Booklets “Renewable Energies” (English) and “NIshati Rafiki” (Kiswahili)

New booklets about Climate changes and the overview about the current possible uses of Renewable Energy technologies and also the international laws for climate protection are written by dtp, printed by Oxford University Press and supported Deutsche Bundesstiftung Umwelt (DBU).

10. Conclusion

1272 students and 112 teachers have been connected to the Solar School programs I and II. Solar School Program II: 840 lamps for 21 Schools plus 3 x 21 = 63 lamps free for Science teachers. A total of 903 lamps are distributed during ZASEA Solar School program II.

Every participant of I and II is member of a family of minimum 5 people. This enlarges the number of people who got the knowledge about Climate changes and Solar Energy use also indirectly to 6352 people.

The student lamps are very famous now. Around 10.000 lamps are needed to cover the demand of the schools and the villagers in a first step. They are ready to pay up to 15.000 TSh. per lamp.

11. Costs of the Lamp Production

Pos. 1: 1000 lamp Sets from India including transport	6.300 $	
Pos. 2: Registration, Import taxes and charges, Transport	224 $	
Pos. 3: Assembling and Administration 3 $ per lamp	3.000 $	
Production costs total:	9.524 $	
Production costs for 1 lamp		**= 9,542 $/ lamp**

12. Costs for School Program and Monitoring

1 School Program (Preparation, communication, transports, teaching	312,50 $
1 Monitoring (transports, interviews, repairing)	62,50 $
Total	**365,00 $**

School program for one lamp 365 $ / 43 lamps 8,49 $ / lamp

Total of production + Solar School Program (9,542 +8,49) 18,03 $/lamp

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Income for 40 lamps, paid by students = 225 $ or 5,23 $/lamp

ZASEA Solar School Program: Contribution = 18,03 $ minus 5,23 $ = 12,80 $/Lamp

13. Results of Monitoring of the Solar School Program II

2012 a total of 21 schools are visited in Unguja and Pemba. MONITORING of all 21 schools are done by ZASEA and the German volunteers. From August 2012 to December 2012 all school where visited again to give Service for broken lamps and to collect data about the uses of the lamps. (Questionnaire attachment 2)

Table 1 shows the uses of the lamps in the families of the students.

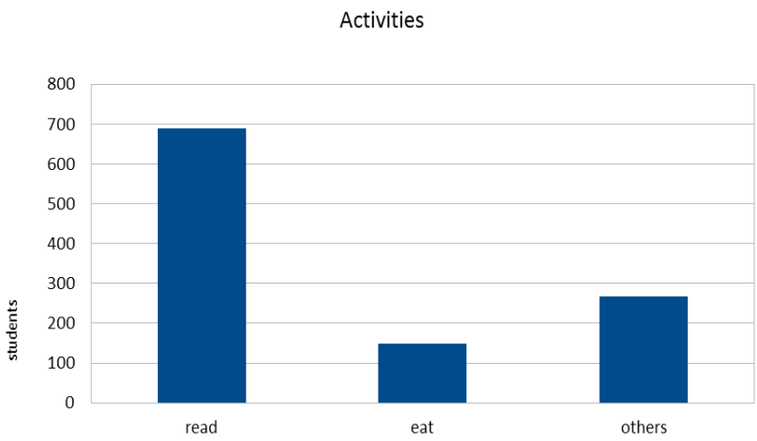


Table 2 shows the results for the “hours of uses” and “number of repairing”

School	Students inter-viewed	Total hours all lamps are used per day	Average usage of one lamp per day (hours)	Lamps that need repairing (spare parts)
Muyuni	37	114,5	3,09	8
Paje	36	78	2,17	10
Mwera	31	70,5	2,27	15
Chuini	16	38,5	2,41	9
Pete	32	100,5	3,14	3
Matemwe	26	46	1,77	12
Uzini	40	88	2,20	14
Mfensini	39	97	2,49	3
Kibele	40	137	3,43	2
Nungwi	40	112,5	2,81	8
Mwenge	38	117,5	3,09	2
Chukwani	40	118,5	2,96	3
Chaani	33	110	3,34	3
PwaniMchangani	40	190	4,75	11
Mkwajuni	36	103,5	2,88	7
Mahonda	39	125,5	3,22	3
Cheju	31	130	4,19	13
Mchangani	37	112,5	3,04	7
Kizimkazi	40	119,75	2,99	1
K.Dimbani	40	131	3,28	5
	711	**2140,75**	**3,01**	**139**

Dependent on the environment are the uses of the lamps. Mostly the lamps are used to replace Kerosine lamps. But also some lamps are used for back up of power breaks if the houses are connected to the grid. The lamps in grid connected houses also replace Kerosine lamps but only for less hours compared to the not grid connected houses. So the average of uses depend on the grid or not grid connection. At least the average is 3.01 hours per day.

School 21 Fundo Island

One School in Fundo Island close to Pemba Island could not be visited for Monitoring because of expensive travelling and long time travelling. Fundo Island is totally without electricity and there is a big need of more School programs – as well as on some other small islands around. Their development can be raised very quick by bringing solar light am mobile charging. The lamps are running as well as the Economical Solar Plant (ESP, 85 Watt SHS given by ZASEA/dtp) for mobile charging. The Local technician pays a leasing fee of 16.000 TSh/month and saving money for spare parts 10.000 TSh/month to ZASEA.

Replacement of Kerosine lamps: The current price for getting light from 1 Kerosine lamp is 200 TSH/day, or 1.400 TSH per week, 5.600 TSH/month and 67.200 TSH/year.
In Euro: 10 Cent/day, 70 Cent/week, 2,80 Euro/month and 33,60 Euro /year.

The special Solar School Program price of 9000 TSH/lamp allows to replace the money in around 7 weeks.

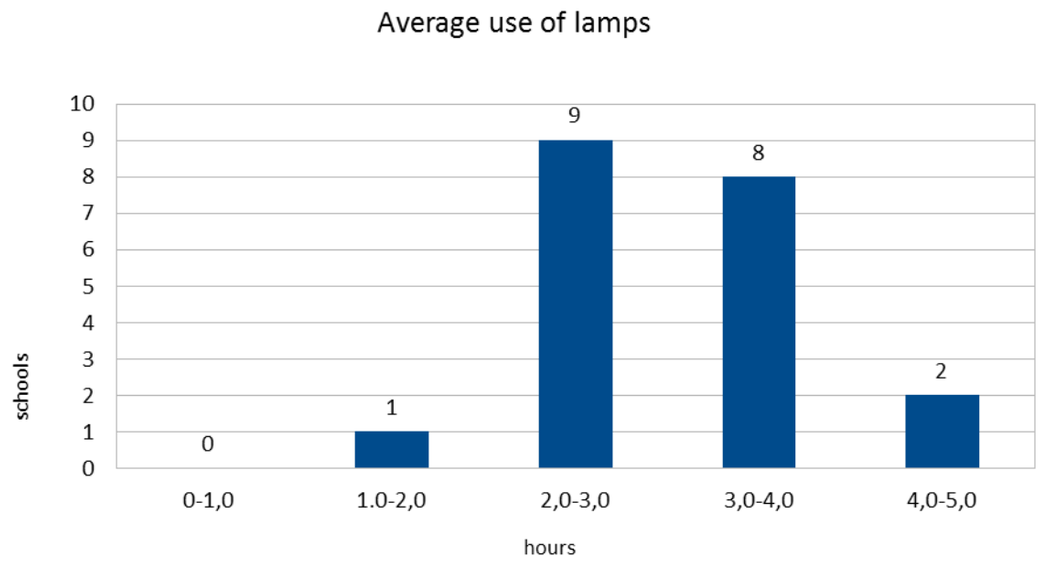
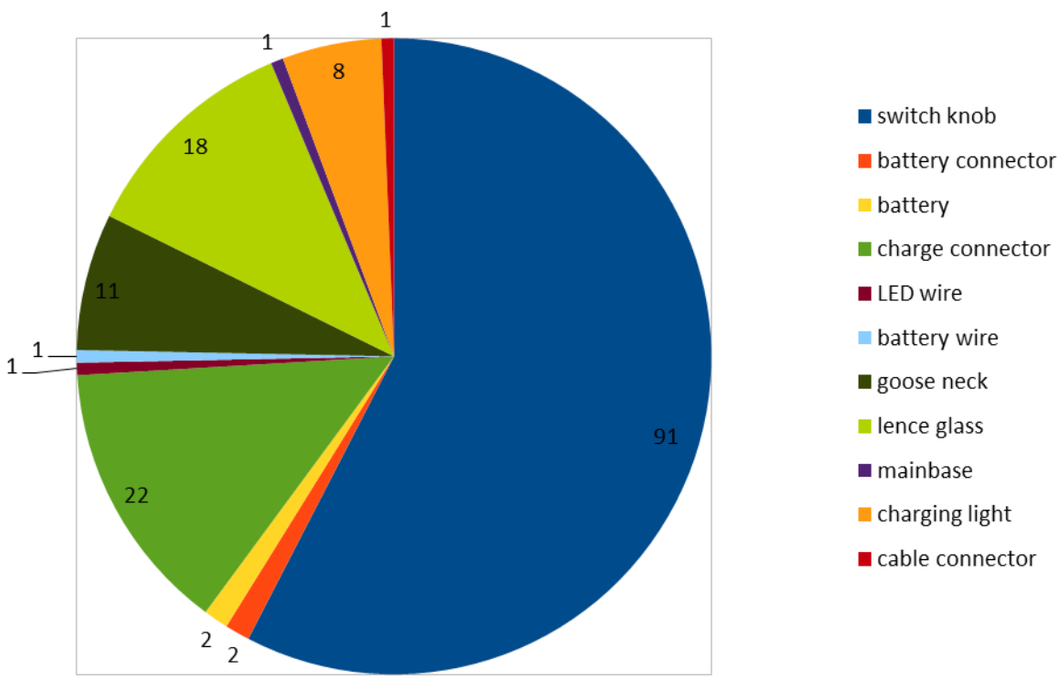


Table 3 shows the result of repairing lamps



Kind of repairing/spare part needed: switch: 91, battery connector: 2, battery: 2, charge connector: 22, LED wire: 1, battery wire:1, spring:11, lence glass:18, main base: 1, LED charging light: 8, cable connector:1 (142 lamps are repaired till 14.1.13).

14. Financial Support of the Solar School Programs I and II

The ZASEA Solar School Program was supported by Deutsch-Tansanische Partnerschaft e.V. (dtp), URBIS Foundation, Norddeutsche Stiftung Umwelt und Entwicklung (NUE) and Deutsche Bundesstiftung Umwelt (DBU) in cooperation with the DTP weltwärts-program „German volunteers for intercultural exchange and climate protection through renewable energies".

15. OUTLOOK

In 2013 the next 1000 Lamp sets from THRIVE Energy arrived in Zanzibar. The women local technician assembled the lamps and the second range of 21 Solar School programs started at 28th of January 2013 in Secundary School of the village Potea.
In the first quarter of 2013 a film about the ZASEA Solar School program will be finished by dtp..

The price of the Sets increased from 5 to 7 $ per lamp, so the new calculation has to be done with 7 $ per lamp. Till now the administration costs are not complete.

Attachment 1

Content of teaching:
Climate protection, theoretical and practical exercises of solar technology

STEP 1: Preparation before project implementation

- Asking project permit from Ministry of Education and vocational training
- Introducing the project to the Ministry of Energy Land Water and Mineral of Zanzibar
- Discussing of general cost of transport – ZASEA board
- School selecting: Group consulters/ presenters
- Introduce the program to all selected school
- Preparation of school list with names and phone numbers of the Head teachers

STEP 2: First school visit
Preparation of the presentation day in school (1 - 2 weeks before)

- Preparation of the letter for the head teacher
- Meeting arrangement between ZASEA team and school staff
- Distributing the letter to the head teacher and discussion with teachers
- Arrangement of the performance in school
- expected time: 240 minutes
- Arranging day, date, time, class and period
- Visiting place for practical lesson
- Inform teachers about the methodology

STEP 3: Preparation of solar school program in the school

- Selecting teaching and learning materials like copies of flyers, leaflets, other references, examination paper
- Selecting ZASEA teachers
- Collecting solar components like solar demonstration kit, panels in different sizes, charge controller, battery, solar light board demonstration
- Arranging the transport
- Last follow up preparation

STEP 4: Second school visit – Solar School Program

- Going to the school at the planned date
- Practical studies at solar installation, outside of the class
- Theoretical studies how a Solar System is functioning, in the class room
- Teaching of Global warming
- Teaching Greenhouse gases
- Discussion with students
- Exercises for relaxing in the class room
- Teaching ONE CHILD ONE LIGHT: uses and misuses of the student lamps
- Every student gets a box with one student lamp and 3 lamps are given to the headmaster as a gift for Science teachers
- Short oral or written TEST
- Presentation of the booklets “Renewable Energies” and “Nishati Rafiki”
- 4 booklets and a CERTIFICATE about the participation of the school in the ZASEA Solar School Program are given to the headmaster

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Attachment 2

School: _____School Program
Date_____

	Name: Lamp Nr.:		Users				Activities			Other lamps		Dry place for the lamp?		Panel c
DATE	charge hours/day	light hours/night	1	2	3	more	read	eat	others	kero-sine	Others	yes	no	1 x per week