

# REPORT ON SMALL-SCALE ENERGY CONSERVATION PROJECTS IN TAJIKISTAN



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This information report describes small-scale energy conservation projects implemented in 2006-2008 by the environmental organization "The little Earth" with support from the Norwegian Society for the Conservation of Nature.

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# GENERAL INFORMATION REPORT

## on small-scale energy conservation projects

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## GENERAL INTRODUCTION

The problem of providing the population in remote mountain villages of Tajikistan with energy sources for heating, cooking and lighting became one of the most urgent ones from the time of gaining the independence. The collapse of a centralized system for delivery of fuel and lubricants was the main reason of increased pressure on scanty natural resources of mountainous regions. Lack of access to such services as power supply affects vital activities of local communities and reduces their ability and capacity for further development.

The heavy shortage of energy sources in mountain villages deprives the population of the most basic means of subsistence and community development.

Moreover, the use of oil and paraffin lamps and candles for lighting negatively affects the village residents' health and also becomes a major factor of poverty aggravation: the families spend significant resources on such lighting devices and fuels for them. Therefore availability of lighting will have a positive effect on improving comfort and health, children's performance at school, small business development and activization of the communities in general.

All too often, there is no electricity supply and access to communications (no telephones) in remote mountain villages. Access routes (usually dirt roads) are often blocked and transportation is extremely difficult in winter period. Village residents use firewood, shrubbery, dry dung and other biomass for heating the houses and cooking. Of late, an increasing degradation of rare forest resources has been noticed around many mountain settlements as a result of repetitive cutting of trees.

This was why the environmental organization the Little Earth with support from the Norwegian Society for the Conservation of Nature launched implementation of small-scale energy conservation projects. In 2006-2007, two schools were winterized in mountain areas of the republic. Over these years we introduced and constructed 2 solar greenhouses using passive solar heat which are well suited for mountain territories. In early 2008, the Little Earth started developing the project on energy effective stoves and use of briquettes with involvement of experts from Nepal.

Within the frame of its projects the Little Earth actively cooperates with experts in the sphere of renewable energy sources and organization working in the field of energy conservation (GTZ, CAMP etc).

These projects became an excellent instrument for improving efficiency of work done by the Little Earth in the sphere of environmental protection, specifically, through assistance in mobilization of local communities and introduction of new, resource saving technologies. While ensuring environmental sustainability the Little Earth also strives to promote community development in general. After all, introduction of alternative, self-contained energy sources and energy conservation are directly interlinked with the issues of poverty reduction and improvement of social conditions.

## WINTERIZATION OF SCHOOLS – INTRODUCTION

In Tajikistan, because of low temperature in classrooms many children have to wear overcoats even during classes in wintertime which unfortunately has become quite common. The problem of heating schools during the cold period is among the most urgent ones. The most difficult situation exists in schools of remote mountain villages. Electricity supply in such areas is severely limited during the winter period to 3-4 hours per day and some villages are not connected at all to the centralized electricity distribution network. This makes many schools to use firewood, coal and dry dung for heating in wintertime. This, in turn, leads to deforestation and reduction of forest coverage, soil degradation and child diseases caused by smoke-filled classrooms.

The environmental organization Little Earth working with support and assistance from the Norwegian Society for the Conservation of Nature under the SPARE Project (School Project for Application of Energy and Resources) has identified the areas of highest concern with regard to energy conservation at schools.

It was decided that a demonstration school winterization project must be carried out to set an illustrative example of how energy can be conserved and comfort raised at the same time.

During the cold season, we have to use heating on a continuous basis to maintain proper temperature and comfort. In mountain villages, schools are usually heated by using energy from burning coal and firewood. This results in depletion of natural resources and atmospheric pollution. Moreover, if the winter is cold the heating season has to be extended (normally from late October up to late March or early April). Some schools have to close down temporarily to wait out the lowest winter temperatures.

School buildings lose vast amounts of energy due to a number of reasons. This is largely associated with the structure of school buildings and materials used to construct them. There are many schools in the republic constructed based on a standard design of bricks or concrete slabs back in the Soviet time. In the past, all schools in cities and larger towns were connected to a centralized heating supply network. For schools in remote mountain villages there used to exist a centralized system of supply with fuel materials. This system worked more or less fine for several decades. In the situation when energy sources and heating were in constant supply the issue of winterization of school buildings was not regarded as an urgent one.

Now that the centralized system has collapsed we are facing all the consequences of its irrationality: the problem of heat conservation and shortage of energy sources has emerged to prominence. Nevertheless, even now local authorities and school administrations do not pay sufficient attention to energy efficiency whereas new buildings are constructed without due regard for energy conservation possibilities. It is no wonder that most energy in schools during the cold period is used for heating.

The most common reasons of heat losses in classrooms are as follows: poorly insulated windows and doors, outer walls (particularly in buildings made of precast panels), ceilings of the upper storey and floors of the ground storey. In many schools single window frames, cracked and broken panes or complete lack of glass in some rooms represent a major problem. On the other hand, slits in windows, doors and junction areas of the building structure are another significant source of heat losses. All of this results in the fact that schools use up much more energy than they really need. Losses of heat in schools of the republic exceed the standards by several times.

When heat leakages from a building are high to maintain comfort temperature one has to spend a lot of energy. This is why it is essential to reduce energy losses as much as possible. In this case we can save energy without sacrificing the comfort.

In 2006, the environmental organization Little Earth with support from the Norwegian Society for the Conservation of Nature launched implementation of a demonstration project for winterization of school # 15 in Pishambe village of Varzob district. In 2007, it carried out heat insulation of school #95 in the village of Labijai in Karatag district. In 2007-2008 we carried out the project for replacement of windows in school #22 of Nosiri Khusrav district and also installed solar panels in the Labijai school. Besides, in conjunction with the NGO Azal we implemented partial winterization of the school in Shulmak village and, surveyed 5 more schools with the view of their winterization upon request of the UN Children's Fund in Tajikistan in July-August.

## WINTERIZATION OF THE SCHOOL IN PISHANBE VILLAGE

In 2006, with support from the Norwegian Society for the Conservation of Nature, our NGO selected a pilot facility (school) for winterization. The school #15 in the village of Pishambe was constructed in 2005 of adobe bricks. The school building represents a one-storey structure the southern half whereof sits on a low basement. The total area of the building foundation constitutes 156 square meters. The small school building completely lacked heat insulation whatsoever and had single-pane windows with a lot of slits. About 100 schoolchildren (in grades from 1 to 8) attend that school.

During the cold season, the school uses organic fuel such as firewood, coal and sometimes dry dung, for heating. On the average, the heating season in the school lasts for 4-5 months a year (November, December, January, February and March)



according to the school administration. The average temperature in classrooms during the winter period ranges from 9 to 11 degrees Centigrade when the heating is on.

The school # 15 was selected for implementation of the project due to a

number of reasons. Construction of the school had not been completed which made it possible to avoid additional expenses for alteration of structures for subsequent installation of heat-insulation materials. The school is a small one which is also rather convenient for implementation of a small-scale demonstration project. Moreover, in the same village where the school is situated, CARE International carried out activities under its project for climate change adaptation. Administration of Dehmalik jamoat also officially implement winterization of the

requested "For Earth" to school.



### Implemented activities

Prior to starting heat insulation of the school per se, "For Earth" conducted several meetings with the school headmaster and chairman of the jamoat. Based on the reached understanding an agreement on implementation of the project was made with the local authorities and the school administration. The agreement stipulates that "For Earth" provides the necessary materials for heat insulation of the building (including installation of windows) and the local authorities and the school administration should make available workers for implementation of the heat insulation and monitor propriety of work.



"For Earth" also conducted consultations with an expert from the "Dushanbegiprogor" project-design institute.

The expert prepared drawings for possible heat insulation in accordance with the existing standards (copies of the drawings are attached to this report). All drawings were submitted to the school administration.

#### REPLACEMENT OF WINDOWS

All single-pane windows in the school were replaced with new sealed double-glazed units. Thus the total of 9 windows sized 1.5 x 1.5 meters were replaced by sealed double-glazed units with plastic frames.\*

#### HEAT INSULATION OF THE FLOOR

The school building had an earthen floor which was to be covered with planks. To make the floor cold-proof the rammed down ground of the foundation was covered with para-insulation foil which was then overlaid by one layer of glass-wool (5cm.). Thereafter about 30 cm above the insulant the wooden floor covering was laid.



#### HEAT INSULATION OF CEILING

Heat insulation of the ceiling was implemented using polyethylene film and glass-wool. The polyethylene film was stretched between ceiling joists and fixed by wood strips. Glass-wool was carefully placed over the polyethylene film in two layers (the total thickness of the two layers constituted 10 cm.). After the glass-wool was laid down between the joists it

was fixed in place by plywood nailed above it. Thereafter wooden planks were placed again over the plywood.

### **Additional recommendations**

A part of the school building's northern wall used to get wet because the edge of the roof did not protrude far enough from the wall. The school roof also lacked a drainage. As a result, rain and melt water caused wetting of a large portion of the wall and foundation on the northern side of the building.

The school administration was given the recommendation to install a trough to capture the rain and melt water and to hydro insulate the foundation in the northern part of the building using rubberoid left over after the initial insulation of the ceiling by fixing it along the foundation (so that some part of it is buried in the ground up to a certain depth) and also to install a special device to collect and withdraw water. This would help prevent wetting of the foundation from melting snow and intensive rains.

### **Results**

Once all these measures were implemented the temperature in the school in wintertime was raised by 5-8 degrees. Temperature readings taken in late December 2006 and January 2007 showed that temperature in the winterized classrooms constituted 18-20 degrees with the outside temperature being around 4-5 degrees. A more comfort temperature will facilitate improvement of the education process and academic progress of the school children. The replacement of windows with sealed double-glazed units, heat insulation of floors and ceilings resulted in reduced consumption of coal and firewood. According to the school teachers and their headmaster, they have been using much less coal and firewood ever since the school was winterized and the temperature in classrooms has risen considerably.

The heat insulation and installation of economical energy saving stoves has led to reduced pollution inside the classrooms and, consequently, decreased the risk of diseases children used to develop from the smoke generated by stoves heating the classrooms. The reduced use of firewood has, in turn, reduced the pressure on the scanty forest trees cut down by local population.

Apart from winterization of the school building itself the school administration was handed over information materials developed by "For Earth" under the school project for use of resources and energy. The school also received a set of training materials on climate change in the Tajik language (including 5 color posters on climate change, a booklet and a CD with an educational video film). These materials can be used to conduct classes.

## **WINTERIZATION OF THE SCHOOL IN LABIJAI VILLAGE**

The secondary school of general education #95 in the Western part of mountain village of Labijai in Karatag gorge (100 km from the city of Dushanbe) was selected after several fact-finding trips to the area (including a trip of the former employee of the Norwegian Society for the Conservation of Nature, Mr. Claes Buk) and meetings with local authorities and administration of the local forestry department.

The school was constructed in 2000. The school building is a one-storey structure, rectangular in plan view which consists of two classrooms and a staff-room. Walls are 40 cm thick made of adobe bricks and quarry stone. The total area of the building in plan is 54 m<sup>2</sup>. Floors are wooden made of edged tongue-and-groove boards. The deck is wooden. Ceilings are made of wood-fiber board.

The school does not have funds for reconstruction and purchasing of additional fuel. The school used to spend about 15 cubic meters of firewood during the heating season. There were droughts in the



classrooms; window frames had slits and window panes were broken in several places. Besides, there was no water drain (trough) to evacuate water from the roof. In the absence of a socle the back wall of the school building would get wet up to 1.5 from the ground..

The school and the entire Labijai village is not connected to the centralized power supply network.

As of the end of 2007, the school had 36 primary school children in grades 1 through 4. It is envisaged that in the future the school will have school children of grades 1 through 9. The school works in two shifts. There are five teachers on the staff.

### Implemented activities

Prior to starting heat insulation of the school per se, "For Earth" conducted several meetings with the school headmaster and chairman of the jamoat. In July, 2007, based on the reached understanding an agreement on implementation of the project was made with the local authorities and the school administration. The agreement stipulated that "For Earth" was to provide the necessary materials for heat insulation of the building (installation of windows and doors) and the local authorities and the school administration were to make available workers to implement hydroinsulation, drainage, removal of water from the roof and to monitor propriety of work.

### REPLACEMENT OF WINDOWS

Based on results of assessment of the building it was decided to replace single-pane windows with double glazed ones. In August 2007, three school windows sized 1.17 x 0.75 m were replaced by double-glazed ones with wooden frames. All windows were also insulated using silicon sealer.

### REPLACEMENT AND WINTERIZATION OF DOORS.

All three doors in the school building were winterized using heat insulating padding. One of the doors was completely replaced with a new one and then winterized. Door openings were also winterized using silicon tube for improved heat insulation and prevention of droughts.

### DRAIN INSTALLATION.

A drain system was installed on the roof of the school building. Melt and rain water is now collected in troughs and evacuated through storm water pipes mounted on corners of the building. This helped to avoid wetting of walls and foundation of the building which affected the temperature inside the classrooms.

### HYDROINSULATION OF THE BACK WALL.

Since the back wall of the school kept getting wet on account of melting





snow and rain water it was decided to waterproof it. Waterproofing was done by affixing rubberoid to the wall from 1.5 meters high down using asphalt mastic. That done, a drainage system was constructed.

### SOLAR PANELS FOR LIGHTING

In wintertime and in cloudy weather it becomes dark in the classrooms on account of a rather small area of window openings. This often happens in the afternoon during the second shift. On such days they use paraffin lamps in school which results in additional emission of soot, carbon monoxide and unpleasant smell of paraffin oil.

With this in mind, "For Earth" together with a representative of the Norwegian Society for the Conservation of Nature decided to provide the school with electric energy by installing solar panels and equipment for transforming the low voltage direct current (12v) into alternating 220

volt current and to equip the classrooms with daylight lamps with the total capacity of 100 watts. This equipment is used for lighting of the classrooms and for running of one desktop computer with an LCD monitor for 5-6 hours. "For Earth" made an appropriate contract for delivery and tuning of the equipment with a specialized company. Installation of the equipment had to be performed by May 10, 2008.

### Results of the intervention

After the above activities were implemented, the temperature inside the school rose on the average by 7 degrees in wintertime. Temperature readings taken in late December 2006 and January 2008 showed that temperature in the winterized classrooms constituted 18-20 degrees with the outside temperature being around 4-5 degrees.



A more comfort temperature resulted in improvement of the education process and academic progress of the school children. This is evidenced by interviews with the school teachers. According to the school teachers and their headmaster, they have been using much less firewood ever since the school was winterized and the temperature in classrooms has risen considerably. The heat insulation has led to reduced pollution inside the classrooms and, consequently, decreased the risk of diseases children used to develop from the smoke generated by stoves heating the classrooms. The teachers also pointed out that schoolchildren went down with cold-related diseases less often this winter. The heat insulation of the school also helped reduce consumption of firewood. At present we are trying to obtain more accurate data on the amount of saved fuel.

### INSTALLATION OF SOLAR PANELS

Dark classrooms represented another problem teachers and school children used to face. Small windows could not let sufficient amount of daylight into the classrooms and in cloudy days it became outright dark inside the building. The village has neither access to the centralized power distribution network nor its own independent sources of electric power. This was why it was impossible to address the problem in a traditional way.

In May 2008, a system of lighting was installed in school # 95 which works using solar energy. Solar photo panels with the capacity of 100 watts were installed on the roof of the school.

The energy generated by them is accumulated in two batteries and then is used to provide lighting in the two classrooms and staff-room. Luminescent lamps, each with the capacity of 36 watts, were installed in all rooms.

The accumulated energy is sufficient to use lighting for 10 hours if there is no sunlight. A wall outlet was also installed in the staff-room which can be used to operate low-power equipment.

The batteries and lamps installed in the school are available at local markets and can be replaced in case of necessity. The solar panels have a long life-cycle and can ensure failure-free operation for several decades. To facilitate operation of equipment and the system a short user guide was prepared for the school administration in the Russian and Tajik languages.

## WINTERIZATION OF THE SCHOOL IN KHAIDAROBOD VILLAGE

The project for winterization of windows in the building of the primary school #22 of Khaidarobod village, Komsomol jamoat, Nosiri Khusrav district, which was constructed two years ago and put into operation with a lot of defects, was developed based on results of a fact-finding visit to the school and request of the former school headmaster.



In wintertime the school is heated by steel stoves. They use firewood and guzapoya (dried cotton stems) for fuel. The temperature in the classrooms in wintertime would fall down to +7°C because of draughts. School children would sit in classrooms without taking off their outdoor clothes. The school does not have funds to buy window panes and additional fuel to heat classrooms.



### Implemented activities

The Little Earth staff visited and examined the school on 15 March 2007 and once more on 25 January 2008 to carry out temperature monitoring and conduct negotiations with the school administration and local self-governance bodies. Having reviewed the our findings we decided to completely replace eight single-pane windows with new double-glazed ones on the northern side of the building where the lowest temperatures were observed. The single-pane window frames dismantled from the northern side were to be installed as additional frames on the southern side. As a

result all windows in the school would become double-glazed and all doors would be repaired and trimmed by an experienced carpenter.

On 27 December 2007, based on discussions and meetings with representatives of local authorities and the school headmaster a tripartite agreement was made stipulating that the jamoat would allocate experienced workers, cover the costs of finishing materials and construction works to be implemented. The Little Earth was to provide 8 double-glazed windows, window panes, silicone sealant, 250 running meters of glazing molding and silicone sealing tubes.

By late February the prefabricated windows were delivered to the school administration. The local authorities had promised to provide workers for installation of the prefabricated windows and complete the work before mid-March. However, since the jamoat failed to provide funding (workers' wages) installation of the windows was postponed until May 2008. In May the new windows were installed on the northern side of the school. The window frames removed from the northern side were installed on the southern side making windows there also double-glazed.



**Expected results:** After the window installation the temperature in the classrooms would rise up to +16+18 °C which will create more comfort conditions for classes in winter period, particularly in the northern part of the school. If the school administration fulfills its obligations and installs the dismantled single-pane frames on the southern side in addition to the existing ones this will result in rising of temperature in the southern part of the building. Possibly this will also help reduce consumption of fuel for heating. Participation in this project will improve practical knowledge of energy conservation: lessons under the SPARE project are also conducted in this school.

## WINTERIZATION OF THE SCHOOL IN NISUR



In the course of their visit to the village of Nisur (GBAO) in June 2007 the Little Earth staff prepared an energy passport of the school and conducted a preliminary examination of the old school building. Based on the assessment results several options of the school winterization were submitted to the Norwegian Society for the Conservation of Nature and the school administration. On account of an extensive scope of work (associated with the need to install the roof) and transportation costs for delivery of construction materials the required amount exceeded by three times the funds available in the project

budget. This was why the decision on heat insulation of the school was suspended.

In early 2008, upon request of the school administration, the Khukumat of Rushan district allocated funds for construction of a new school building with six classrooms. The school administration and Savnob jamoat requested the Little Earth to provide assistance in winterization of the new school. Several working meetings were conducted with stakeholders in the village of Nisur and with the foreman of the construction company that constructed the new school in the village. As a result of negotiations a tripartite agreement was made (between the local authorities, construction company

and the Little Earth) for heat insulation of the new school building in Nisur village. According to the reached agreement, the limited liability company "Sharq" (the construction company responsible for construction of the school) was selected as the general contractor for winterization of the school.

Since the new school had plastic sealed double glazed units installed it was agreed that additional funds would be allocated for winterization of the ceiling. The ceiling had to be winterized with mineral wool.

Initially it was planned to complete all winterization activities by the end of 2008. However, on account contingencies (raising of water level in Bartang river in late September, heavy snowfall in November and December, the road to the village of Nisur was blocked for motor vehicles. For this reason, Sharq Ltd wrote a letter to the Little Earth requesting it to postpone all the winterization work until the end of March 2009.

## WINTERIZATION OF THE SCHOOL IN SHULMAK VILLAGE

In late 2007, the non-governmental organization "Azal" under its project "Strengthening of local development bodies and sustainable management of natural resources" supported by the European Union issued a bidding for winterization of an annex to school #7 in Shulmak village of Rasht district. It was the first school winterization project for the NGO Azal in that region. Based on the bidding results the contract for winterization of a part of the school building and conducting a workshop on energy conservation was signed with the non-governmental environmental organization "The Little Earth".



The secondary school of general education #7 is situated 20 km to the north-west of Garm town in the village of Shulmak. The village is located 205 km from the city of Dushanbe.

The annex to school #7 of Shulmak village consists of six classrooms. According to the school administration it was constructed in 1997 using the "hashar" method (joining together effort of the community to construct houses, bridges, fences, channels, etc). The total number of children enrolled in the school is 412. Classes are conducted in two shifts. The school facade faces 45° to the north-west matching the direction of the prevailing winds in the gorge. Iron and cast-iron stoves are the only source of heat in the building. Fuel used: firewood and coal. Annual consumption of fuel: 7 tons of coal and 15 m<sup>3</sup> of firewood. The heating season lasts for 6 months: starting in November and ending in April.

Average outside temperature in winter: - 15-20°C.

Temperature in school during the heating season: +10-15°C.

In October 2007, the Little Earth experts visited the secondary school of general education #7 in Shulmak village and met with its administration and teachers. They explained in detail the significance of winterization of the school annex and elaborated on the fact that energy conservation measures would help improve comfort in classrooms and minimize the amount of smoke inside the building.

A technical and economic passport of the school was drawn, temperature was taken in the classrooms, drawings were made reflecting



geometrical dimensions of the annex to the school building with the view of defining the scope of future work.

Based on the preliminary assessment results three variants of proposal for winterization of the building were produced along with a detailed cost estimate. All the documents were submitted for review by the NGO Azal management.

### **Implemented activities**

The variant for school winterization proposed by experts of the Little Earth environmental organization and accepted by the NGO Azal contained the following measures for heat insulation of the annex to school #7:

- carry out winterization of ceilings in three classrooms of the annex (in its northern portion);
- install additional window panes in the existing frames to make them double-glazed. Make the outer windows hinged to allow for ventilation;
- seal off the window panes using liquid seal and glazing molding and insulate window frames using silicone tubes;
- open up ceilings and floors in the classrooms, assemble blocks of mineral wool, carry out hydroinsulation using rubberoid, mount back again the ceilings and floors;
- repair and adjust door panels, air seal them using silicone tubes.

All the works were carried out in accordance with the plan. Upon completion of the works for winterization of three classrooms cosmetic repairs of the premises were carried out. The areas where plaster had fallen off were repaired using alabaster, ceilings, floors, windows and doors were painted. The quality of finishing work depends on qualification/ training of the workers.

### **Expected outcome**

Once all these measures were implemented the temperature in the school in wintertime should increase by 5-8 degrees. A more comfort temperature will facilitate improvement of the education process and academic progress of the school children. The risk of contracting respiratory and cold-related diseases will be reduced. It is expected that representatives of the NGO Azal local office will carry out temperature monitoring in the school building throughout the 2008-2009 winter season. The obtained data will be processed and used for further dissemination of information about importance of heat insulation of buildings.

## **SURVEY FOR UNICEF**

The interest in energy conservation on the part of the UNICEF made it possible to launch discussions on possible heat insulation of some schools that the UNICEF is working with in the sphere of sanitation, hygiene and improvement of education process. As a result of talks with the UNICEF representative in Tajikistan an agreement was signed between the environmental organization Little Earth and the UNICEF office in Tajikistan on carrying out a short-term survey of five pilot schools (selected by the UNICEF office) with the view of their possible heat insulation.

Once the agreement was signed the Little Earth entered into a contract with a specialist having relevant education and working experience in the sphere of construction and building design. The school survey started in July 2008.



Within one week ending on July 22 the Little Earth specialists surveyed the following schools of

general education: school #55 of Nishoni Lenin neighborhood in Sorok Let Tajikistana jamoat; school #69 of Chavliboi neighborhood in Ispechak jamoat of Rudaki district, school # 43 (Bohtar district), school # 43 of Zargar neighborhood in Stakhanov village and school #20 in Khavaskor neighborhood of Tojikobod jamoat.

Our experts prepared technical and energy passports for each of the facilities, collected data on the heating system, temperature conditions, number of students, window dimensions, materials used in construction, etc. Based on the obtained information, survey results and data collected a detailed report was prepared which was then submitted to the UNICEF.

In each of the schools our experts met with representatives of school administrations. Interviews and discussions were held with the school headmasters and classrooms where heat insulation measures can potentially be applied were jointly selected. The school administrations provided the experts with the required verbal information and gave suggestions of their own regarding improvement of the situation. We received letters from each of the schools requesting assistance.

Representatives of school administrations in each of the facilities received handouts covering issues pertaining to energy conservation and renewable energy sources. Specifically, the schools received several issues of the bulletin "Green energy and we", booklets describing work done by the Little Earth within the framework of small-scale projects on energy conservation in mountain areas of Tajikistan and SPARE program.

Having analyzed the obtained data and survey results our specialists prepared heat insulation options and relevant recommendations for each of the schools. A tentative cost estimate was also prepared for each school. Based on the submitted recommendations regarding winterization and budget options the UNICEF office in Tajikistan can select the most suitable option for winterization of entire schools or individual classrooms.

## ASSESSMENT OF AND VISITS TO OTHER SCHOOLS

In July 2007, the Little Earth staff and a representative of the Norwegian Society for the Conservation of Nature jointly visited several mountain villages in different areas of Tajikistan. Two schools of general education in the village of Namozgoh (Zideh jamoat) and in Nisur village in Bartang valley (GBO) were examined in the course of the trip.

As a result of this fact-finding visit, meetings with local authorities and examination of the school in Namozgoh village it was discovered that the school building was in state of failure and needed capital repairs with reconstruction of the northern wall and replacement of the roof. However, the administration did not plan to allocate any funds for repairs in the near future. Having weighed all these factors as well as the existing risk and based on analysis of obtained data and discussions it was decided to forego the project for winterization of that school.

On July 4-7 a team of the Little Earth staff and a representative of the Norwegian Society for the Conservation of Nature visited Nisur village of Savnob jamoat in Rushan district of GBAO. Meetings and discussions were held there with local authorities, the school headmaster and a local NGO representative. The building of the old school of general education #31 was examined. Using the findings obtained during the trip and based on results of the school examination the Little Earth experts came up with 3 options of winterization of the school in August 2007. However due to the fact that construction of a new school was started in the village by that time it was decided to discuss further involvement in winterization of the school only upon review of design specifications of the new school.

## **GENERAL COMMENTS ON WINTERIZATION OF SCHOOLS**

In general we can point out that these projects were interesting due to a number of reasons. Heat insulation of schools is implemented but rarely by local organizations. The projects facilitated capacity building and gaining of experience by the Little Earth staff in the field of practical application of energy conservation techniques. The projects also supplied illustrative evidence of the existing enormous potential for implementation of such initiatives and the need to pay more attention to energy efficiency of both new and already constructed buildings (particularly public ones).

### **Energy efficiency issues must be considered in advance**

Such projects for heat insulation of school buildings must be integrated in the work of donor organizations funding projects for construction and rehabilitation of school buildings in Tajikistan. Such projects are rather costly and cannot be implemented at the local level relying solely on resources of local authorities (on account of lack of proper financing and energy saving projects per se). This will increase donor expenses by 5-20% (depending on the scale of the heat insulation work and used materials).

Government agencies responsible for planning, construction and architectural supervision must monitor compliance with the existing Construction codes and regulations with regard to heat engineering ("structural heat engineering"). It is important to note that such heat insulation measures must be planned in advance. It is much easier to carry out heat insulation and apply other energy conservation techniques at the stage of planning and outset of construction. The issues of energy conservation and efficient energy utilization must be mainstreamed in activities of both international organizations operating in Tajikistan and respective government agencies.

### **Awareness building and involvement of local communities**

Building awareness of local population about relevance of the project and the need for its implementation must be an important part of activities. The Little Earth would always maintain direct contacts with the school administration and local authorities. Besides, information on heat insulation of schools was included in one issue of the bulletin "Green energy and we" and was also presented on the information stand "Save the heat". Booklets were prepared for residents of Labijai village containing information on winterization of the school in the Tajik language. Nevertheless, it will be necessary to hold broader consultations and discussions with various stakeholders throughout the stage of project development in the future. This will make it possible to prepare the necessary basis for active involvement of the community in the project implementation and will yield more effective results.

With this goal in mind, in April and May, we are planning to hold workshops for local population in the villages of Labijai and Shurhok where the local school will be winterized this year. The workshops will be aimed not only at raising local residents' awareness about the importance of energy saving but

also at arousing their interest and boosting activity to obtain more effective results. It is expected that the workshops will be held in the Tajik language with involvement of specialists from CAMP-Kuhiston who have ample experience of work in mountain communities on promotion of energy conservation issues.

### **Use of local workers**

Whenever possible it is always best to hire and use local workers having required skills and knowledge. This serves to reduce implementation costs of such projects and also facilitates involvement of the local community ensuring their ownership and responsibility for future maintenance of the facilities which were built or winterized with assistance from international organizations or government agencies. "For Earth" always seeks to involve local workers and determine the input which the local administration or the local community must provide within the projects implemented by our organization. This is essential not only in terms of improving local workers' skills in the field of heat insulation but also for sharing responsibility for the undertaken activities which ensures better sustainability of achieved results.

### **On-site manager**

Based on the above it is always advisable to have a skilled manager stationed at the construction site who can carry out the necessary monitoring and supervise the work process. In the course of implementation of several school winterization projects in mountain villages the Little Earth encountered a number of technical problems originating from the poor technical knowledge of local workers. To avoid these in the future we have retained a coordinator for our energy conservation projects with experience in construction and heat insulation who is responsible for direct supervision of such projects (including project design, preparation of cost estimates, monitoring and control) and is also assigned a number of administrative tasks.

### **Community Contribution**

Of late, the Little Earth decided to implement projects only in cases when the local community or its individual members are prepared to provide an input equivalent to 25-30% of the project implementation cost. The contribution helps increase responsibility of local population and heighten their interest in obtaining sustainable results. The contribution can be provided by way of financial resources or in-kind (materials, unpaid work, etc)

## **DIFFICULTIES ENCOUNTERED IN PROJECT IMPLEMENTATION**

### **Communication problems**

The problem of communications was one of the most severe ones in the course of the project implementation. There are no telephone landlines in remote villages and mobile cellular phones do not work there. This was the reason why all arising issues had to be addressed in face-to-face meetings. This resulted in delays and in some cases in misunderstandings regarding issues under discussion.

### **Transportation**

Despite the fact that the villages where the school winterization activities were implemented are

situated relatively close to Dushanbe visiting them often represents a major problem. The villages can only be accessed by a poor dirt road with a great number of potholes and bumps. These villages were particularly hard to reach in spring, autumn and winter when after heavy precipitation some sections of the road became impassable even for "off-road vehicles".

The road to Pishambe and Labijai is closed in winter which limits the working season when the engineering activities can be implemented.

This circumstance affected severely the timing for visiting the villages for monitoring and discussion of the project implementation progress. The poor roads and distance from the major highways also became the reason of higher costs of transporting materials to the school and visits of the Little Earth staff.

### **Severe winter**

The winter of 2007-2008 was one of the coldest in the last 25 years. On account of the extremely cold weather Tajikistan faced a severe shortage of electricity. Many cities and towns were left without access to electricity altogether and strict quotas for power supply were introduced in the major cities. Enterprises and industrial facilities had to stop their operations. The low temperature and heavy precipitation caused obstruction of many roads, failure of power transmission lines, pipelines and other infrastructure.

As a result, throughout the winter up until April, the Little Earth could not start or continue its work in the selected villages, which caused many of the planned activities to be postponed to a later date.

## **INTRODUCTION OF GREENHOUSES**

Food security has always been the key issue for survival of mountain villages and communities in Tajikistan. In those areas, there is a severe shortage of land suitable for farming whereas the ecosystems are extremely fragile. Moreover, the severe mountain climate also affects life sustenance of these communities. In the past, population of mountain areas used to live in harmony with the nature. They lived in their villages for centuries using natural resources and a sustainable way. However the situation has changed drastically today. The population growth results in expansion of old villages and establishment of new ones; available arable land area decreases and forests are cut down. All of this results in a harsh increase of pressure on the natural environment, deterioration of socio-economic conditions of people and migration of population from mountain villages to urban areas.

In mountain villages people are highly dependent on the scanty natural resources and subsistence farming. In wintertime, residents of remote villages subsist on dry fruit and provisions stored in summer. In 2006, "For Earth" with support from the Norwegian Society for the Conservation of Nature launched activities to introduce solar greenhouses based on experience of several other organizations using the same technology in the Northern India, Nepal, Pakistan and Afghanistan to promote development of local communities and support the villagers.

Whereas the traditional greenhouses lose heat quickly and temperature therein decreases as soon as the sun goes down, a "solar greenhouse" makes it possible to preserve heat for a long time. The "trick" is in a special design of the greenhouse. During its construction it is essential to bear in mind that the purpose of a greenhouse is not only to collect heat but also to preserve it as long as possible. This can be achieved through the use of heat insulation and correct design and positioning of the structure.

Implementation of such projects and introduction of solar greenhouses in mountain areas of Tajikistan will make it possible to:

- expand opportunities of local communities with regard to self-production of vegetable crops;
- partly reduce harvesting losses;
- improve the crop quality and prolong the time of greenhouse utilization;
- afford an opportunity of growing different tree species (using the greenhouses as tree nurseries).



## CONSTRUCTION OF A GREENHOUSE IN NOSIRI KHUSRAV DISTRICT

In early 2006, representatives of the Norwegian Society for the Conservation of Nature provided to our NGO a variety of information materials on the program for construction of "solar greenhouses" in Ladah, a mountain state in India. As a result of further discussions (based on review and analysis

of the materials) it was decided to construct a few demonstration "solar greenhouses" in several districts of Tajikistan. Having made several field trips and upon consultation with local partners we selected two districts for construction of the greenhouses: Nosiri Khusrav district (owner - private person) and Spitamen district (owner - school, see below).

In September-December 2006 a "solar greenhouse" (with the area of 5 by 10 meters) was constructed in Komsomol jamoat, Khamzaobod neighborhood. The site was chosen by no coincidence. Some time ago, there were several traditional greenhouses (requiring additional heating in winter) built here with support from the Canadian International Development Agency. Now the "solar greenhouse" will give local residents an opportunity to see the difference between the two types of greenhouses.

The pilot project for construction of the "solar greenhouse" was implemented by the environmental organization "For Earth" with support from the Norwegian Society for the Conservation of Nature. The main objective of the "solar greenhouse" construction is to demonstrate to the local community and other interested persons and organizations the new opportunities and benefits provided by this design of the greenhouse.

Only affordable and inexpensive local materials were used in construction of the new greenhouse. The northern wall of the greenhouse which mostly conserves the solar heat and also the side walls were constructed of air-dried bricks. The greenhouse needs heat insulation so that its walls reflect solar heat inside the greenhouse and not outside. Double walls had to be designed and the space between them (10-20cm) had to be filled with available heat insulation materials. The future greenhouse owner (a local farmer) also provided his contribution to the greenhouse construction by involving local builders and providing some of the construction materials.

To monitor efficiency of the new greenhouse design, temperature inside and outside the greenhouse was carefully monitored and recorded for several months. To this end a special thermometer was installed in the greenhouse measuring the temperature both inside and outside.

The "solar greenhouse" in Nosiri Khusrav district made it possible to raise crop productivity (since it can be used throughout the year), helped to improve economic situation of the local community and eliminated the need to provide additional heating.

Several international and local organizations visited the greenhouse and received general information on details and specifications of the "solar greenhouse" and could also discuss the initial results obtained. In 2007, the local UNDP office became interested in the greenhouse built in Nosiri Khusrav district. They constructed several similar greenhouses in the neighboring districts under one of their projects.



Information about the project was also widely disseminated both among local NGO's and international organizations and the general public through the local media.

## CONSTRUCTION OF A GREENHOUSE IN SCHOOL #4 OF SPITAMEN DISTRICT



The pilot project for construction of a solar greenhouse on the territory of secondary school of general education #4 in Spitamen district was implemented in 2006-2007 by the environmental organization "For Earth" with assistance from the Youth group for protection of environment and with support from the Norwegian Society for the Conservation of Nature.



Spitamen district is situated in the west of Sughd region of Tajikistan. This district borders on Uzbekistan. An overwhelming majority of its residents are Uzbek-speaking. Incomes are mostly received by local population from small businesses and development of agriculture in the district. According to the local executive authority over 30% of the district's population live below the poverty line.

There were several reasons why it was decided to construct the greenhouse in that district. First of all the school administration showed interest in construction of an experimental greenhouse which could be used not only for growing of crops and for educational purposes as well to supplement classes in biology, physics, etc. Secondly, there was a dynamic partner (Youth group for protection of environment) which actively facilitated implementation of the project.

Prior to development of the project for construction of such a greenhouse in Spitamen district the YGPE staff together with prof. D.Abdullaev (candidate of physical and mathematical sciences, head of heliotechnology laboratory) conducted a series of meetings involving participation of school administrations and the local nature protection committee. The optimum location for construction of the greenhouse was identified. All organizational and administrative issues were settled.

During the initial stage administration of school #4 of Spitamen district allocated the site for construction of the greenhouse, cleaned up the territory and prepared bricks for construction. Upon completion of the solar greenhouse construction the school teachers and students enclosed it with a fence to ensure safety of the greenhouse. Moreover, at the finishing stage of construction the school students were involved in covering a part of the greenhouse top.

For the period of the solar greenhouse construction we hired two local workers and 1 expert who worked every day and whose services were remunerated from the project budget. The overall working process was supervised by the NGO "For Earth" and the "Youth Group for Protection of Environment" with involvement of the expert, prof. D.Abdullaev. Construction of the solar greenhouse was finished in two months (December 2006 - January 2007).

Once the construction was finished, the school teachers and students started using it for educational purposes. They grow different plants in it applying in practice the knowledge they receive in the classes of biology and botany. They also get familiar with the use of heat insulation and renewable energy sources by the example of the greenhouse. The school watchman and also duty teachers and students of grades 7-11 are responsible for safety and proper operation of the greenhouse. Starting from January 2007 it was put in the care of the Green Patrol of the school headed by the teacher of biology, the headmaster and the teacher on duty.



The ownership of the greenhouse was officially transferred to school #4 of the Spitamen district. After construction of the greenhouse was finished several experiments associated with growing plants and seeds of dill, parsley, coriander, bell pepper, cucumbers were implemented and temperature regime was monitored regularly. Thus, school #4 of Spitamen district will be partly provided with foodstuffs for students as a result of growing vegetables and fruits in the constructed greenhouse. Information about the project was disseminated through bulletins of the YGPE and "For Earth". Several excursions were organized to the greenhouse construction site both for SPARE participants and for representatives of local and international organizations.



## CONSTRUCTION OF A GREENHOUSE IN NISUR VILLAGE (GBAO)

In August 2008, the environmental organization "Little Earth" signed an agreement with the local NGO "Oyandasoz" on construction of a solar greenhouse for Oyandasoz in the village of Nisur (GBAO).

Nisur village is situated in Bartang valley of GBAO. This is a very remote mountain village. The local population is mainly engaged in subsistence farming and, sometimes, animal husbandry. Most of its 42 families live below the poverty line.

This is one of the first projects for construction of such greenhouse in a highland area. The decision to construct the greenhouse was taken back in 2007 after the visit to the village by the Little Earth staff together with a representative of the Norwegian Society for the Conservation of Nature. In the course of the trip a number of consultations were held with local residents and a representative of the local NGO "Oyandasoz" with the view to possible construction of such a greenhouse. In Nisur our team visited several sites where construction of the greenhouse would be possible. In 2008, the Little Earth staff tentatively discussed with the NGO "Oyandasoz" the conditions of construction and other organizational issues.

In August 2008, upon signing of the agreement, an Oyandasoz representative received the first tranche of funds. During that meeting we discussed once again work-related issues and design features of the greenhouse. The optimum design option was chosen with due regard for climatic and geographic characteristics of the area. The Oyandasoz representative received one copy of manual for construction of greenhouses containing detailed information on the subject.

In September 2008, works to construct the greenhouse foundation and the back wall were launched in Nisur village at the chosen site (the land is owned by a local farmer). To achieve the set goal the builders had to transport some of the materials from nearby sites which complicated the construction process. On account of early frosts and impossibility of pursuing the construction work Oyandasoz wrote a letter to the Little Earth requesting it to postpone completion of the greenhouse construction until March-April 2009.

Thus, construction of the greenhouse is expected to be completed in April 2009.

After its completion the greenhouse will be handed over to the Oyandasoz which will monitor its operation and maintenance. It is envisaged that the greenhouse will be used for growing of early sprouts of tomatoes, onions, cabbage and other vegetables.

The initial information on the project has been disseminated through e-mail. We are planning to include materials about the project (upon its completion) in the bulletin "Green energy and we". The NGO "Oyandasoz" must also organize several excursions to the greenhouse for local community representatives.

## ROUND TABLES AND WORKSHOPS

### Round table on renewable energy sources

On 20 September 2008, a round table was held in Dushanbe which was devoted to "Initiatives of introducing renewable energy sources (RES) and energy conservation projects in Tajikistan". The event was organized by the environmental organization "Little Earth" with support from the Norwegian Society for the Conservation of Nature. The key objective of the above round table was to



discuss existing difficulties and obstacles to development and promulgation of RES and energy conservation technologies and to review good practices of different organizations working in that sphere.

The round table was attended by representatives of international and local non-governmental organizations, staff of several commercial companies, scientists and experts in the field of renewable energy sources as well as representatives of the media.

The presentations delivered during the event related to the participants objectives and priorities of the "Goal-oriented integrated program for wider use of renewable energy sources for 2007-2015". Another presentation described experience of disseminating energy conservation initiatives (within the framework of the GTZ-funded project for combating desertification) in districts of Gorno-Badakhshan autonomous region. Presentation made by "Bars-consulting" was devoted to difficulties and problems they had faced during implementation of projects for construction of mini-HPPs.

Mr.Yuri Skochilov, director of the Youth Environment Center focused in his address on the position taken by Russian environmental organizations with regard to socio-environmental problems of energy generation and transmission and also mentioned as an example best practices developed abroad pertaining to introduction of renewable energy sources and energy conservation techniques.



Presentation made by Timur Idrisov from the Little Earth was devoted to development of "voluntary obligations in the sphere of energy conservation" for donors and international organizations implementing or supporting projects aimed at construction or rehabilitation of public buildings such as schools, medical stations, recreation centers, etc.

The round table participants emphasized importance of such events to ensure coordination of efforts, development of common positions and recommendations. The participants also agreed to establish a common e-mail distribution list and expressed their interest in continuation of the started dialogue.

## Round table "Environment-friendly construction: concept and philosophy"

On 11 October 2008, a round table entitled "Environment-friendly construction: concept and philosophy" was held in Dushanbe. The event was organized by the environmental organization "Little Earth" with support from the Norwegian Society for the Conservation of Nature. Architects from "Gaya Architects" (Norway) were invited specifically to take part in the round table.



The round table gave all interested participants the opportunity to receive new materials regarding the concept of environment friendly construction and discuss methods and approaches for introduction of energy conservation measures both at the household and state level. This was the first round table devoted to environment friendly construction in Tajikistan.

The delivered presentations furnished the participants with information about the main principles and objectives of environment-friendly construction. The Gaya Architect's experts, Alrid Berg and Rolph Jacobsen related their experience in design and construction of houses and buildings made of natural materials (clay, straw and wood), and shared information on the project for construction of environment-friendly houses in a rural area close to St.Petersburg. They cited examples of eco-houses in other European countries and the US where environmentally-friendly construction gains more and more adherents. Arild Berg and Rolf Jacobsen pointed out that houses made of natural materials are no inferior to modern ones and at the same time the benefits both for the nature and human health are manifest.

Dag Høystad from the Norwegian Society for the Conservation of Nature in his address drew the participants' attention to importance of energy conservation measures. Using the example of his own house he showed how one can significantly reduce energy consumption by utilizing heat insulation, modern energy-efficient equipment, waste water heat and renewable energy sources.

The round table was attended by teachers and students of the Tajik Technical University (architecture and construction faculty), staff of Giprostroi project-design institute, representatives of several international and local non-governmental organizations and also employees of some commercial construction companies.

The participants thanked the speakers for their interesting presentations and expressed their hopes for continuing closer cooperation to promote the ideas of environment-friendly construction and energy conservation.

## OTHER WORKSHOPS

The Little Earth staff conducted a number of presentations and workshops devoted to energy conservation and RES for local communities and local NGO representatives in different districts of Tajikistan. Such workshops were held in Khamadoni, Karatag, Nurabad and other districts of the republic.



## OTHER ACTIVITIES

### INSTALLATION OF PHOTOPANELS IN THE LITTLE EARTH OFFICE

The environmental organization Little Earth which is currently implementing a program for promotion of energy conservation and renewable energy sources has decided to set an example and demonstrate by itself how solar energy can be utilized. In January 2009, the Little Earth staff finished installation of solar panels that will provide back-up power supply to the office of the organization in case of electricity outages.

The two French-manufactured photo panels with the generating capacity of 50 watts each are connected (through a charge controller) to a car-battery where the energy is stored. The electricity generated by solar panels and stored in the battery is sufficient to run two computers with LCD monitors for 4 hours. As required the energy may be used for emergency and stand-by lighting. The energy from the solar photo panels can also be used for charging small electric appliances: torchlights, MP3 players and radio sets running on 12 v power input.

The installed equipment has already aroused interest of local residents and representatives of other organizations. Therefore, the Little Earth developed a small booklet describing the system and its operating principles. The booklet will be made available to anyone who may need it. Besides, we are planning to organize guided tours of our office for school children and some environmental organizations.

## EXPERT EVALUATION OF CAMP ENERGY COMMITTEES

As a result of the Energy Conservation Program implemented by CAMP in different mountain communities local energy committees were organized. CAMP "Kuhiston" established energy committees in the villages of Bungakiyon (Faizabad district), Bobosurhon (Hissar district) and Qalai Dukchi (Isfara district).



In late September 2008 the management of CAMP-Kuhiston in Tajikistan invited independent experts to carry out monitoring and scheduled evaluation of activities performed by energy committees in those villages. The evaluation commission comprised the following persons: an expert of the Little Earth, a teacher of the heat supply chair of the Osimi Tajik Technical University and an engineer of the Electric inspection service "Professional Service Group Ltd".

The objective of the inspection was to evaluate activities of the energy committees, carry out monitoring of implemented energy conservation activities, provide consultations on issues of energy conservation and identify the best energy committee based on given criteria.

In September 2008, the team visited Faizabad district (Bungakiyon village), Hissar district (Bobosurhon village) and Isfara district (Kaduchai Dukchi village) and met with representatives of energy committees and local authorities. As a result of the evaluation an information report was drawn up and submitted to CAMP Kuhiston. The report contained recommendations for improvement of activities performed by the energy committees.

During the scheduled evaluation of the energy committees, the Little Earth expert examined three primary schools of general education (one in each of the districts), drew up their energy passports and rough sketches of the facilities to review the possibility of their winterization in the future.

## PARTICIPATION IN OTHER ROUND TABLES AND WORKSHOPS

In 2008, the Little Earth representatives were actively involved in workshops and round tables devoted to issues of energy conservation and RES which were held by other organizations. Specifically, the Little Earth delivered presentations at round tables organized by the German consulting group GOPA in summer and autumn of 2008, which were devoted to issues of energy conservation and RES.

In June 2008, the Little Earth participated in the exhibition-fair to promote rational use of natural resources (including the issues of RES and energy conservation) organized by CAMP Kuhiston. Presented at the fair were over 20 information stands prepared by international organizations, local public and non-governmental organizations and producers working in highland areas. Among others, a stand showing materials of the environmental organization "Little Earth" was presented at the fair. It familiarized the participants with small-scale energy saving projects for winterization of schools and construction of solar green-houses implemented by the "Little Earth" with support from the Norwegian society for the conservation of nature as well as the work done under the SPARE project (School Project for Application of Energy and Resources) and new initiatives of the organization in the sphere of introduction of energy-efficient stoves.

Interested guests of the fair received booklets and information bulletins "Green energy and we" by way of handouts.

Two Little Earth specialists also took part in a practical training devoted to renewable energy sources and energy conservation organized in Kyrgyzstan by the local organization UNISON with support from Women of Europe for Common Future. In the course of the training its participants familiarized themselves with different technologies of using solar collectors, photo panels, technology used for winterization of houses and construction composting toilets, etc. The Little Earth representatives delivered a presentation on the work done by our organization in the field of energy conservation and RES and also gave a master class on construction of a solar drier.

## **WORK UNDER ICS**

See a separate report prepared by the Little Earth on its work to introduce energy efficient stoves.

## **PUBLICATIONS**

In 2008, the Little Earth prepared a guide on construction of solar greenhouses. The guide was developed based on materials of the French organization GERES which implemented several such projects in mountain villages in northern India, Nepal and Afghanistan. The guide is available for interested persons and organizations both in the electronic form and as a hard copy.

## **PLANS FOR 2009**

### **PLANS FOR CONSTRUCTION OF GREENHOUSES**

#### **COMPLETION OF THE GREENHOUSE CONSTRUCTION IN NISUR**

This year, we are planning to complete construction of the greenhouse in Nisur village in the Bartang valley of GBAO in conjunction with the local NGO "Oyandasoz". For more detailed information refer to the section "Construction of a greenhouse in Nisur" above.

#### **GREENHOUSE IN KHAMADONI**

In late 2008, the local NGO "Zan va Zamin" requested the Little Earth to look into the possibility of construction of a demonstration solar greenhouse in Khamadoni district bordering on Afghanistan. In January 2009, an expert of the Little Earth made a trip to that district where he took part in a workshop and made a presentation on energy projects of our organization implemented with support from the Norwegian Society for Conservation of Nature.

During his trip he also visited several sites proposed for the greenhouse construction. Tentative negotiations were held with the owner of the site most suitable for the greenhouse construction. Another criterion for selection of the site was the fact that the farmer was prepared to make a 30% contribution to the greenhouse construction.

As a result of the negotiations the technical documents were prepared and a tentative cost estimate drawn up. An agreement with the farmer is expected to be signed in February 2008 whereas the construction will start in March 2009.

## GREENHOUSE IN LABIJAI

We are planning to organize a training session in energy conservation for the local community of Labijai village (Tursunzade district) in May-June 2009. After the training, the Little Earth will construct a pilot solar greenhouse in that village. In the past, Labijai used to be a summer village, i.e. its residents would spend winters in the valley to come back in spring. However, on account of the population growth and some other factors, Labijai has now become the place of permanent residence for 30 households. This is why the greenhouse will provide a good tool for adaptation of the village residents to the severe winter conditions in that area. It is expected that the greenhouse will have a positive effect on life of the local community.

## PLANS FOR WINTERIZATION OF SCHOOLS

### COMPLETION OF SCHOOL WINTERIZATION IN NISUR VILLAGE

This year we are planning to complete winterization of the ceiling in the new school building in Nisur village (Bartang valley of GBAO). The heat insulation works were postponed until this year on account of the road closure in the valley and early frosts. For more detailed information refer to the section "Winterization of the school in Nisur" above.

### Choryakkoroni dara village

In December 2008, upon request from the administration of school #125 of Choryakkoroni Dara village (Choryakkoron jamoat, Rudaki district (DRS)) the Little Earth experts visited the school and conducted a superficial assessment of the building with the view of its possible winterization. An information session was held with the school administration and teachers; booklets and other materials describing the Little Earth activities were distributed. An expert of the Little Earth took measurements, prepared sketch drawings of the school buildings showing dimensions and filled out the engineering and energy passport of the school. He also recorded data regarding sources of livelihood of Choryakkoroni dara residents.

The village of Choryakkoroni Dara is located 5 kilometers to the north-west from Dushanbe. The secondary school of general education is located in the northern part of the village. There are 245 children enrolled in the school who attend classes in two shifts. The school has 13 teachers. It is headed by the headmaster, Mr. Khamrokul Sidikov. The school headmaster is also the acting chairman of the village council.

### School #125 in Choryakkoroni Dara village

The secondary school of general education #128 in the village of Choryakkoroni Dara (Rudaki district) consists of two buildings constructed in different years. The first building constructed in 1979 consists of three classrooms, a sheltered space and a coal storage facility. The building is located in the northern part of the school territory. It was constructed using the "hashar" method without the foundation. It has adobe walls. Rudaki district khukumat is planning to construct a new building for the school in 2010. The second school building was constructed in 1985 also using the "hashar" method. It has three classrooms, headmaster's office and a staff-room.



The school facade faces 45° to the north-east. Access roads are unsurfaced. Both the school buildings are one-storey. The school was constructed without any design and budget documentation. Its walls are made of cement blocks on rubble concrete foundation. Floors in the school are wooden without heat insulation. Ceilings are constructed of matched plywood. The loft is wooden without additional winterization. The hip roof is covered by corrugated asbestos boards. The fast sheet windows are single-pane. There is no window hardware. Door open on the outside without an additional buffer zone.

In wintertime classrooms are heated by cast-iron stoves burning solid fuel. Chimneys are run through the ceiling and roof using asbestos pipes. The total heating space in the three classrooms constitutes 54 m<sup>2</sup>; the heating space of the headmaster's office and the staff-room is 24 m<sup>2</sup>. Rudaki district khukumat allocated for the current school year 4.5 tons of coal, 6 cubic meters of firewood and 30 liters of diesel for the entire heating season.

Temperature measurements inside the classrooms in mid-January 2009 when the stoves still had not been used showed the inside temperature of +10°C with the outside temperature of 0°C. Children sit inside the classrooms with their outdoor clothes on. Because of small window openings it is rather dark in the classrooms whenever the weather is cloudy. Although the school is connected to the centralized power distribution network there are no electric lamps in the classrooms and power supply is limited to 4 hours a day.

The dead windows do not allow for airing the classrooms. Whenever firewood or coal is burned in the cast-iron stoves a lot of smoke and carbon monoxide is emitted which leads to respiratory tract diseases and headaches.



### PROPOSED MEASURES

Based on the assessment findings the Little Earth proposed to implement heat insulation of the three classrooms in the second school building constructed in 1985.

Specifically:

- Replace 6 single-pane windows with new double-glazed ones with the total area of 8.4 m<sup>2</sup>;
- Winterize ceilings in three classrooms using ISOVER by dismantling the ceilings and laying down the insulation between the ceiling joists to be followed by parainsulation below and above the counter ceiling in the attic; cover it up with adobe plaster 10 cm thick.;
- Winterize the floors by filling the space between the foundation soil and the wooden floor beams with expanded clay aggregate with an underlying plastic sheeting for hydroinsulation or winterize the floors using ISOVER.

If no additional difficulties and issues should arise in the course of negotiations we are planning to make a tripartite Agreement with the local authorities and the school administration for winterization of classrooms in one of the school buildings. It is expected that replacement of windows will be done in February already and winterization of the classroom ceilings and floors will begin in late March 2009 during the spring vacations.

### School in Shurhok village

Upon request of the Karatag forestry manager and based on application from administration of school #36 of Shurhok village (Karatag jamoat, Tursunzade district) the Little Earth experts carried out an assessment of the school with the view of its winterization back in autumn of 2007. An engineering and energy passport of the facility was drawn up. Also prepared were drawings showing geometrical dimensions of the building and temperature measurements were taken. Based on the assessment results we chose the variant of winterization of three classrooms by installing winterized wood flooring and replacement of single-pane windows with double-glazed ones. A cost estimate for construction materials and transportation was also prepared.

A draft tripartite agreement and cost-estimates were prepared in early 2008 and submitted to the chairman of Karatag jamoat and the school administration for review. Several meetings were held between the Little Earth management and the school administration to discuss issues of co-financing on the part of the jamoat and contribution of the school itself in the budget of the winterization project. In May 2008, the school in Shurhok village was visited by the Program Coordinator of the Norwegian Society for the Conservation of Nature, Mr. Dag Hoistad, who approved the chosen winterization variant.

In August, an expert of the Little Earth traveled to Shurhok village to inquire about the progress of approval of the tripartite agreement. The agreement still was not signed on account of a leap in prices at construction markets. When Mr. Dag Hoistad visited Tajikistan again in October 2008 with architects from Norway the issue of school winterization in Shurhok village was brought up again. At that time it was suggested that the floor be winterized using expanded-clay aggregate in accordance with the Norwegian technology.

Since the school headmaster left for another position and another headmaster was appointed and also because of replacement of several officials in the local governance body no winterization works were started in the school in 2008. It is expected that if the new variant of the agreement will be signed in February 2009 the winterization work can start in March-April 2009.

## **WINTERIZATION OF OTHER SCHOOLS**

It is envisaged that schools in two more villages will be identified and winterized. At present, the Little Earth is engaged in fact-finding trips discussing the relevant issues with local authorities and school administrations. It also consults with non-governmental institutions working in certain populated areas which might be of interest for the Little Earth in terms of development and implementation of their small-scale projects. We are now considering the issue of possible winterization of schools in the villages of Boboi Surhon and Poyoni Sholmak.

## **WORKSHOPS AND TRAINING**

Within the framework of implementation of small-scale energy conservation projects the Little Earth is planning to conduct a series of training workshops for local community representatives on energy conservation and renewable energy sources. The training will enable local communities not only to receive information on existing technologies and alternatives but they will boost discussion of various initiatives at the local level.

In 2009, we are planning to conduct such training sessions in the villages of Labijai (or Shurhok), Choryakkoron and Nisur. It is possible that the workshops will be held with involvement of CAMP-Kuhiston experts.

## **PLANS TO DISCUSS RES RELATED ISSUES**

In 2009, the Little Earth plans to continue with organization of round tables to promote the use of renewable energy sources. The round table held in September 2008 aroused great interest in the subject under discussion and provided an impetus for a more active work in this field on the part of other organizations.

In 2009, we are planning to conduct a round table on RES in Khujand (Sughd region). It is expected that the round table will bring together different stakeholders and will provide an opportunity to discuss problems and prospects of RES development in the region and to review the existing practices of their introduction in local communities.

Another round table on RES will be held in Dushanbe in mid-2009 or in the second half of the year. It is expected that recommendations provided at the round table will be submitted to official authorities and respective ministries.



**Norges Naturvernforbund** (Norwegian Society for the Conservation of Nature) is Norway's largest and oldest environmental organization. The organization was established in 1914 and is a non-governmental, nationwide, democratic member organization with around 20 000 individual members, 100 local groups, and regional branches in all counties. After more than 90 years with voluntary work for our common environment, for conservation of the extraordinary nature and wildlife we have in Norway, the organization is well known and respected. Although the organization has a national agenda, many environmental questions have proved to have an international or even global character. Development issues, resource allocations and international cooperation are very much parts of our everyday activities.

Norges Naturvernforbund works actively on international questions on environment, energy, climate and development towards decision makers, the general public and in our own organisation. The International Project Department frequently contributes with inputs on development issues for use in our internal and external information activities. Frequent seminars and workshops are being organized and the department is a regular participant in external forums.

Norges Naturvernforbund cooperates with environmental NGOs and support civil society development in a number of countries in East and South. The objectives are to strengthen our local partners' capacity and influence in their struggle for a better environment. Environmental Education, Sustainable Energy Solutions and Climate Change are key issues for the cooperation. At the present Norges Naturvernforbund initiate, implement and maintain projects regarding capacity building, energy saving, renewable energy, climate and education in 20 countries in former Soviet Union, Eastern-Europe and Africa.

SPARE (School Project for Application of Energy and Recourses) is the largest international school project on energy, climate and environment. 4500 schools and 175.000 pupils in so far 16 countries participate annually in the SPARE educational program. The SPARE program was created in 1996, by Norges Naturvernforbund and is today managed by the International Project Department.

Norges Naturvernforbund is a part of Friends of the Earth International.

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