

A photograph of a family in a solar veranda. A woman sits on a striped rug on the left, holding a child. Another child sits on the rug. In the center, a woman sits on a chair at a table covered with a blue and white floral tablecloth, writing. A man sits at the table, also writing. The veranda has a glass roof and walls, and a blue door and windows are visible on the left. The text "step by step" is in the top right corner.

step by step



MANUAL FOR CONSTRUCTION AND OPERATION OF
PASSIVE SOLAR ARCHITECTURE
(SOLAR VERANDA AND DIRECT GAIN)

INTRODUCTION

As winter approaches, people collect fuel in the form of dung, coal, and wood to prepare for the cold. The fuel collected is expensive and is often not sufficient to protect peoples' houses from the winter cold.

Unfortunately, most of the heat created from burning fuel escapes through cracks in the windows, doors, and other places in the ar-

chitecture.

In Tajikistan, the average annual amount of sunlight is 2100 to 3170 hours. This figure may change depending on the region of the country.

On average, there are 280 to 330 sunny days and only 35-40 cloudy or rainy days.

Using this manual to construct

solar verandas, residents can take advantage of Tajikistan's naturally sunny climate and save money on the amount of fuel they burn, thereby putting less of a strain on the environment.

A solar veranda is made from local materials. During sunny days, it can not only warm the house but also provide a space to complete work, which is often hard to find a space to do in crowded winter rooms.



1. WHY A SOLAR VERANDA?

A solar veranda warms a home during sunny winter days.

This section gives you several advantages of solar verandas.



During sunny days of winter, your family can have outdoor lunch and enjoy warm sunlight.



During sunny days, you can even bathe your children in the solar veranda.



In winter, you can dry laundry in the solar veranda.



Your children can do their homework in a warm clean place.



*For short periods only!
It is not recommended
to grow many plants for a
long period.*

The solar veranda is convenient for growing plants and seedlings.



Burning fuel to heat your home all day is expensive.



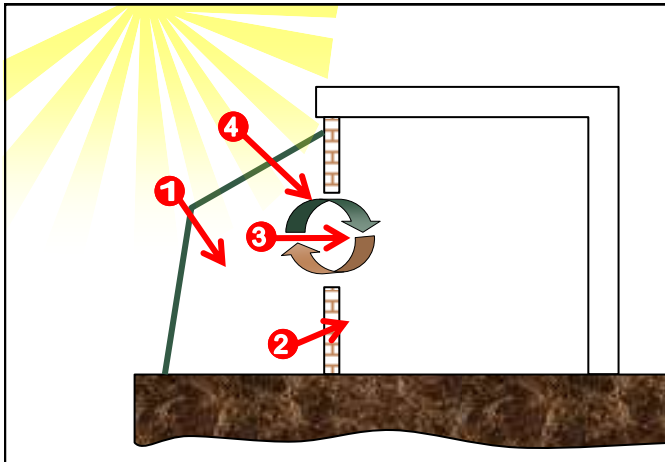
**OPTION 1.
SOLAR VERANDA**

2. CONSTRUCTION OF SOLAR VERANDA

Six simple steps that will save you fuel

1. Collects sunlight energy during day
2. Transmits energy through the house front walls
3. Transmits energy into the living room through open windows
4. Transmits sunlight energy into the living room.

Main principles of passive solar house operation.



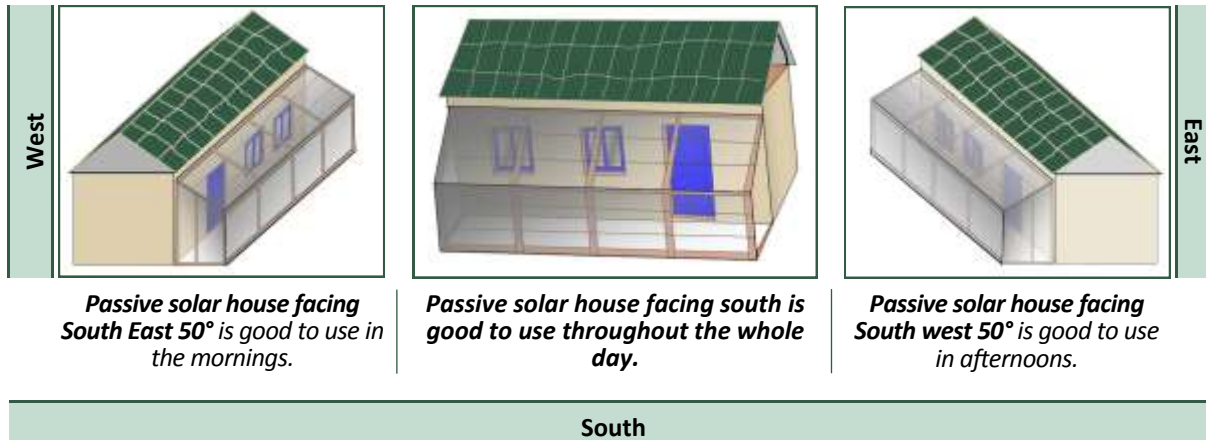
Key steps in construction of a solar veranda

- Step 1. Selecting the right place
- Step 2. Construction of the frame
- Step 3. Construction of floors
- Step 4. Installing door and ventilation windows;
- Step 5. Replacing living room windows with Double Glazed Wooden Windows
- Step 6. Stretching the polyethylene plastic sheet cover.

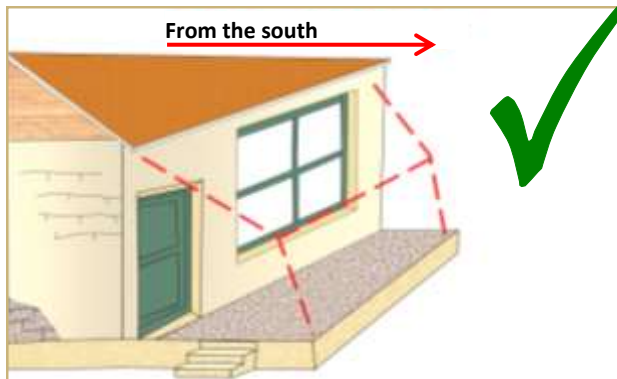
Step 1

2.1. SELECTING THE RIGHT PLACE

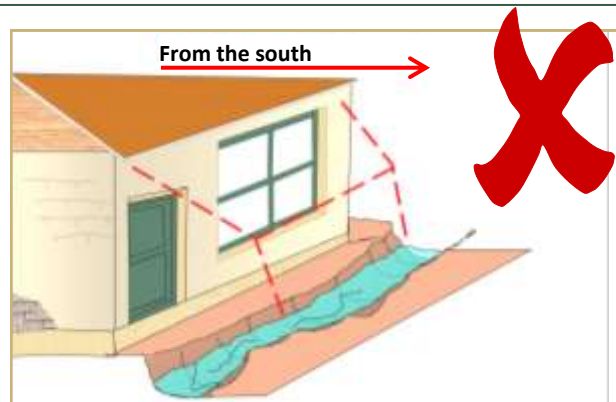
A solar veranda must be built facing south $\pm 50^\circ$.



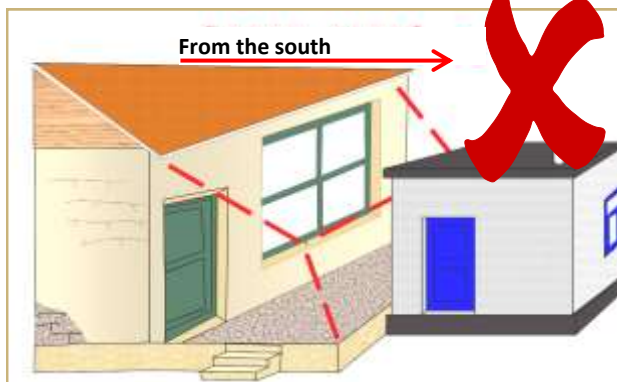
In order to select the right place for a solar veranda, it is important to consider several factors.



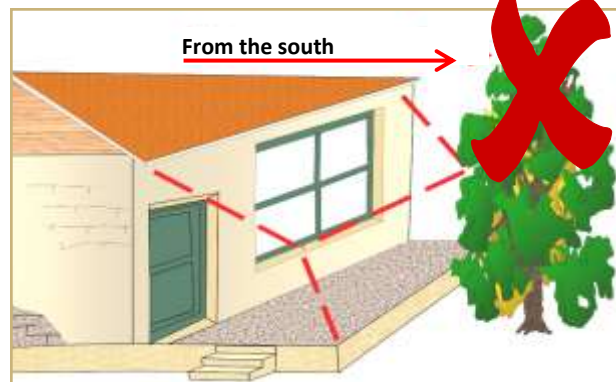
There shouldn't be any impeding objects in the place selected for construction of passive solar house.



Construction of passive solar house is not recommended in places where there are holes or canals.



Do not build your passive solar house in front of buildings as other buildings can block the sunlight.

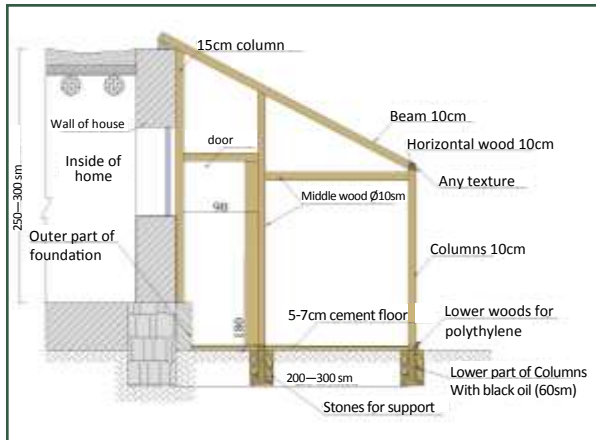


Construction of passive solar house is not recommended in places with big trees.

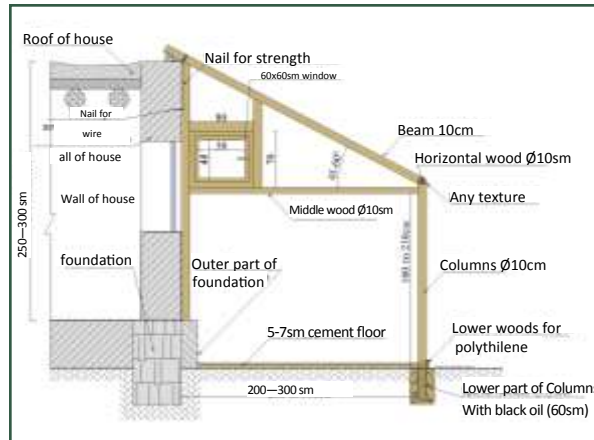
Construction impediments

Blocking the sunlight

Step 2 2.2. CONSTRUCTION OF FRAME



Cross section from left side

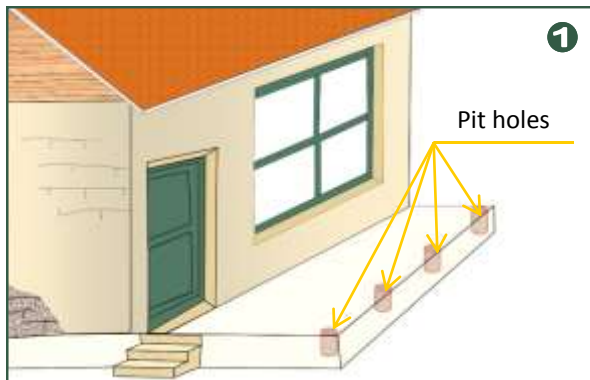


Cross section from right side

The frame can be built from wood (log or plank) or iron (corner brace, profile, pipe).

While building the frame, pay close attention to the following:

- Distance between the columns;
- Strength of frame's connection to ground and walls
- Make sure there are no rough points at structure connection points so that the plastic doesn't rip.



1
In the front part, drill 60 cm hole on the ground for columns.



2
Install the front columns in the holes. To stabilize the columns, put stones and cement around them. Two columns are also attached to the wall.



3
Then attach the beams horizontally to the lower and upper part of the columns and also between the front columns and walls.



4
Place the beams on top of the horizontally assembled wood boards.

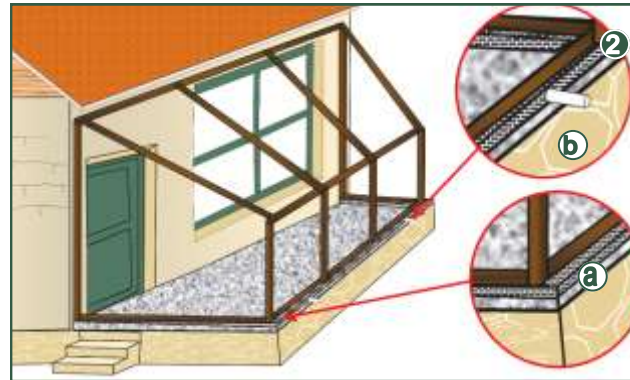
Step 3

2.3. CONSTRUCTING THE FLOOR OF THE SOLAR VERANDA

The floor is built following these steps:



The floor of the passive solar house is covered with 5-10 cm mixture of sand and cement. The floor should be built with slope to the front.



If you have planned to build the floor with raised edges a), place drainage pipes so that the water can escape under the ground (b).

For construction of the cement floor, it is important to meet the following requirements:

- Use high quality cement;
- If planned to do so, laying curbs;
- The floor should be sloped;
- Placing at least one water pipe with 40mm diameter.

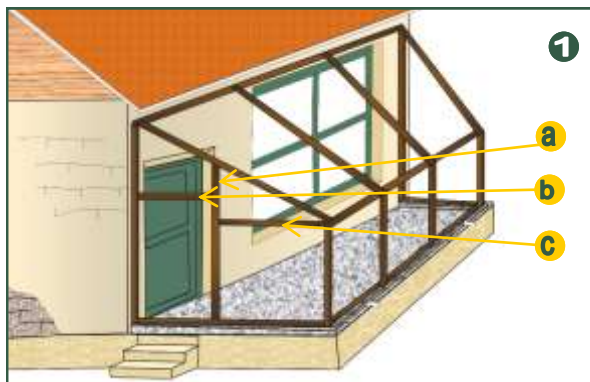
Step 4

2.4. INSTALLING DOOR AND VENTILATION WINDOWS

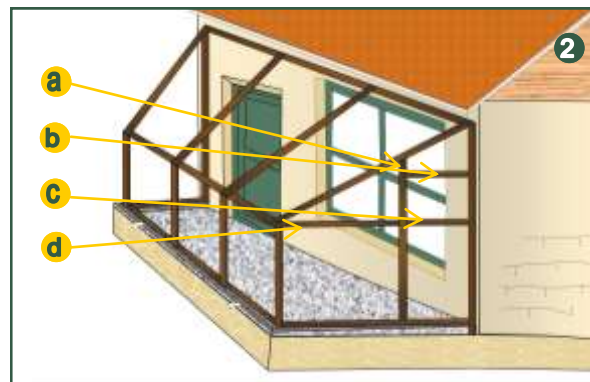
While constructing door and windows, consider the following:

- **Quality of door and window frames (it should not have any hole or cracks);**
- **Quality of polyethylene plastic sheet;**
- **There should be hinges and a handle**

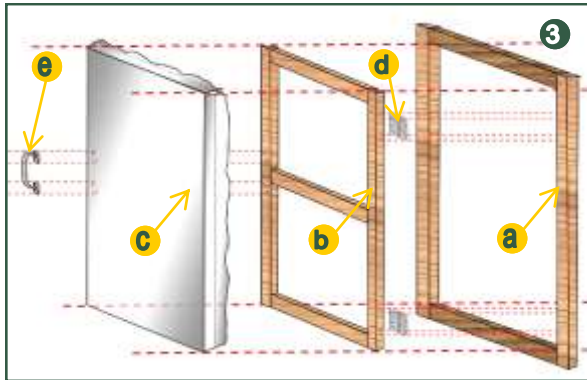
The solar veranda must be covered with plastic, have an entry door, and windows for ventilation.



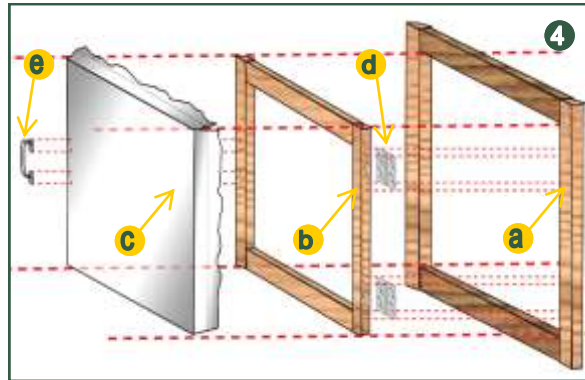
Prepare a place for door: a) install the door side columns, b) install the upper part of the door frame, c) attach a horizontal support board.



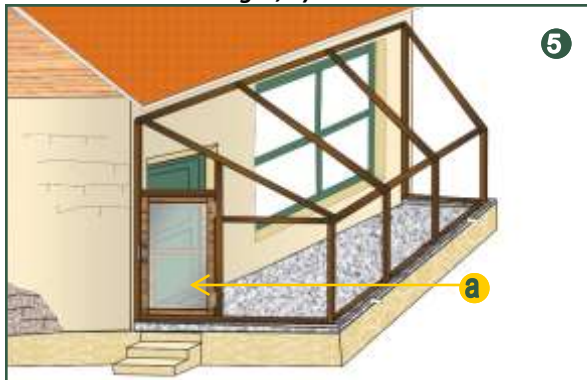
Preparing place for window: a) install side bars (b) attach the upper window frame, c) attach bottom frame, d) attach the horizontal board.



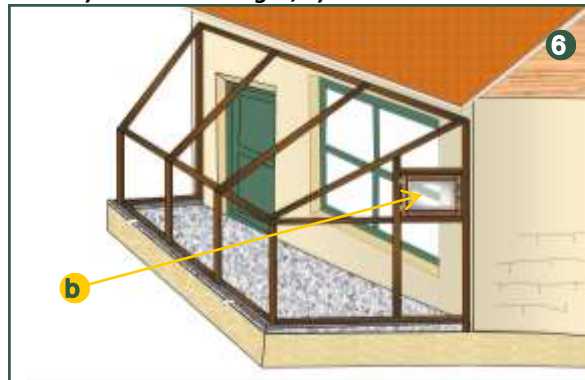
Construction of door: a) construct the door box, b) Build the door frame, c) stretch the plastic sheet, d) attach the hinges, e) attach the handle



Construction of windows: a) construct window box, b) Construct window frame, c) stretch the plastic cover, d) attach the hinges, e) attach the handle.



At the final stage (a) install the door in the place you prepared.



At the final stage, install the window in the place you prepared (6).

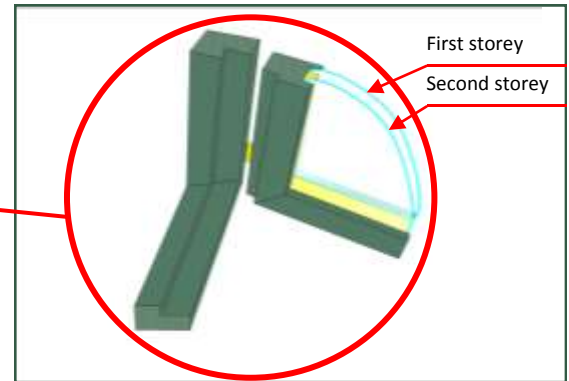
Step 5

2.5. ADJUSTING THE WINDOWS OF THE HOUSE

In order to adjust windows of the heated house, it is important to follow these requirements:



The living room windows that open into the solar veranda must be easy to open to let in the warm air.



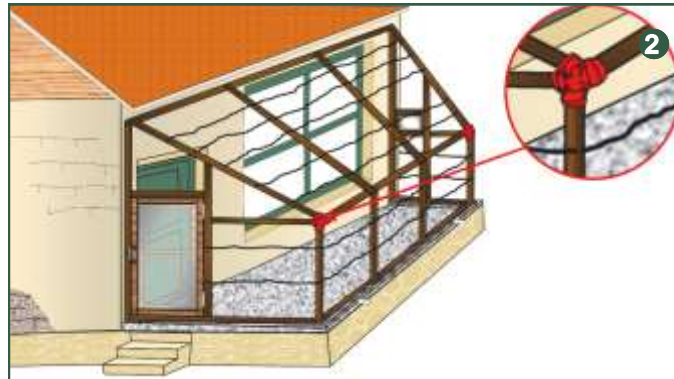
The windows must be double glazed to keep all collected energy during night.

Step 6 2.6. STRETCHING POLYTHYLENE A PLASTIC SHEET

Find the most durable plastic sheet and support wire available.



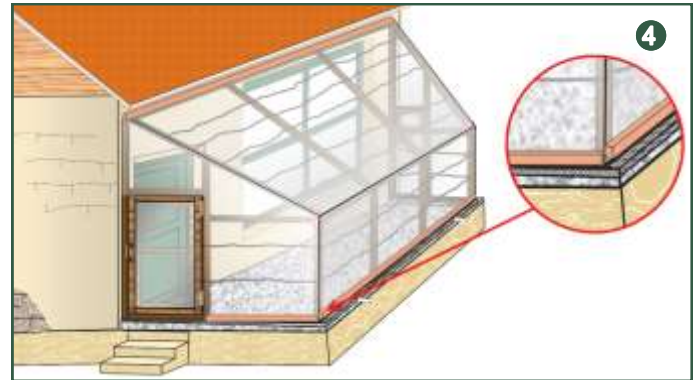
First, stretch 6-8 line of wire over the frame to stabilize the plastic sheet during rain and wind.



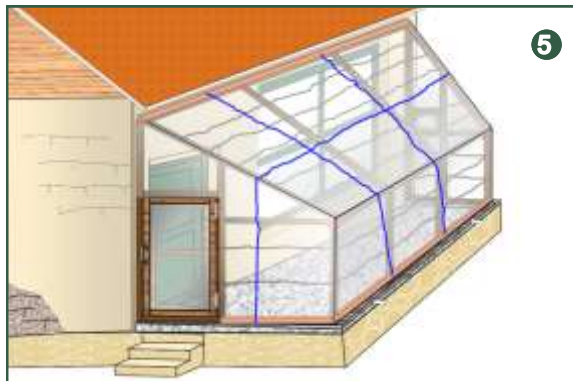
Wrap up any sharp edges on the frame with cloth so that they don't tear the plastic sheet later.



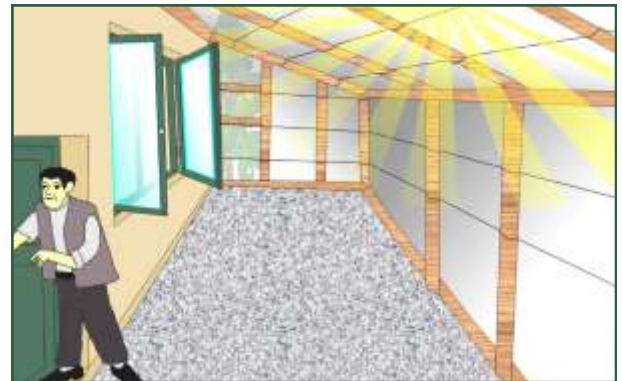
Then, stretch the polyethylene plastic sheet over the wire on the frame.



In order to fasten the plastic sheet to the wall and the base, attach it with a batten.



In especially windy areas you can protect the plastic by stretching thread over it.



The solar veranda is ready.

OPTION 2. DIRECT GAIN

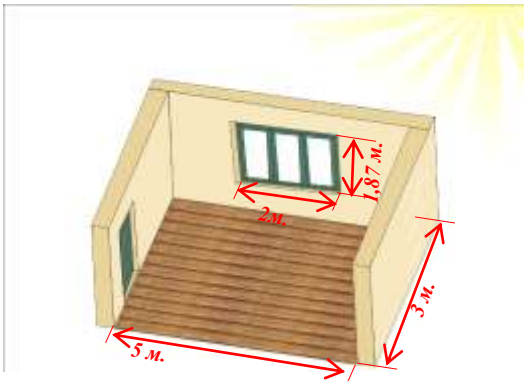
3. INSTALLING OF DOUBLE GLAZED WINDOW

Besides providing day light, living room windows serve two other purposes:

- Transmitting sunlight energy
- Transmitting heat through air circulation: when the outside temperature is warm, open windows to let warm air into your living room.

However, if the window is too big, excessive heat will be lost at night.

Windows must face the south, so that they are exposed to sunlight during the day.



The window is most efficient when the area of its glass part equals 15%* of the area of the floor of the room.

Example: If the floor area of the living room is 15m^2 , then the size of only the glass part of the window must be 2.25m^2 .

If the size of glass part is most commonly 60% of the total size of the window then the size of the glass part will be 3.75m^2 . If the width of the window is 2m, the height must be 1.87m.

* For houses used only during the day (schools and businesses), the area of the glass part of the window should equal 19% of the area of the room.

4. OPERATION OF SOLAR VERANDA

How to transmit the sun-light energy into the room?

During sunny days, when the solar veranda is warmer than in the house, open the windows to let the warmth into the living room.

When should I close the windows?

Close the windows when there is no sun, such as at

night or during cloudy days.

How to refresh the air of the solar house?

When the air of the solar house is not fresh, ventilate it by opening the windows. To have good ventilation, it is recommended to open not only windows but also the door of the solar house.

How to determine whether inside air is not fresh?

- When you see water from humidity collecting on the plastic sheet
- When you see mold on the walls or the wood
- When the solar veranda smells dank.

5. CONTACT INFORMATION OF PROMOTERS AND MASTERS

	Ayni district	Asht district
For construction of solar green-house, please contact:	Narzulloev Barot Address: Hayronbed village, Fondaryo jamoat, Phone: 92 848 77 60.	Karimov Rustam Address: Marhamat village, jamoat Oshoba. Phone: 92 702 82 63
To purchase construction materials, please go to:	Sarvoda Construction Store Address: Sarvoda town (near hospital)	Uppon village market Address: Upponi Bolo village, Oshoba jamoat.
For more information and consultation, please contact:	Sirojiddinov Asliddin jamoat Fondaryo Phone: 92-764-20-52.	Abdulloev Faizullo jamoat Oshoba Phone: 92-727-06-51.



European Union



French Development Agency



Women in Europe for a Common Future



German cooperation



Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH



UKAID



Abbé Pierre Foundation



Groupe Energies Renouvelables, Environnement et Solidarités



Agency for Support Development Process Nau

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