A solar oven or solar cooker is a device which uses sunlight as its energy source. Because they use no fuel and they cost nothing to run, humanitarian organizations are promoting their use worldwide to help slow deforestation and desertification, caused by using wood as fuel for cooking. Solar Cookers are a form of outdoor cooking and are often used in situations where minimal fuel consumption is important, or the danger of accidental fires is high.
Types

There are a variety of types of solar cookers: over 65 major designs and hundreds of variations of them. The basic principles of all solar cookers are:

- Concentrating sunlight: Some device, usually a mirror or some type of reflective metal, is used to concentrate light and heat from the sun into a small cooking area, making the energy more concentrated and therefore more potent.
- Converting light to heat: Any black on the inside of a solar cooker, as well as certain materials for pots, will improve the effectiveness of turning light into heat. A black pan will absorb almost all of the sun's light and turn it into heat, substantially improving the effectiveness of the cooker. Also, the better a pan conducts heat, the faster the oven will work.
- Trapping heat: Isolating the air inside the cooker from the air outside the cooker makes an important difference. Using a clear solid, like a plastic bag or a glass cover, will allow light to enter, but once the light is absorbed and converted to heat, a plastic bag or glass cover will trap the heat inside. This makes it possible to reach similar temperatures on cold and windy days as on hot days.
- Plastic Sheet: Uses plastic sheets to assure that liquids do not seep through into the oven. Also to prevent staining of the underlying sheet in the oven.

Alone, each of these strategies for cooking something using solar energy is fairly ineffective, but most solar cookers use two or all three of these strategies in combination to get temperatures sufficient for cooking.
The top can usually be removed to allow dark pots containing food to be placed inside. One or more reflectors of shiny metal or foil-lined material may be positioned to bounce extra light into the interior of the oven chamber. Cooking containers and the inside bottom of the cooker should be dark-colored or black. Inside walls should be reflective to reduce radiative heat loss and bounce the light towards the pots and the dark bottom, which is in contact with the pots.
Box cookers

Insulator for the solar box cooker has to be able to withstand temperatures up to 150°C (300 °F) without melting or off-gassing. Crumpled newspapers, wool, rags, dry grass, sheets of cardboard, etc. can be used to insulate the walls of the cooker, but since most of the heat escapes through the top glass or plastic, very little insulation in the walls is necessary. The transparent top is either glass, which is durable but hard to work with, or an oven cooking bag, which is lighter, cheaper,
and easier to work with, but less durable. If dark pots and/or bottom trays cannot be located, these can be darkened either with flat-black spray paint (one that is non-toxic when warmed), black tempera paint, or soot from a fire.

The solar box cooker typically reaches a temperature of 150 °C (300 °F). This is not as hot as a standard oven, but still hot enough to cook food over a somewhat longer period of time. Food containing a lot of moisture cannot get much hotter than 100 °C (212 °F) in any case, so it is not always necessary to cook at the high temperatures indicated in standard cookbooks. Because the food does not reach too high a temperature, it can be safely left in the cooker all day without burning. It is best to start cooking before noon, though. Depending on the latitude and weather, food can be cooked either early or later in the day. The cooker can be used to warm food and drinks and can also be used to pasteurize water or milk. If you use an indoor stove for your actual cooking, you can save significant fuel by using the solar cooker to preheat the water to be used for cooking grains, soups, etc., to nearly boiling.

Solar box cookers can be made of locally available materials or be manufactured in a factory for sale. They range from small cardboard devices, suitable for cooking a single meal when the sun is shining, to wood and glass boxes built into the sunny side of a house. Although invented by Horace de Saussure, a Swiss naturalist, as early as 1767, solar box cookers have only gained popularity since the 1970s. These surprisingly simple and useful appliances are seen in growing numbers in almost every country of the world. An index of detailed wiki pages for each country can be found here.
Panel cookers

Panel solar cookers are very inexpensive solar cookers that use shiny panels to direct sunlight to a cooking pot that is enclosed in a clear plastic bag. A common model is the CooKit. Developed in 1994 by Solar Cookers International, it is often produced locally by pasting a reflective material, such as aluminum foil, onto a cut and folded backing, usually corrugated cardboard. It is lightweight and folds for storage. When completely unfolded, it measures about three feet by four feet (1 m by 1.3 m). Using materials purchased in bulk, the typical cost is about US$5. However, CooKits can also be made entirely from reclaimed materials, including used cardboard boxes and foil from the inside of cigarette boxes.
Solar kettles

Solar kettles are solar thermal devices that can heat water to boiling point through the reliance on solar energy alone. Some of them use evacuated solar glass tube technology to capture, accumulate and store solar energy needed to power the kettle. Besides heating liquids, since the stagnating temperature of solar vacuum glass tubes is a high 220 °C (425 °F), solar kettles can also deliver dry heat and function as ovens and autoclaves. Moreover, since solar vacuum glass tubes work on accumulated rather than concentrated solar thermal energy, solar kettles only need diffused sunlight to work and needs no sun tracking at all. If solar kettles use solar vacuum tubes technologies, the vacuum insulating properties will keep previously heated water hot throughout the night e.g. the SK-TF.
**Cookers with parabolic reflectors**

Although these types of solar cookers can cook as well as a conventional oven, they are difficult to construct. Parabolic cookers reach high temperatures and cook quickly, but require frequent adjustment and supervision for safe operation. Several hundred thousand exist, mainly in China. They are especially useful for large-scale institutional cooking.

Parabolic reflectors that have their centres of mass coincident with their focal points are useful. They can be easily turned, to follow the sun's motions in the sky, rotating about an axis that passes through the focus. The cooking pot therefore stays stationary. If the paraboloid is axially symmetrical and is made of material of uniform thickness, this condition occurs if the depth of the paraboloid is $1.8478$ times its focal length.
Using a solar cooker

The different kinds of solar cookers have somewhat different methods for use, but most follow the same basic principles.

Food is prepared as it would be for an oven or stove top. Because food cooks faster when it is in smaller pieces, solar cookers usually cut the food into smaller pieces than they might otherwise. For example, potatoes are usually cut into bite-sized pieces rather than being roasted whole. For very simple cooking, such as melting butter or cheese, a lid may not be needed and the food may be placed on an uncovered tray or in a bowl. If several foods are to be cooked separately, then they are placed in different containers.

The container of food is placed inside the solar cooker, perhaps elevated on a brick, rocks, metal trivet, or other heat sink, and the solar cooker is placed in direct sunlight. If the solar cooker is entirely in direct sunlight, then the shadow of the solar cooker will not overlap with the shadow of any nearby object. Foods that cook quickly may be added to the solar cooker later. Rice for a mid-day meal might be started early in the morning, with vegetables, cheese, or meat added to the solar cooker in the middle of the morning. Depending on the size of the solar cooker and the number and quantity of cooked foods, a family may use one or more solar cookers.

The solar cooker is turned towards the sun and left until the food is cooked. Unlike cooking on a stove or over a fire, which may require more than an hour of constant supervision, food in a solar cooker is generally not stirred or turned over, both because it is unnecessary and because opening the solar cooker allows the trapped heat to escape and thereby slows the cooking process. If wanted, the solar cooker may be checked every one to two hours, to turn the cooker to face the sun more precisely and to ensure that shadows from nearby buildings or plants have not blocked the sunlight. If the food will be left untended for many hours during the day, then the solar cooker is often turned to face the point where the sun will be when it is higher in the sky, instead of towards its current position.
The cooking time depends primarily on the equipment being used, the amount of sunlight at the time, and the quantity of food that needs to be cooked. Air temperature, wind, and latitude also affect performance. Food cooks faster in the two hours before and after the local solar noon than it does in either the early morning or the late afternoon. Larger quantities of food, and food in larger pieces, take longer to cook. As a result, only general figures can be given for cooking time. For a small solar panel cooker, it might be possible to melt butter in 15 minutes, to bake cookies in 2 hours, and to cook rice for four people in 4 hours. However, depending on the local conditions and the solar cooker type, these projects could take half as long, or twice as long.

It is difficult to burn food in a solar cooker. Food that has been cooked even an hour longer than necessary is usually indistinguishable from minimally cooked food. The exception to this rule is some green vegetables, which quickly change from a perfectly cooked bright green to olive drab, while still retaining the desirable texture.

For most foods, such as rice, the typical person would be unable to tell how it was cooked from looking at the final product. There are some differences, however: Bread and cakes brown on their tops instead of on bottom. Compared to cooking over a fire, the food does not have a smoky flavor.
Disadvantages

Solar cooking is a new approach to cooking in many parts of the world, so a big challenge is social acceptance of this totally new approach and abandonment of traditional cooking methods, such as the three-stone fire.

Solar cookers provide hot food during or shortly after the hottest part of the day, when people are less inclined to eat a hot meal. However, a thick pan that conducts heat slowly (such as Cast Iron) will lose heat at a slower rate, and that, combined with the insulation of the oven or an insulated basket, can be used to keep food warm well into the evening.

Solar cookers take longer time to cook food compared to an oven. Using a solar oven therefore requires that food preparation be started several hours before the meal. However, it requires less hands-on time cooking, so this is often considered a reasonable trade-off.

Solar cookers are less usable in cloudy or rainy weather, so some fuel-based backup heat source must still be available to cook food at these times.

Some solar cooker designs are affected by strong winds, which cool the food and can disturb the reflector.
Darfur refugee camps

Cardboard, aluminum foil, and plastic bags for well over 10,000 solar cookers have been donated to the Iridimi refugee camp and Touloum refugee camps in Chad by the combined efforts of the Jewish World Watch, the Dutch foundation KoZon, and Solar Cookers International. The refugees construct the cookers themselves, using the donated supplies and locally purchased Arabic gum, and use them for midday and evening meals. The goal of this project was to reduce the Darfuri women's need to leave the relative safety of the camp to gather firewood, which exposed them to a high risk of being beaten, raped, kidnapped, or murdered. It has also significantly reduced the amount of time women spend tending open fires each day, with the results that they are healthier and they have more time to grow vegetables for their families and make handicrafts for export. By 2007, the Jewish World Watch had trained 4,500 women, and had provided 10,000 solar cookers to refugees. The project has also reduced the number of foraging trips by as much as 70 percent, thus reducing the number of attacks.

Indian solar cooker village

Bysanivaripalle, a silk-producing village that is 125 km (80 mi) northwest of Tirupati in the Indian state of in Andhra Pradesh, is the first of its kind: an entire village that uses only solar cooking. Intersol, an Austrian non-governmental organisation, sponsored the provision of powerful "Sk-14" parabolic solar cookers in 2004.

Gaza

Some Gazans have started to make solar cookers in order to cook their meals, due to a lack of cooking fuels. The cooker is made from cement bricks, mud mixed with straw and two sheets of glass. About 40 to 45 Palestinian households are said to have started using these solar cookers.