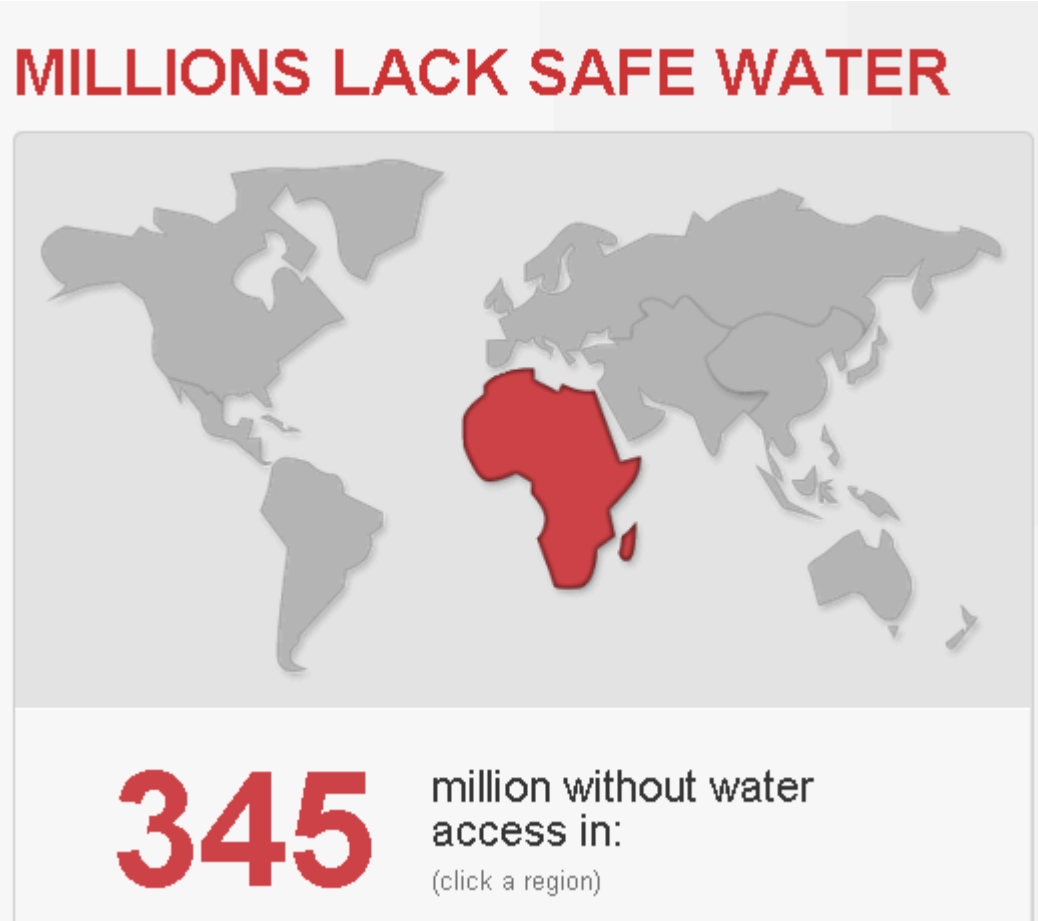
IMPACT LABS NIGERIA

WATER

INTRODUCTION

THE SITUATION ON THE CONTINENT



- Lack of access to clean water and sanitation kills children at a rate equivalent of a jumbo jet crashing every four hours.[1]
- In just one day, it is estimated that more than 152 million hours of women and girls' time is consumed for the most basic of human needs — collecting water for domestic use.[2]

1. http://water.org/water-crisis/water-facts/water/
2. http://water.org/water-crisis/water-facts/women/

THE IMPACT

HEALTH AND SANITATION

Diseases from unsafe water and lack of basic sanitation kill more people every year than all forms of violence, including war. Children are especially vulnerable, as their bodies aren't strong enough to fight diarrhea, dysentery and other illnesses.

90% of the 30,000 deaths that occur every week from unsafe water and unhygienic living conditions are in children under five years old. The WHO reports that over 3.6% of the global disease burden can be prevented simply by improving water supply, sanitation, and hygiene.

WATER IN NIGERIA

63.2M

people in Nigeria don't have access to safe water.

Over 112 million people don't have access to adequate sanitation in Nigeria, two thirds of the population.

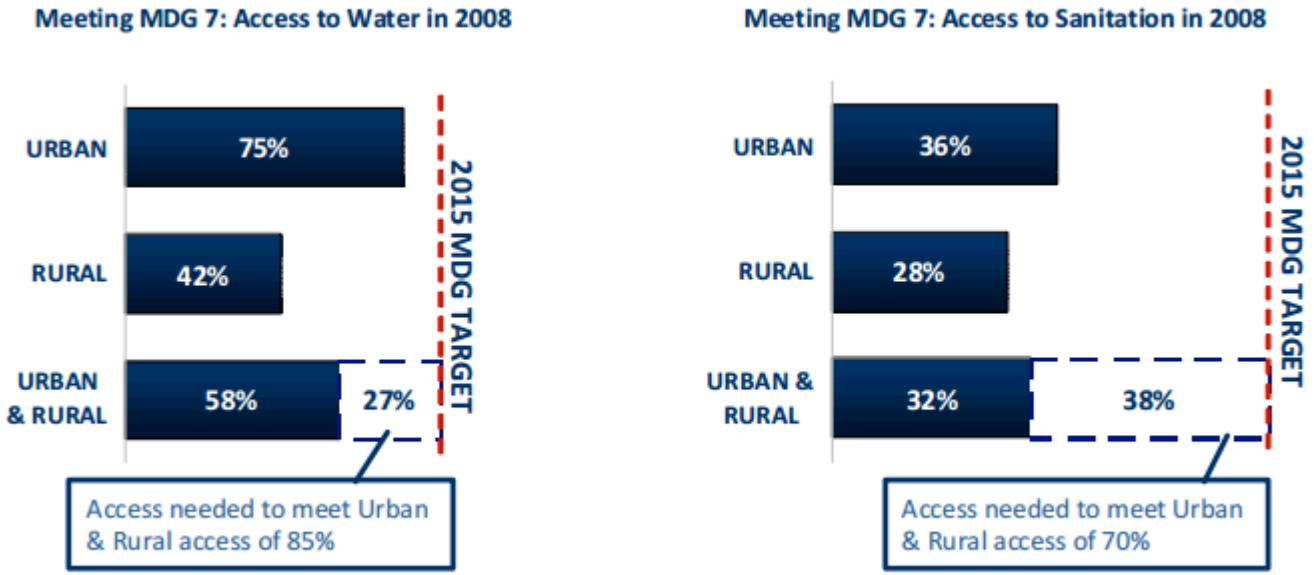
97,000

Over 97,000 children die every year from diarrhoea caused by unsafe water and poor sanitation in Nigeria.

DONOR INVOLVEMENT :

- Nigeria receives less aid than other sub-Saharan countries, but the country still has multiple international development agencies playing a role in Nigeria's Water Supply and Sanitation sector.
- Current Donors include: DFID, United Nations, African Development Bank (AfDB), World Bank, and European Commission

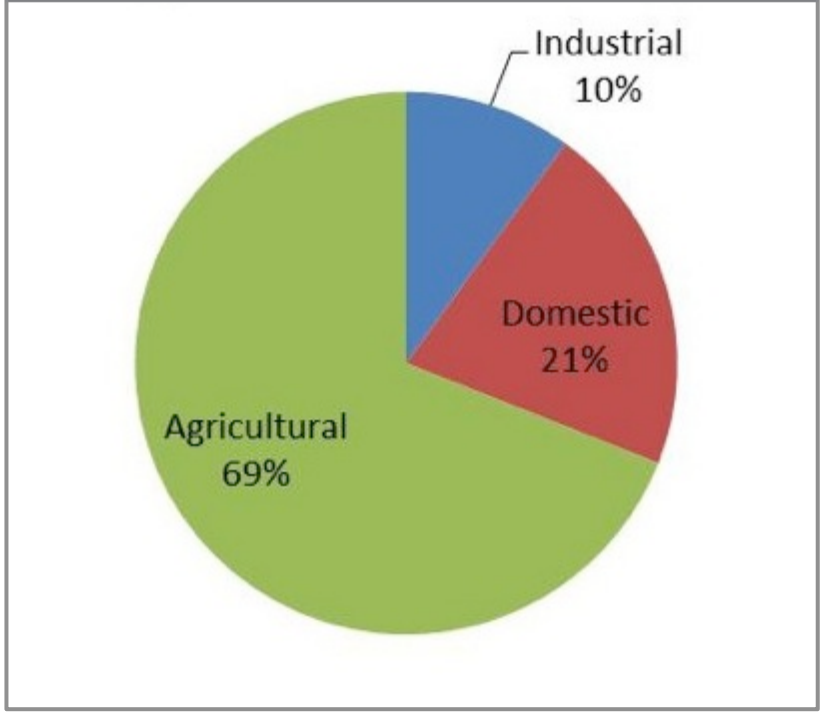
ACCESS TO WATER IN NIGERIA



Data Source: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP), *Progress on Sanitation and Drinking Water, 2010 Update.*
Note on comparing baseline data from earlier reports: The JMP methodology uses all available data in each successive report. This means that estimates may be recalculated for earlier years if more data becomes available. The JMP notes that these new estimates may affect the baseline reported in earlier data sets.

USES OF WATER IN NIGERIA

Nigeria's water usage

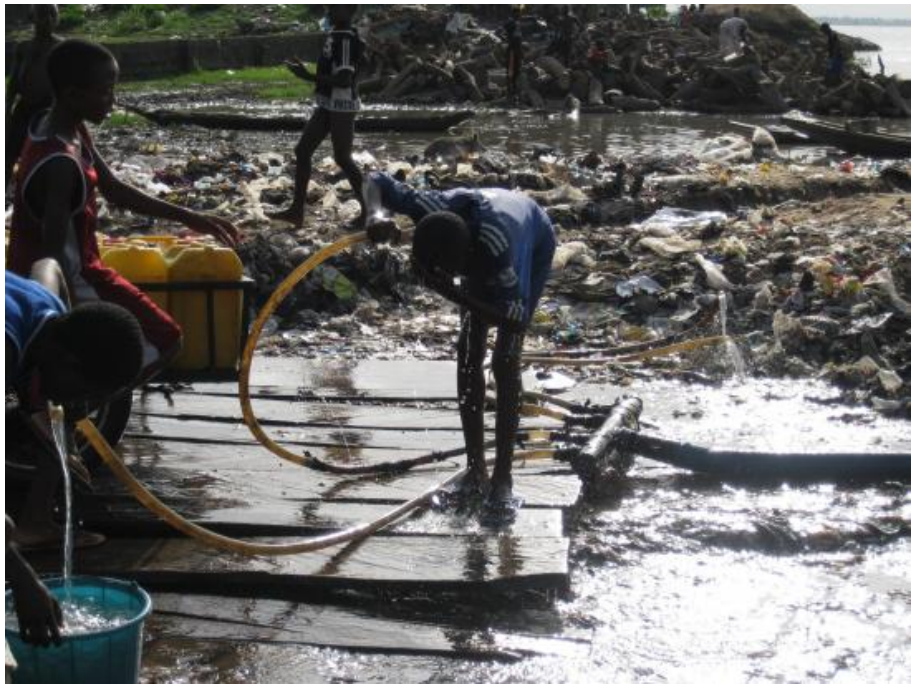


- In Lagos alone, only 4% of households use household plumbing connections as the primary source of water, and 79% of Lagos' citizens do not have access to water-borne sewerage.
- A U.N. study on Nigeria's irrigation systems found that out of 62 farms, 75% run on surface schemes (canals and drainage systems), 19% are run on sprinkler systems, and 6% of them lack a true irrigation system (FAO). These techniques, although practical for farmers, are not very efficient.
- Nigeria gets only 1% of its total energy from hydroelectric power.

MAKOKO, NIGERIA

- Residents of Makoko, Nigeria, an area in Lagos has been nicknamed the “Venice of Africa”
- Most residents in Makoko, however, lack access to clean drinking water
- As quoted from a resident, “"*We use it for drinking, cooking and even bathing. But if you let the water stand overnight it turns red. I think that's because we don't have good technology to get clean water from the ground.*“

BENUE STATE



- In Benue, safe drinking water remains a luxury. Pipe-borne water in Makurdi, the state's capital, is practically absent and where it is available, the supply is erratic and the bulk of the pipe network is old and rusty.
- Most residents rely on yard wells, water vendors and polluted streams that can be contaminated with human waste and disease-causing bacteria.

WHERE IS ALL OF OUR WATER?

Water source	Barriers to access	Possible solutions
Ocean	• Excessive salt content • Remote location	• Desalination
Fresh water	• Unsanitary	• Filtration
Ground water	• Difficult and expensive to reach (due to depth)	• Purification • Cost-effective wells
Rain	• Unpredictability of supply	• Collection
Dew/ natural moisture	• Difficult to harness in substantial quantities	• Specialized membranes

In their current form, the world's currently available water sources are insufficient to meet the projected needs of our growing population

WHY DO WE NEED WATER INNOVATION?

Human health	Economic impact	Scientific potential
		

IMPACT LABS NIGERIA

WATER

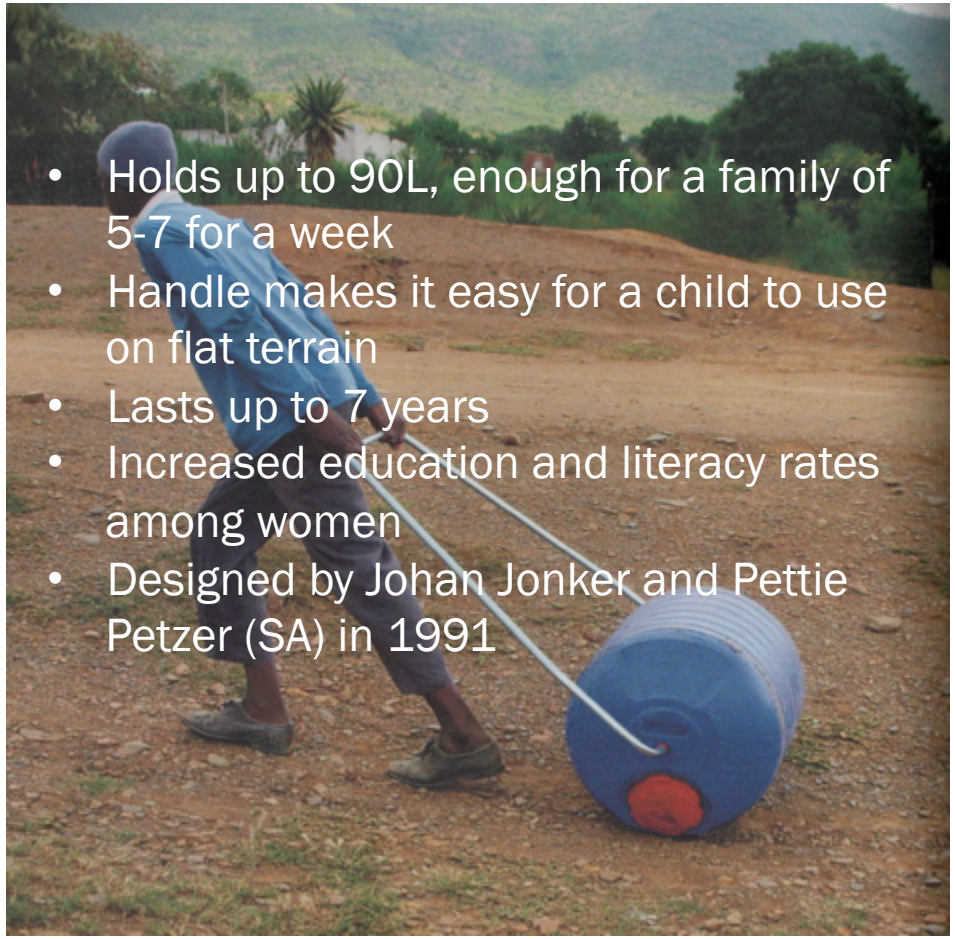
EXAMPLES OF INNOVATION

HIPPO WATER ROLLER

What are the ways that poor families transport water? How often? From what distance?

What do you think are the effects of carrying water on one's head?

How do you think the problem of access to water can be solved/ ameliorated?



Credit: Design Revolution

LIFESTRAW PERSONAL

- Instant, microbiological, point-of-use filtration system
- Cleans 18000L of water in its lifetime
- Removes 99.9999% of bacteria, 99.99% of viruses and 99.9% of parasites
- Requires no batteries, power or spare parts
- Costs $20
- Made by Danish company Vestergaard Frandsen

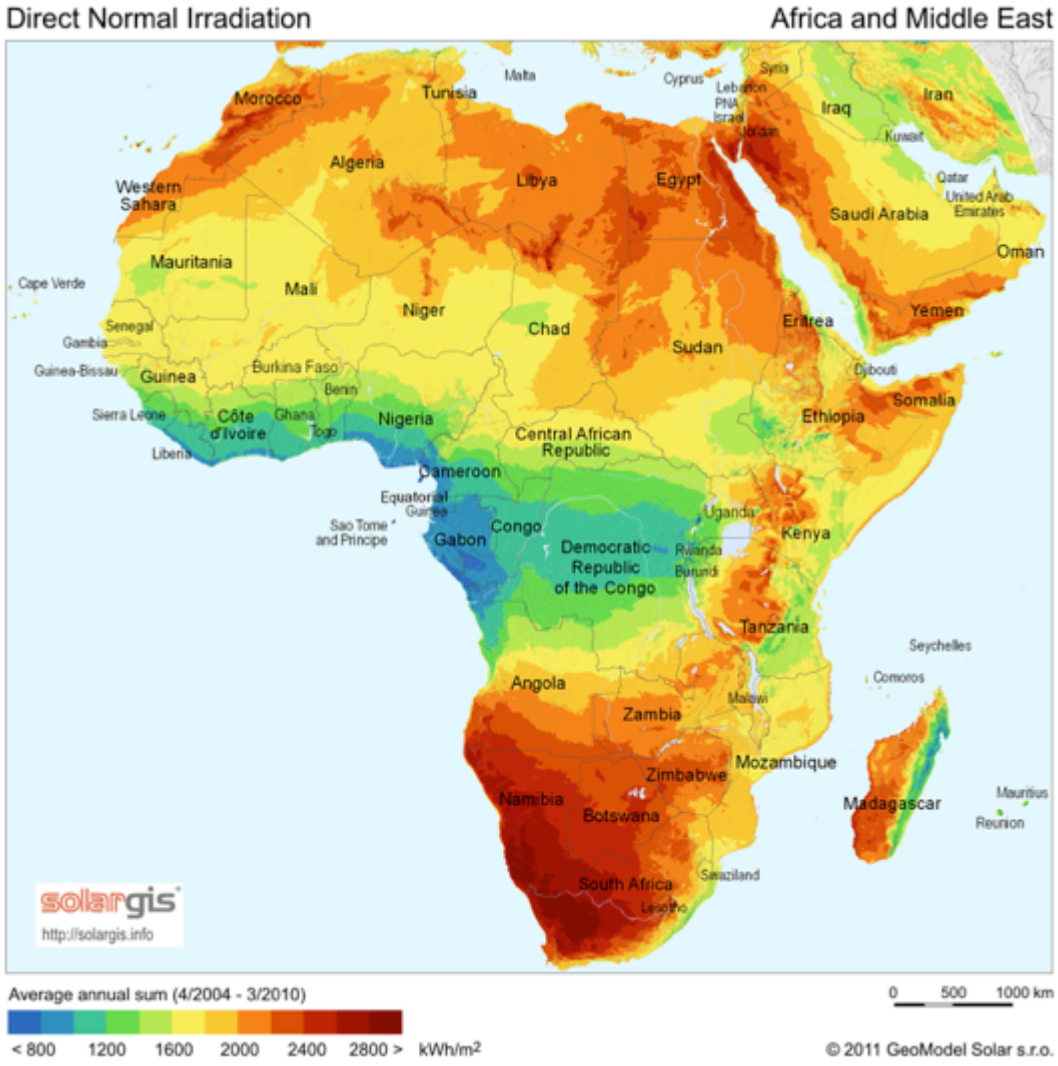
Credit: Design Revolution

IMPACT LABS NIGERIA

SOLAR WATER HEATING

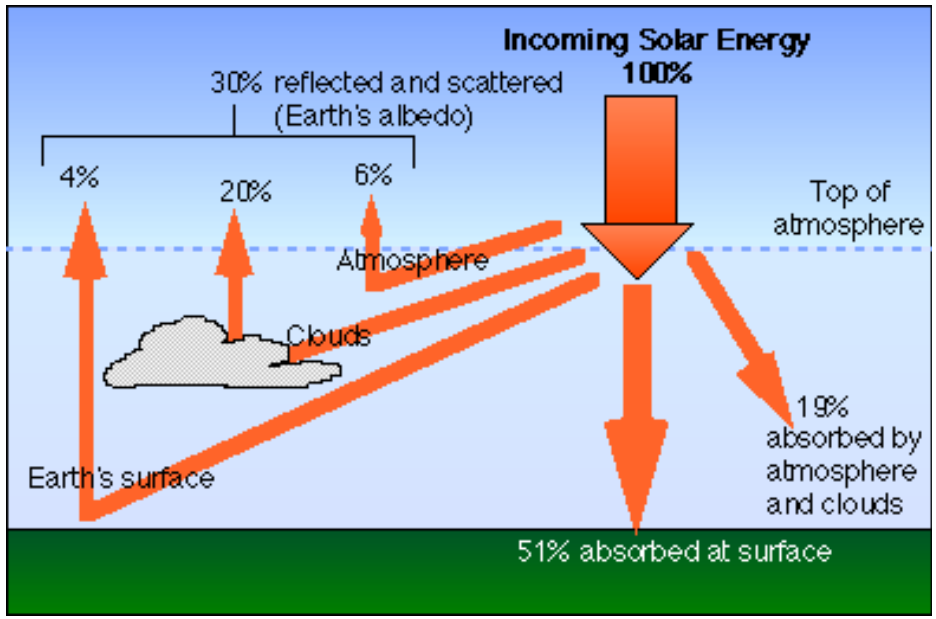
INTRODUCTION

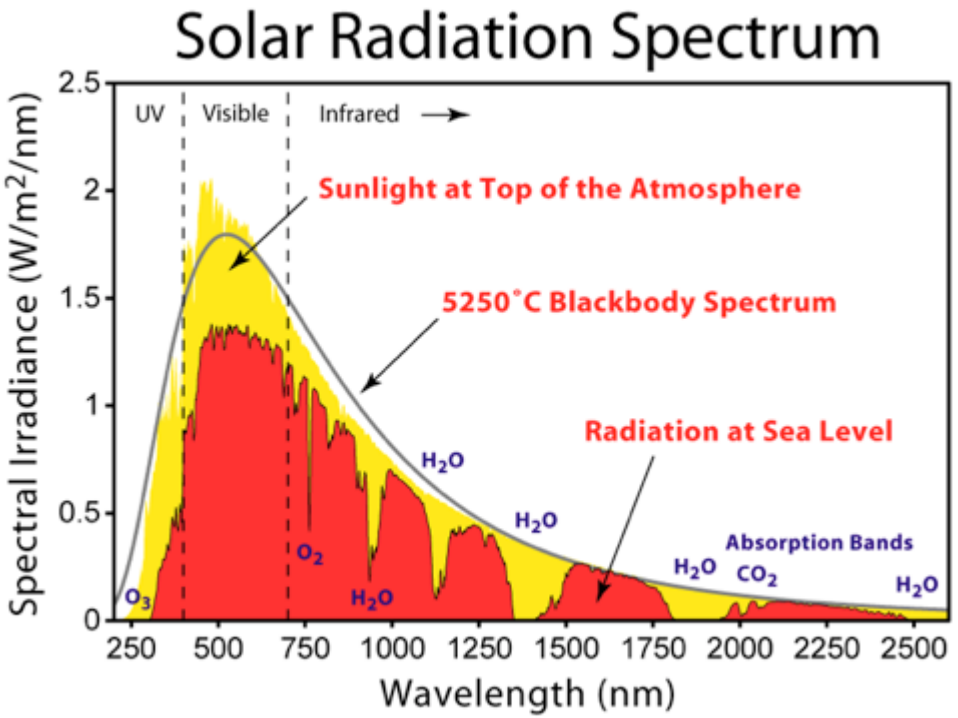
AN INTRODUCTION TO SOLAR ENERGY



Credit: Solargis.com

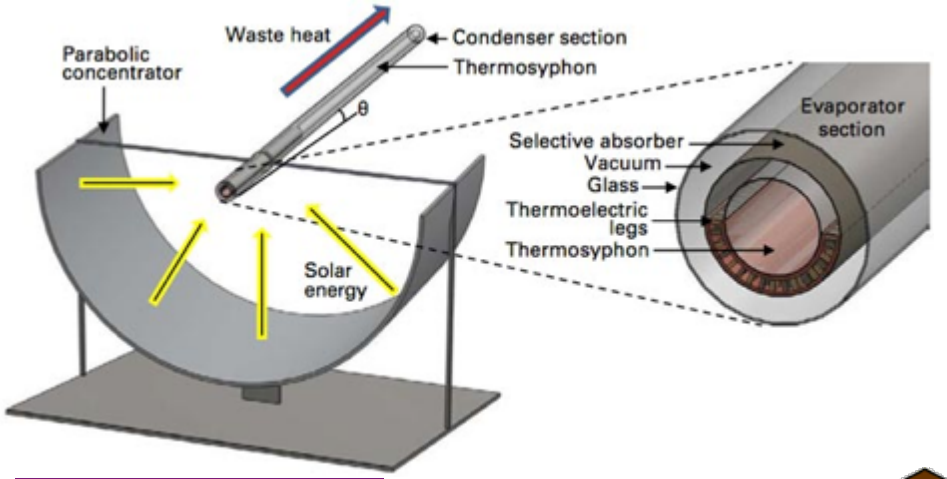
AN INTRODUCTION TO SOLAR ENERGY





Credit: Solargis.com, Wikipedia

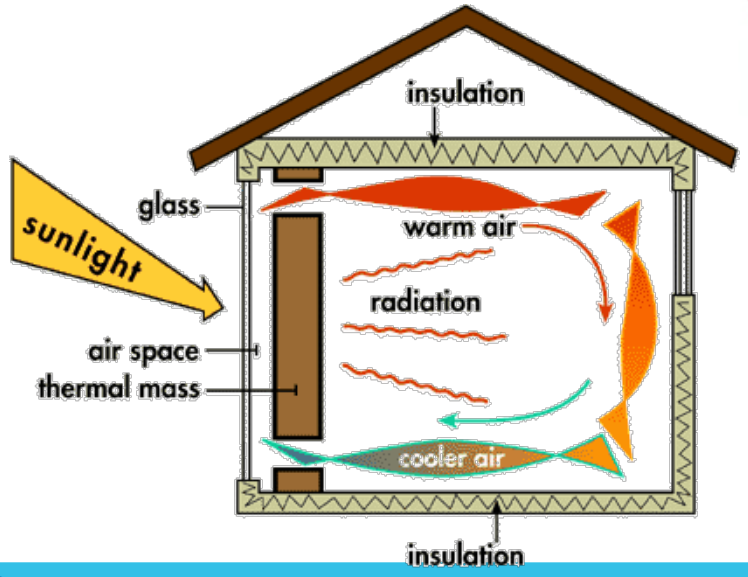
WAYS TO CAPTURE SOLAR ENERGY



Concentration

Solar panels

Passive



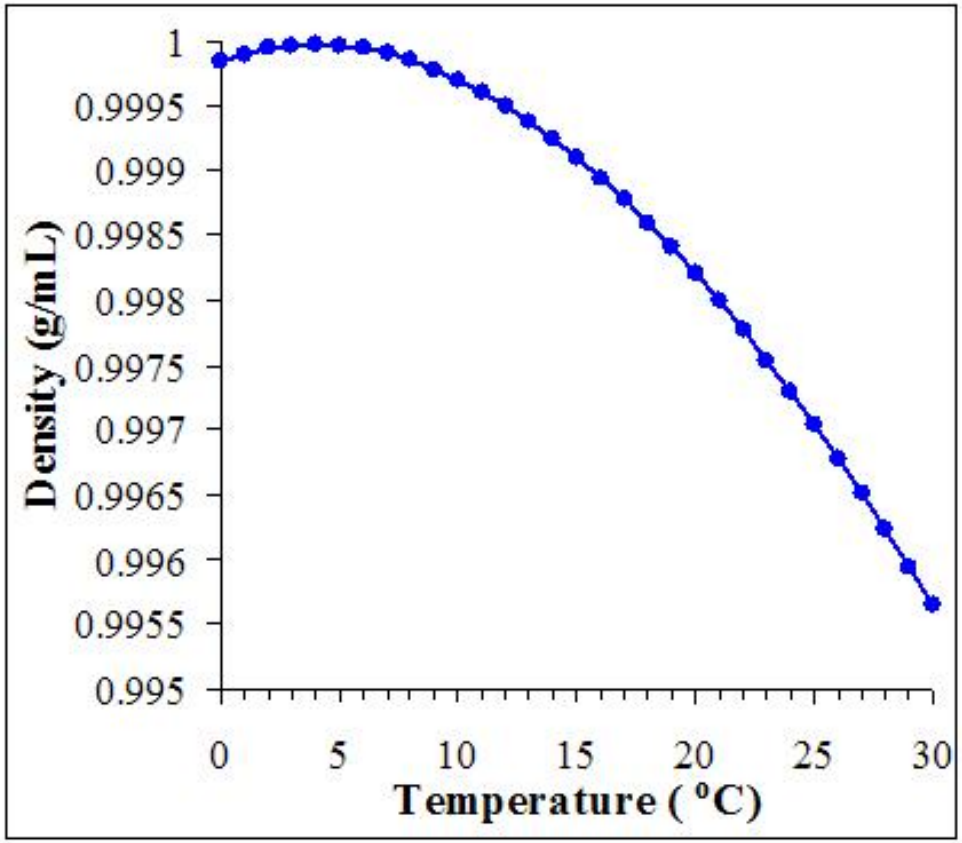
SOLAR WATER HEATING

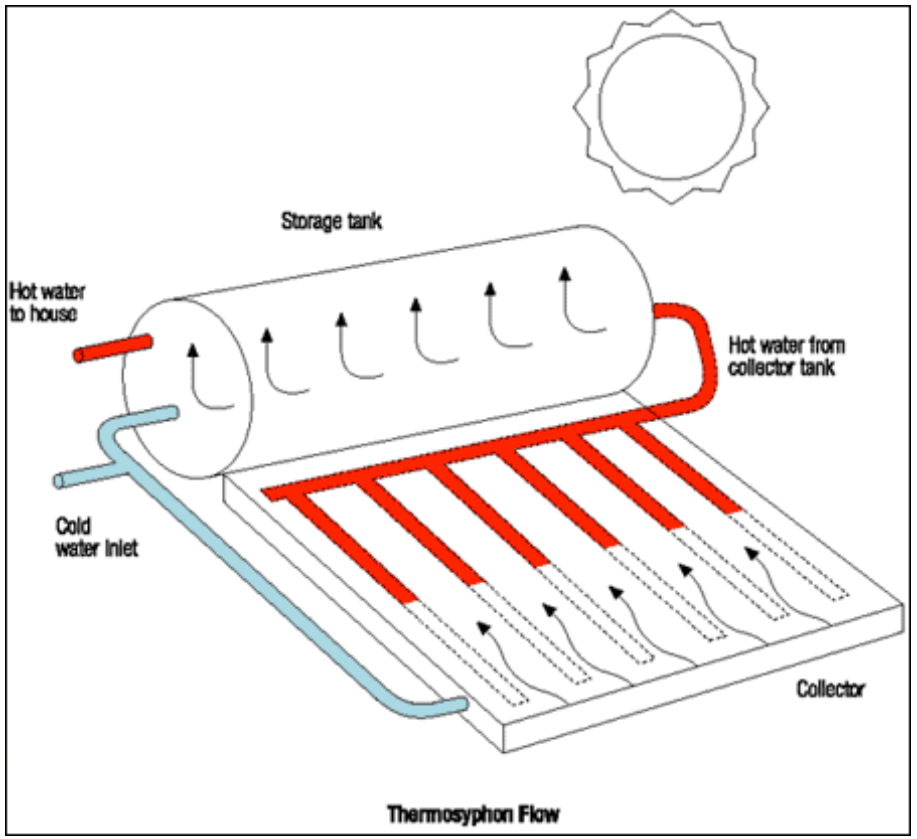
Where is it really necessary?

Why is it really necessary?

Where can it be setup?

CONCEPTS TO UNDERSTAND – WATER DENSITY





Credit: Wikipedia

CONCEPTS TO UNDERSTAND – THERMAL RADIATION

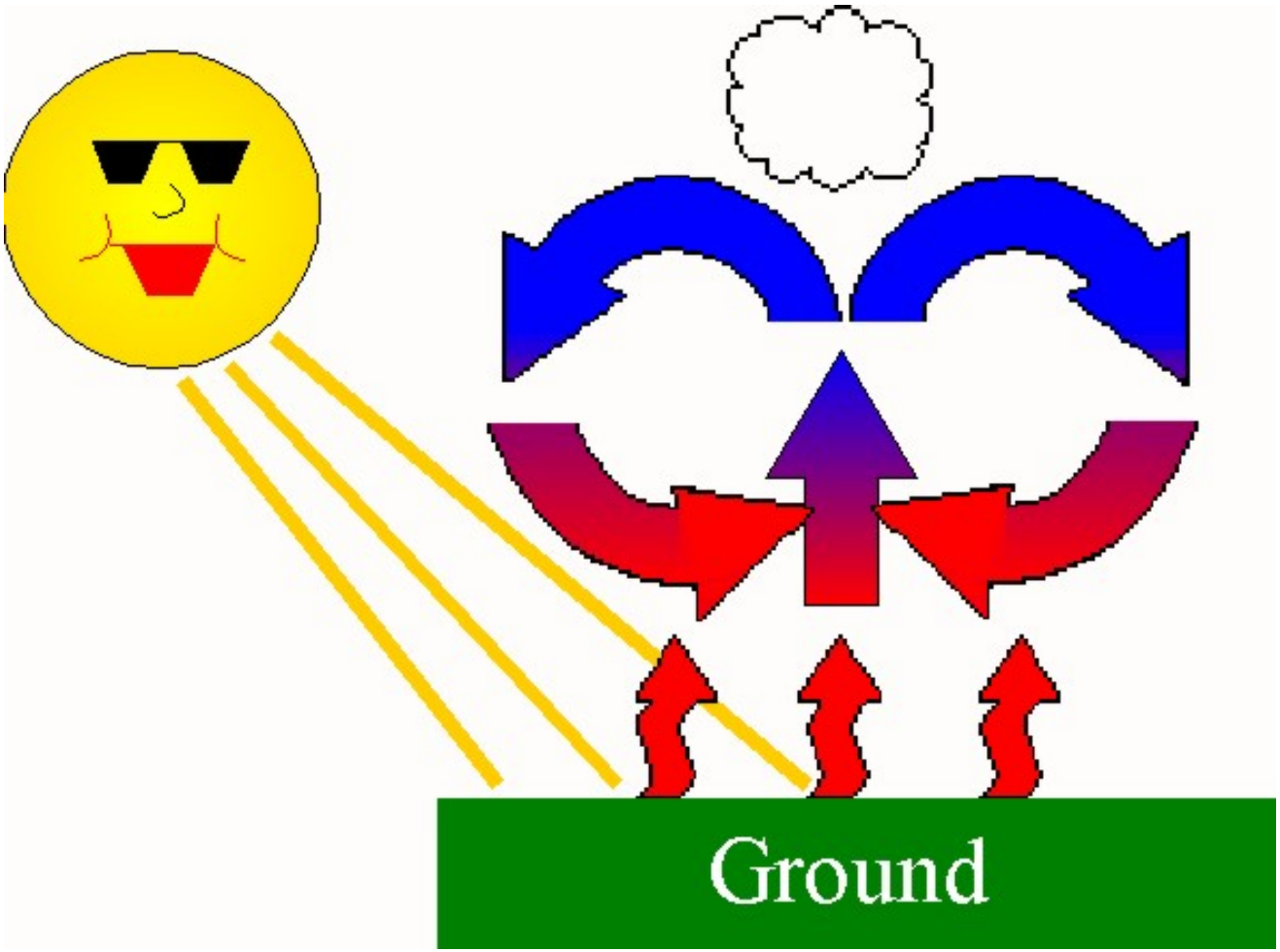
Physics 101

A perfect emitter of thermal radiation is a perfect absorber of thermal radiation

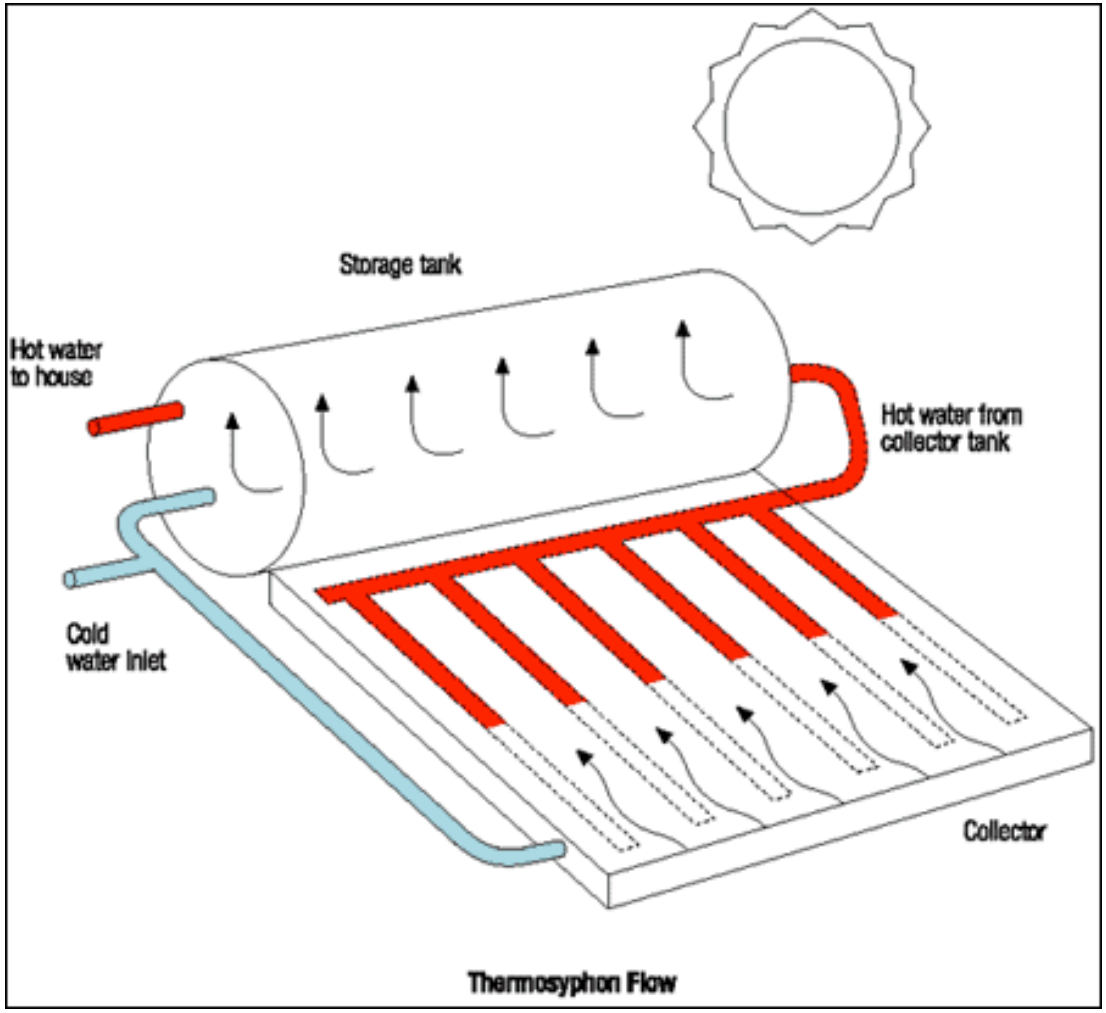
Therefore:

- White surfaces are good reflectors and bad absorbers
- Black surfaces are bad reflectors and good absorbers

CONCEPTS TO UNDERSTAND – CONVECTION



SOLAR WATER HEATING DESIGN



Credit: Wikipedia

SOLAR WATER HEATING – HOW TO

Materials:

1/2" pipes - 12m

1/2" tees - 16

1/2" elbows - 6 1/2"

Male-female connectors - 3

A bucket (or two)

Rubber tubes (for the washers)

Plastics glue

Black enamel paint

Transparent bags (for glazing)

Tools:

Pipe cutters

Scissors

Knife

Clamps

Measuring tape

TWO PARTS

Tank system

External piping system

STEP 1

Think of this device in two parts: the external piping system and the tank (here, a bucket). We begin with the external piping system.

Cut the pipes to the desired lengths. For this demonstration, eight ~1.2m should be fine. *All eight pipes should be exactly equal.*

STEP 2

Now we cut the small pieces of pipes between the long sections. Measure out fourteen ~5cm lengths of pipe and cut them.

STEP 3

We assemble. The outlet and inlet of the piping system should be on one side. It should like like the one on the left:

STEP 4

Now the tank. For this demonstration, we use a regular bucket. Gather the male-female connectors, make washers from the tubes (make sure the holes in the washers are much small than the 1/2")

First, we cut holes at the approximate positions of the inlet and outlet. The holes should be slightly smaller than 1/2". Should the inlet or the outlet be the higher hole? Put in the connectors as shown.

STEP 5

Almost there!

We now connect the piping system to the tank. Figure out where the tank will be placed and construct an appropirate system of pipes to connect the tank to the rest of the device. Set the piping system at some angle to the horizontal (why?). Here is an example:

STEP 6

We are basically done. A couple of things to do:

- Paint the piping system black (why?)

- Disconnect all parts and glue them together. Be sure you are satisfied with all the lengths and the final configuration.

- We want the piping system to heat up in the sun, right? How do we make sure the heating is efficient? How do make sure we dont lose heat in the tank? Come up with your ideas!

- Test your device. How did it perform (figure out what the metrics are)? How can you improve it?