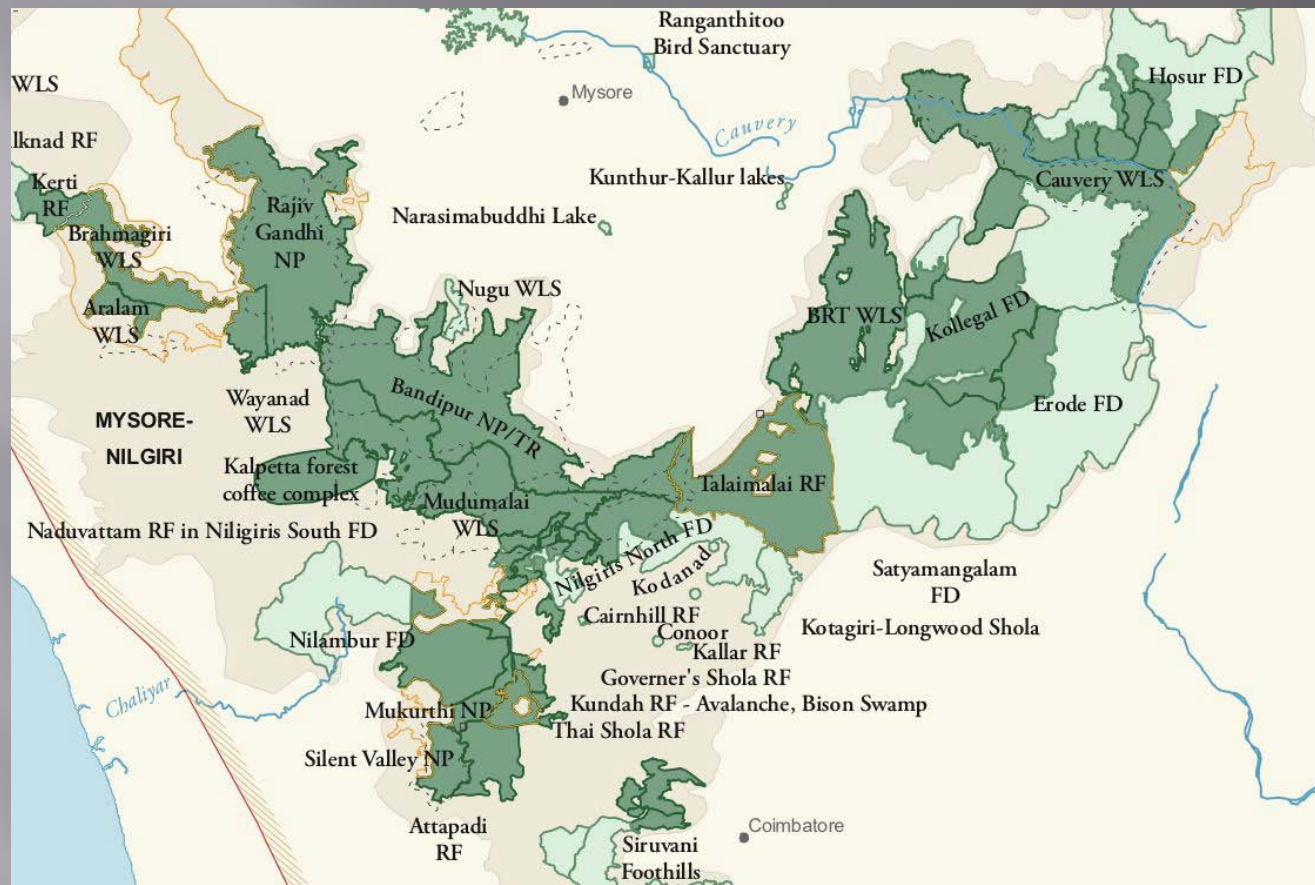


How can we do our part to help reduce global warming and save the planet

- Jacob A Thundathil P. Eng.



SILENT VALLEY NATIONAL PARK



The park is one of the last undisturbed tracts of South Western Ghats mountain rain forests and tropical moist evergreen forest in India. It is the core of the Nilgiri International Biosphere Reserve / Western Ghats World Heritage Site recognised by UNESCO

The Silent Valley is the largest national park in Kerala.
 Silent Valley is considered one of the most ecologically diverse areas on the planet.

Why the controversy

- ▣ In 1973 the valley became the focal point of "Save Silent Valley", India's fiercest environmental movement of the decade, when the Kerala State Electricity Board decided to implement the Silent Valley Hydro-Electric Project (SVHEP) centered on a dam across the Kunthipuzha River. The resulting reservoir would flood the virgin rainforest and threaten the lion-tailed macaque. In 1976 the Kerala State Electricity Board announced plans to begin dam construction and the issue was brought to public attention.
- ▣ In 1983 the then Prime Minister of India, Indira Gandhi, decided to abandon the Project and on November 15 the Silent Valley forests were declared as a National Park.

THE TICKING CO₂ CLOCK

Latest CO₂



Past tipping point?

Have recent concentrations of carbon dioxide in the atmosphere pushed some parts of the climate system beyond their tipping points? And, if so, how deep in trouble are we? This page is a layman's attempt to distil the answers found in current scientific literature.

• Latest •



○ 403.78 PPM

• Last year •



○ 401.73 PPM

• 10 years ago •



○ 382.52 PPM

CO₂ daily and other averages for the last two years (NOAA/ESRL)

SAFE DANGEROUS CATASTROPHIC

Based mainly on Hansen et al. (2008). [More](#)



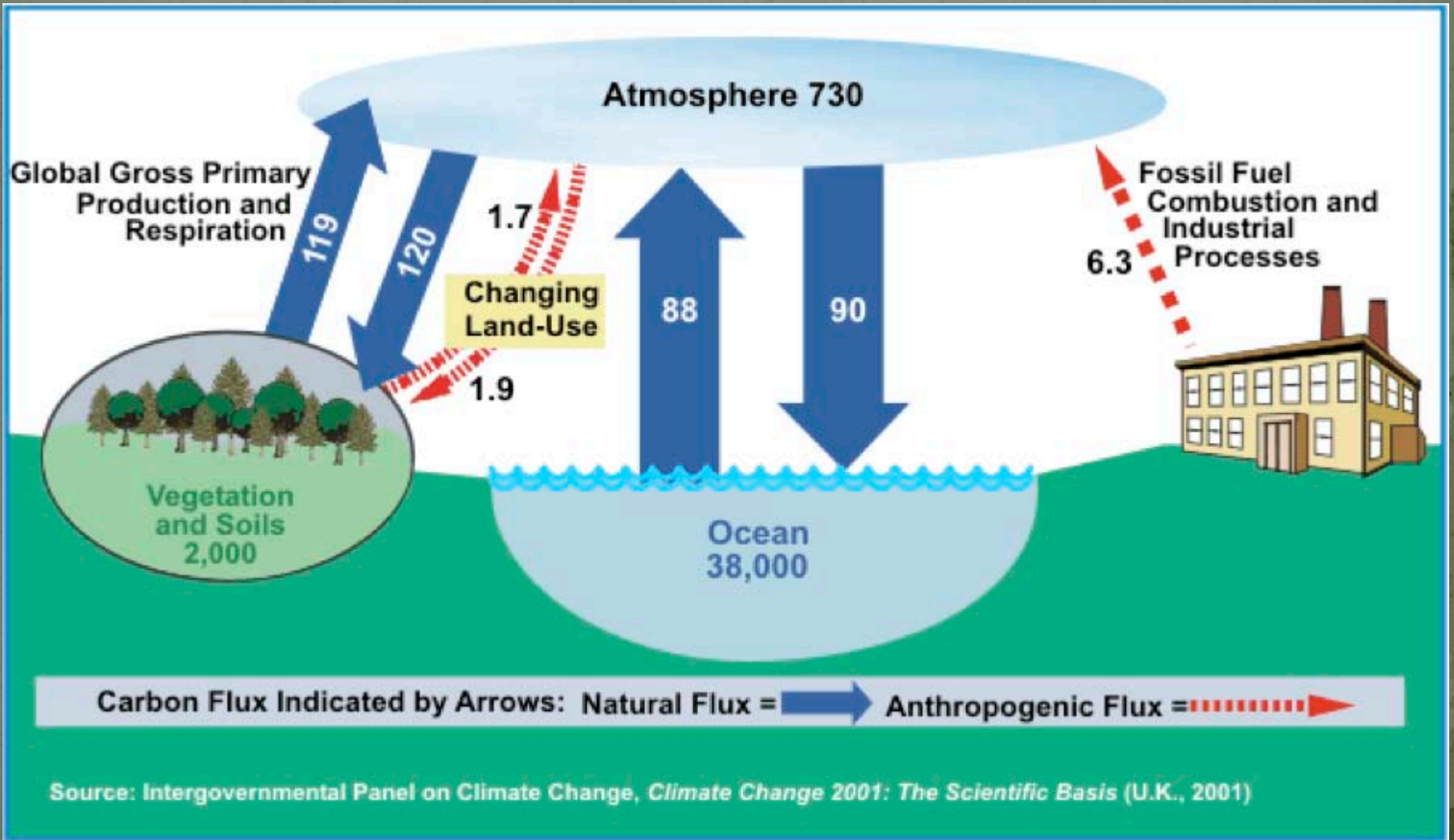
Preliminary data from Mauna Loa Observatory (NOAA). Further details [below](#)

HOW SCARY IS THIS

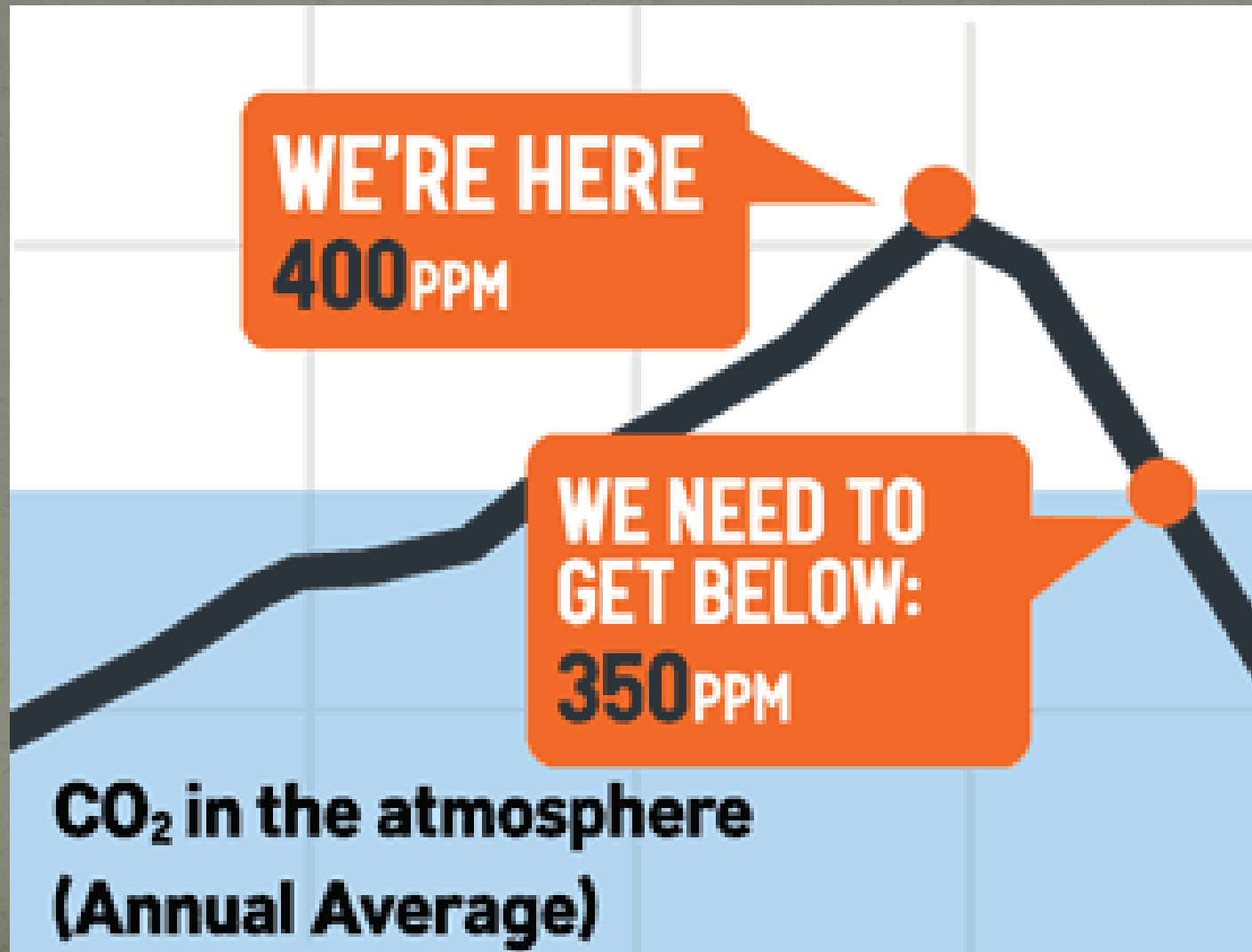
- Greenhouse gas concentrations have moved from the pre-Industrial Revolution level that never exceeded 280 parts per million (ppm) to a new current daily average of 400 ppm.
- It was around 325PPM when we were kids
- Over a period of the last million years, CO₂ never exceeded 280 ppm (based on actual readings of atmospheric chemistry from Antarctic ice-core data). The last time greenhouse gases reached 400 ppm was three million years ago. This before humans existed on this planet

CO₂ FLOW CHART

- QTY IN BILLION TONS



CO₂ TARGET TO AVOID CLIMATE CHANGE





Mercury



Venus

Earth



Mars

Jupiter



Saturn

Uranus



Neptune

SOLAR SYSTEM



PLANET VENUS

CURRENT THEORIES SUGGEST THAT VENUS AND THE EARTH MAY HAVE STARTED OUT ALIKE. THERE MIGHT HAVE BEEN WATER ON VENUS AS MUCH AS EARTH AND SIMILAR AMOUNT OF CARBON DIOXIDE.

WHEN THE SUN WAS IN THE INFANCY, IT WAS 300 DEG COOLER AND 6% SMALLER IN SIZE. HENCE IT GAVE OUT MUCH LESSER HEAT THAN IT DOES TODAY.

DUE TO THIS VENUS COULD HAVE HAD A MORE HOSPITABLE ENVIORNMENT THAN EARTH. IT COULD HAVE POSSIBLY SUPPORTED LIFE

BUT ALL THAT WAS TO CHANGE.
HAPPENED OVER BILLIONS OF YEARS – SUN IS
4.5 BILLION YEARS OLD

AS THE SUN GOT HOTTER, OCEANS GOT
HOTTER, CO₂ GOT EMITTED INTO THE
ATMOSPHERE – CAUSED A RUNAWAY
GREENHOUSE EFFECT. • —————

TODAY NO OCEANS EXIST AS THE SURFACE
TEMPERATURE ON VENUS CAN MELT LEAD –
WATER HAS ALL EVAPORATED WITH JUST
TRACES IN THE ATMOSPHERE

ON EARTH,
EVOLVING LIFE REMOVED ATMOSPHERIC
CARBON-DIOXIDE AND CONVERTED IT TO
FOSSIL FUEL AND LIMESTONE
AS OCEANS COOLED, OCEAN WATERS
ABSORBED CARBON DIOXIDE TO REDUCE THE
LEVEL FURTHER

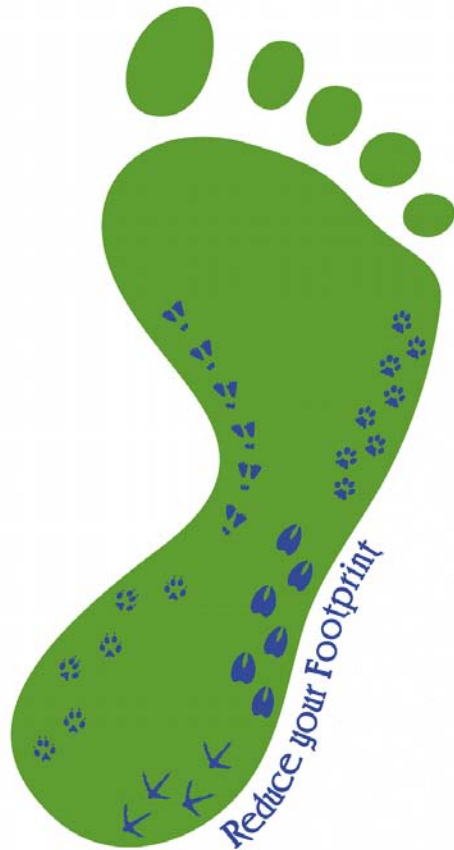
EARTH WILL MEET THE SAME FATE AS VENUS
IN A FEW BILLION YEARS AS THE SUN WILL
BECOME A RED GIANT IN 5 BILLION YEARS.
THAT IS A LONG WAY TO GO SO WE SHOULD
NOT BE BOTHERED

HOWEVER, IT MAY BE NOTED THAT EARTH DID FACE ITS BIGGEST MASS EXTINCTION DUE TO GLOBAL WARMING

PERMIAN-TRIASSIC (P-TR) EXTINCTION EVENT, COLLOQUIALLY KNOWN AS THE GREAT DYING OR THE GREAT PERMIAN EXTINCTION, OCCURRED ABOUT 252 MILLION YEARS AGO, IT IS THE EARTH'S MOST SEVERE KNOWN EXTINCTION EVENT, WITH UP TO 96% OF ALL MARINE SPECIES AND 70% OF TERRESTRIAL VERTEBRATE SPECIES BECOMING EXTINCT. IT IS THE ONLY KNOWN MASS EXTINCTION OF INSECTS. SO MUCH BIODIVERSITY WAS LOST, THE RECOVERY OF LIFE ON EARTH TOOK SIGNIFICANTLY LONGER THAN AFTER ANY OTHER EXTINCTION EVENT, POSSIBLY UP TO 10 MILLION YEARS.

SUGGESTED MECHANISMS FOR THE LATTER INCLUDE ONE OR MORE LARGE IMPACT EVENTS LIKE MASSIVE VOLCANISM, COAL OR GAS FIRES AND EXPLOSIONS FROM THE SIBERIAN TRAPS AND A RUNAWAY GREENHOUSE EFFECT TRIGGERED BY SUDDEN RELEASE OF METHANE FROM THE SEA FLOOR DUE TO METHANE CLATHRATE DISSOCIATION OR METHANE-PRODUCING MICROBES KNOWN AS METHANOGENS; ^{but} POSSIBLE CONTRIBUTING GRADUAL CHANGES INCLUDE SEA-LEVEL CHANGE, INCREASING ANOXIA, INCREASING ARIDITY, AND A SHIFT IN OCEAN CIRCULATION DRIVEN BY CLIMATE CHANGE.

Our ecological footprint

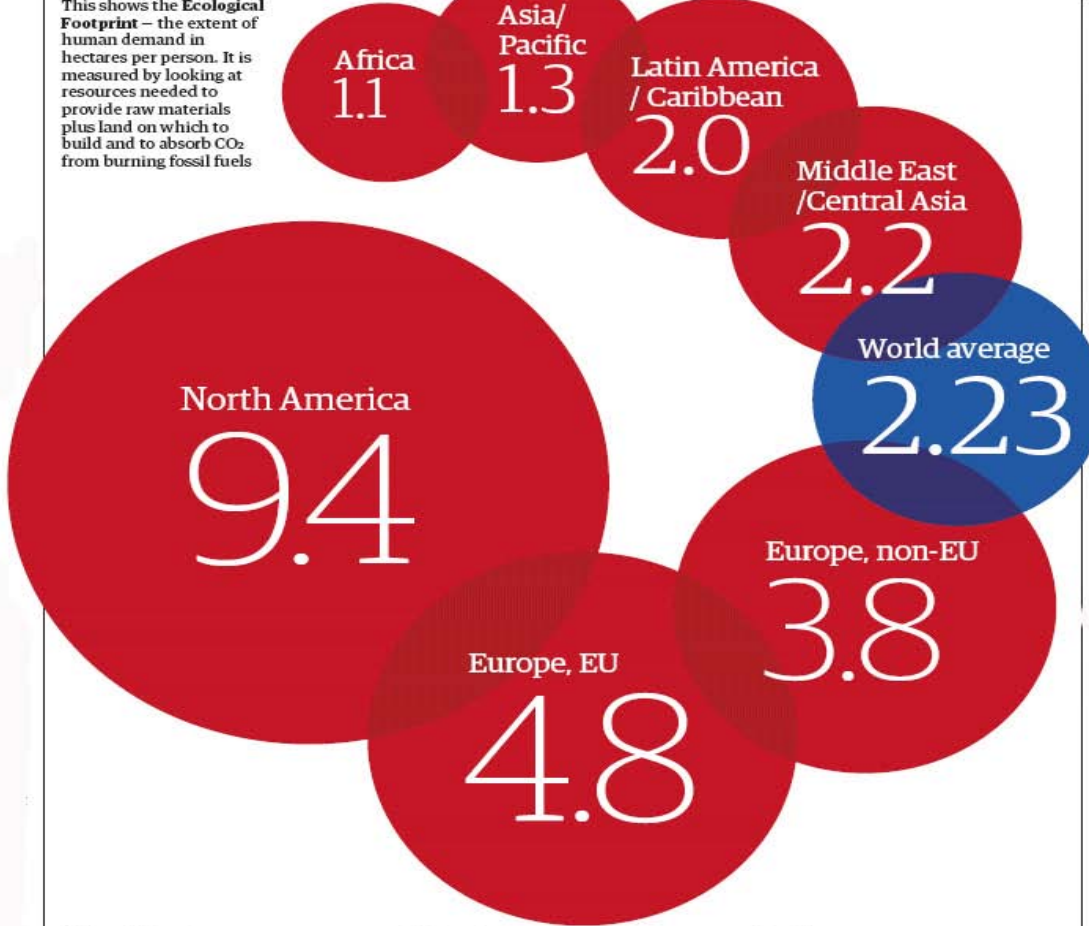


THE HARD FACT IS

WE ARE RUNNING OUT OF TIME
AND WE HAVE PRETTY MUCH
REACHED THE END

THE FACT IS IF EVERYONE IN THE
WORLD IS LIVING THE SAME
STANDARD OF LIFE WE HAVE HERE,
WE WILL NEED FOUR TIMES THE
RESOURCES OUR PLANET CAN
OFFER

This shows the **Ecological Footprint** – the extent of human demand in hectares per person. It is measured by looking at resources needed to provide raw materials plus land on which to build and to absorb CO₂ from burning fossil fuels



THE REALITY

United Kingdom



Afghanistan



Brazil



Ethiopia



United Arab Emirates



United States



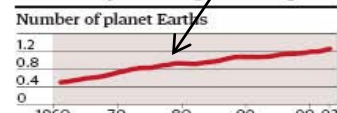
Russia



Japan

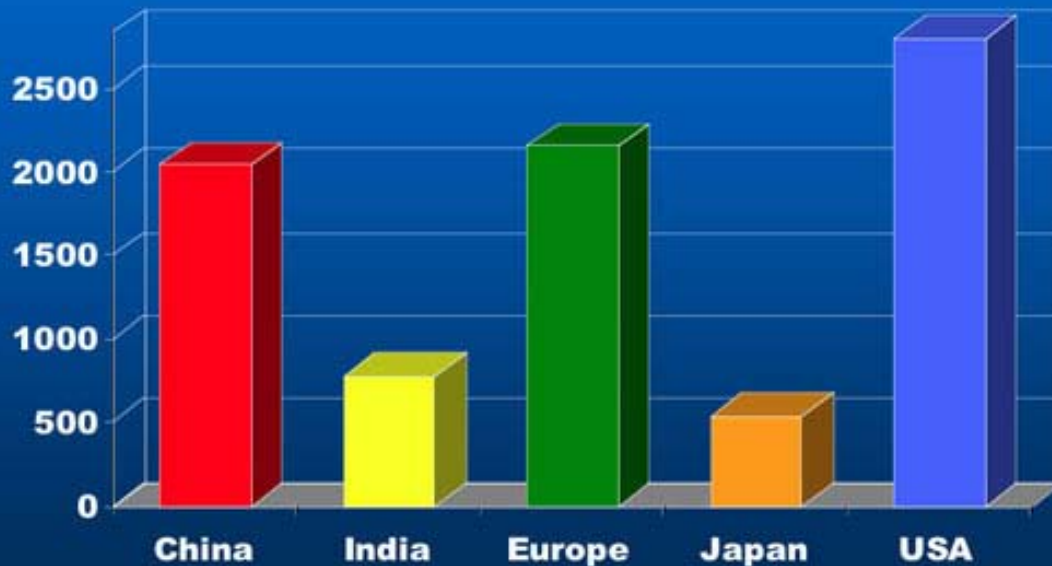


Humanity's ecological footprint



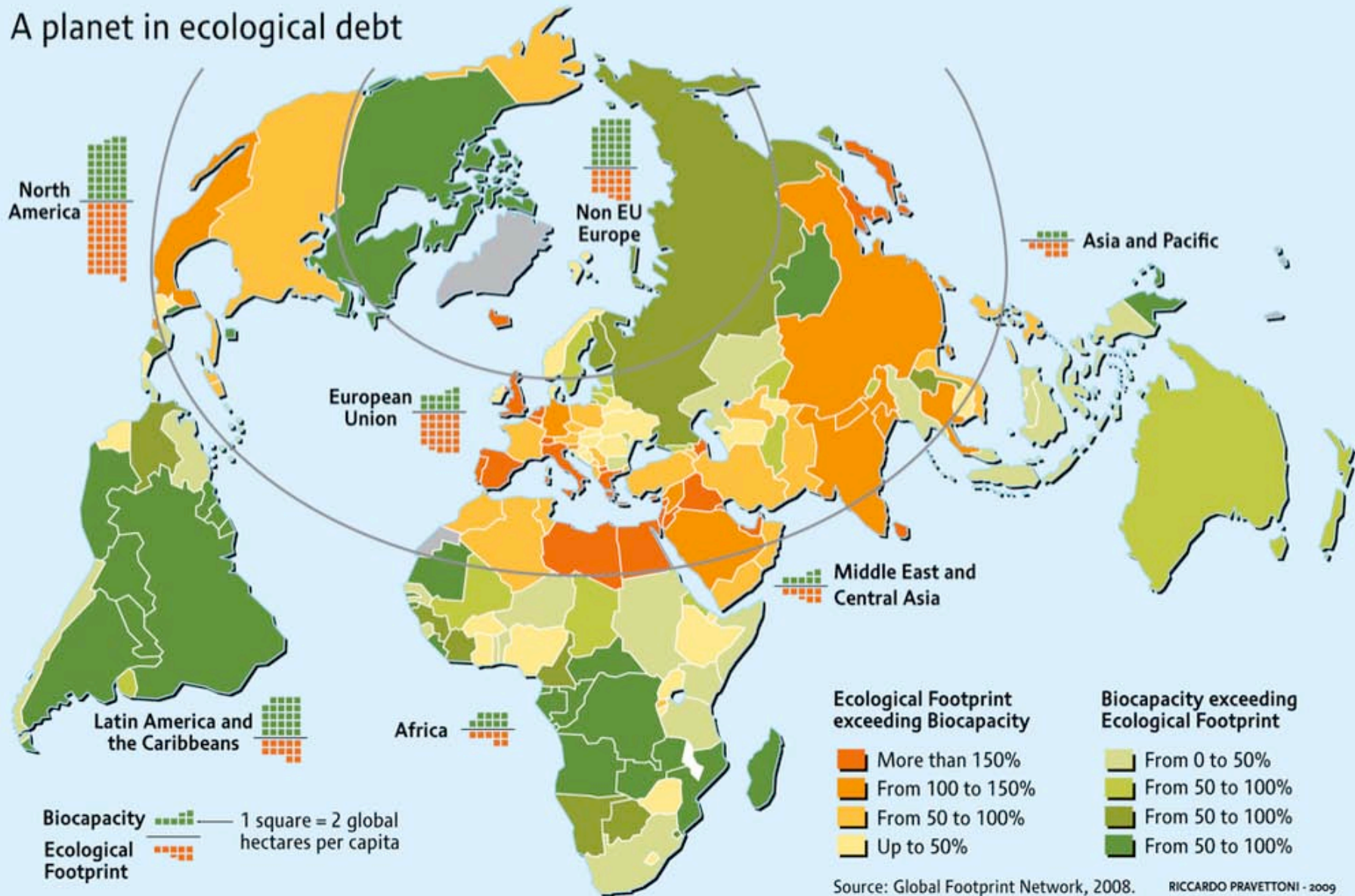
WHERE DO WE STAND IN GLOBAL CONSUMPTION

Ecological Footprint 2004 (million global hectares)




FORTUNATELY, CANADA HAS THE LAND TO SUPPORT IT POPULATION – BUT WHEN THE WORLD IS TAKEN AS A WHOLE, WE HAVE A PROBLEM

A planet in ecological debt



WHAT CAN WE DO TO REDUCE THIS MESS

- WATER
 - FOOD
 - TRANSPORTATION
 - ALTERNATE ENERGY RESOURCES
 - RECYCLING OUR WASTE
 - MAKING OUR HOUSES GREEN
- 



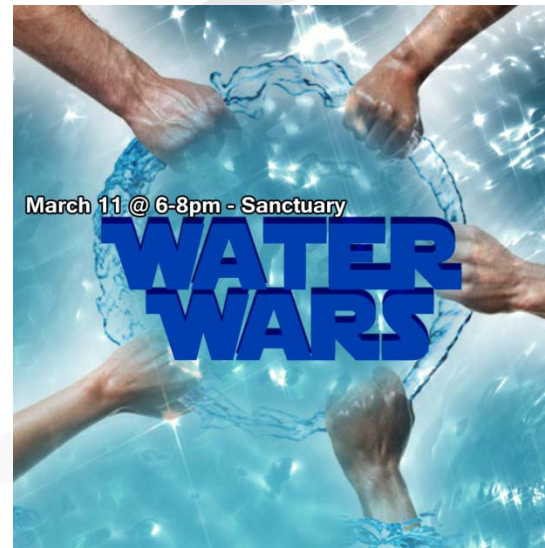
Somewhere between 70 and 75 percent of the earth's surface is covered with water.

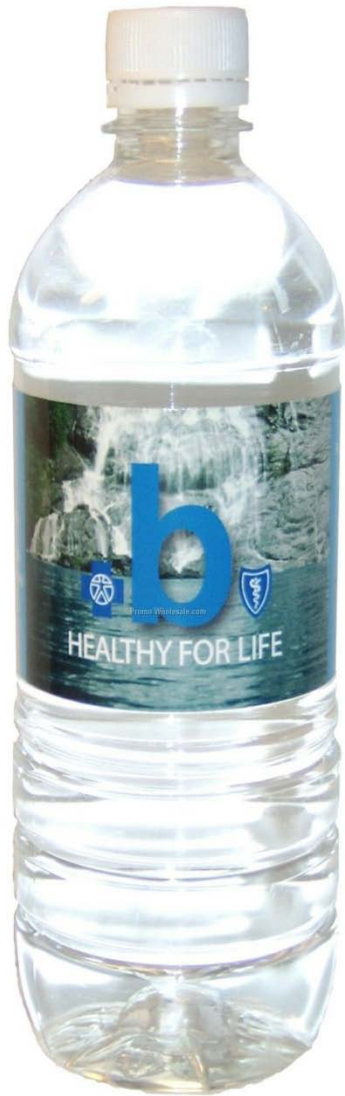
Of all the water on the earth, humans can use only about **three tenths of a percent** of this water. Such usable water is found in groundwater aquifers, rivers, and freshwater lakes.

The unfortunate fact is even this available water is not evenly distributed throughout the world

Importance of water

- Water is essential for survival – whether it is trees or animals
- Most cases – the water required for survival has to be fresh.
- From time immemorial – there has been a quest for water
- This quest will lead to





BOTTLED WATER

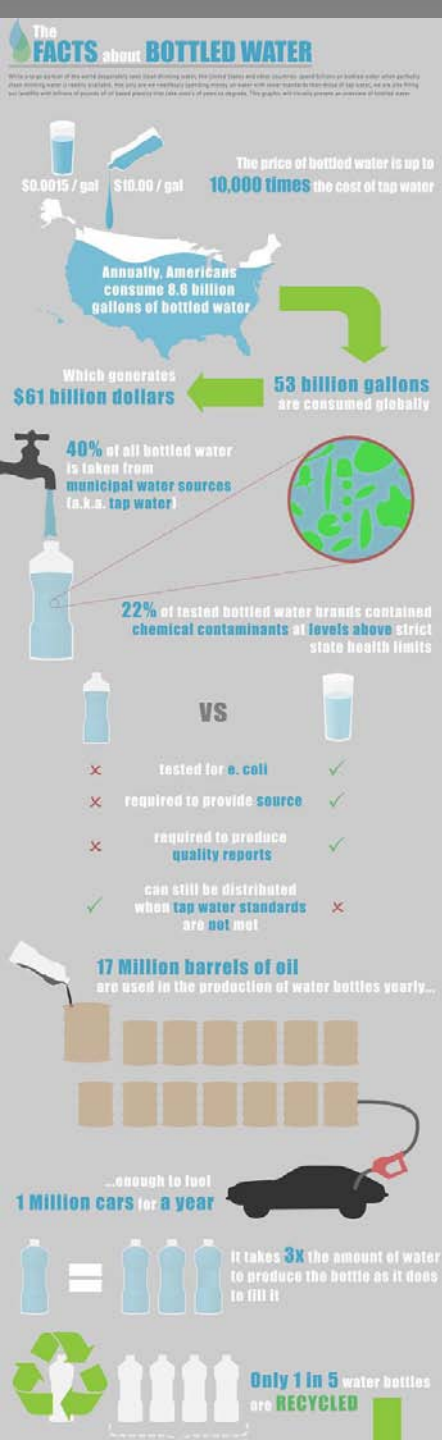
THIS IS THE GREATEST OFFENDER

**DO YOU KNOW THIS IS ONE OF THE
BIGGEST UNREGULATED INDUSTRY**

**NEITHER HEALTH CANADA OR FDA
CAN GUARANTEE THE WATER
QUALITY IN THIS BOTTLE**

**ON AN AVERAGE YOUR TAP WATER IN
CANADA IS 100 TIMES SAFER THAN
THE WATER IN THIS BOTTLE**

**WHEN YOU SEE THE FOLLOWING
FACTS YOU WILL REALISE HOW
DANGEROUS THIS SIMPLE BOTTLE IS**



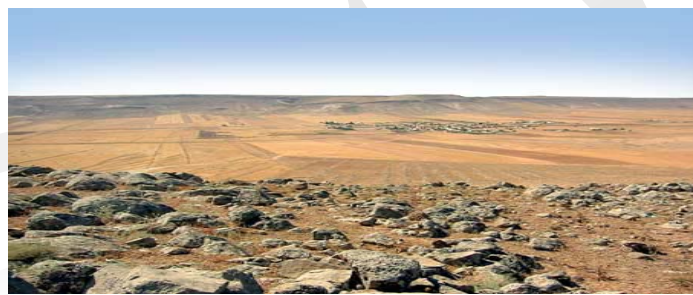
FACTS OF BOTTLE WATER

NATURE IS A CLOSED LOOP SYSTEM. IT HAS EVOLVED OVER A PERIOD OF MILLIONS OF YEARS.

THE FLORA AND FAUNA IN AN AREA DEPEND ON WATER WHICH IS FED BY AQUIFERS. WHEN THE DRAW RATE FROM THE AQUIFER BALANCES THE FEED RATE, YOU HAVE A BALANCE. THIS BALANCE HAS BEEN PRESENT FOR MILLIONS OF YEARS.

WHEN A BOTTLING COMPANY STARTS DRAWING WATER FROM THE AQUIFER AND TRANSPORTING THIS WATER TO VARIOUS PARTS, THIS WATER NEVER COMES BACK.

THIS BECOMES THE RESULT DESERTIFICATION



THIS IS THE TRUE COST OF WATER WHICH YOU DRINK IN A YEAR

The True Cost of Water

COST PER YEAR



\$0.50
Unfiltered Tap



\$30.50
Filtered Tap (RO Filter/5 yrs)



\$43.87
Filtered Tap (Brita Pitcher & Filters)



\$401.12
Typical Water Cooler Bottles (5G Delivered)



\$569.40
Typical .5L Bottles (Bulk)



\$1,898.00
Artesian .5L Bottles (Bulk)



\$2,847.00
Typical .5L Bottles (Vending)



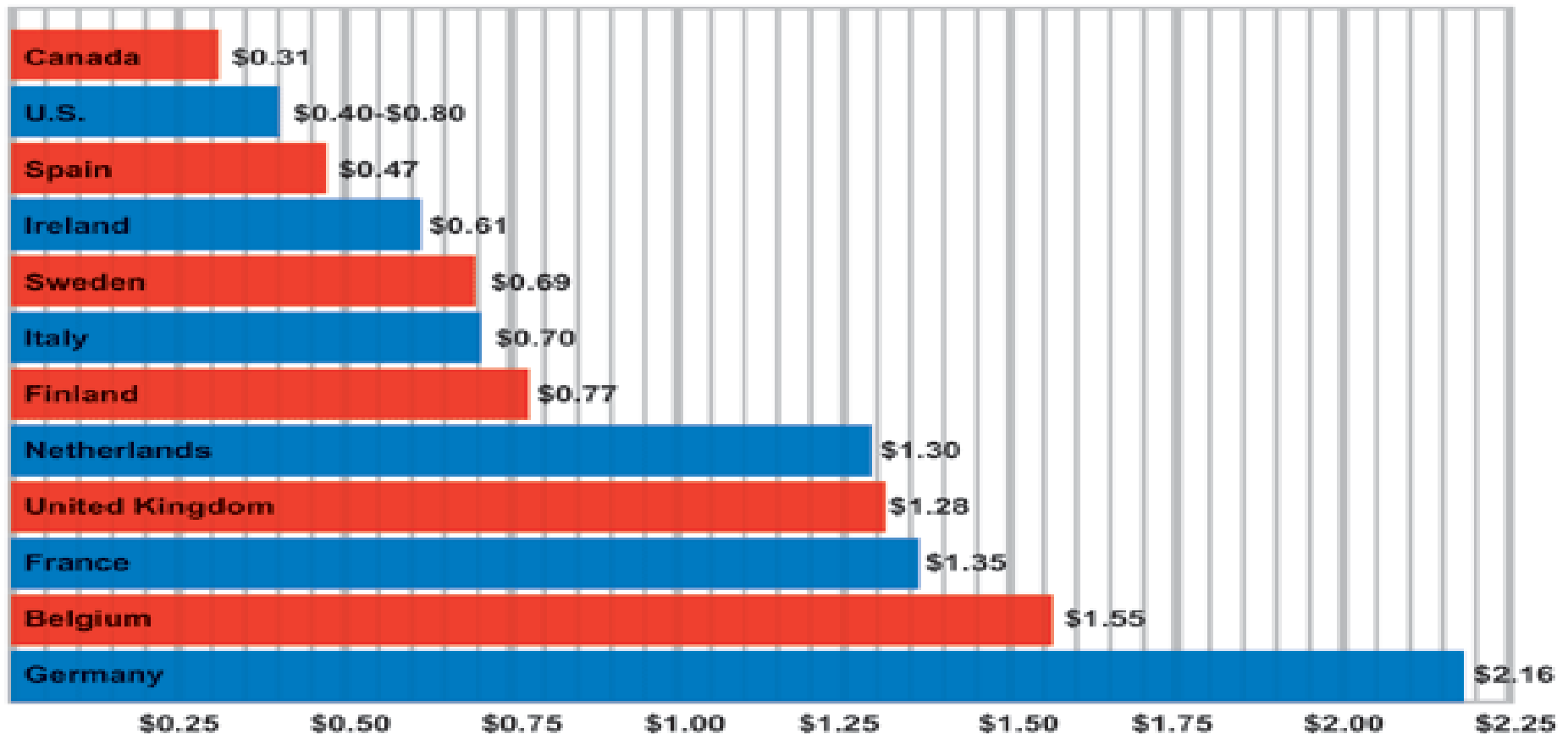
\$7,592.00
Artesian .5L Bottles (Vending)

COST PER .5L



AS CANADIANS - WE GET ONE OF CHEAPEST AND THE BEST QUALITY OF WATER IN THE WORLD – DO NOT COMPLAIN

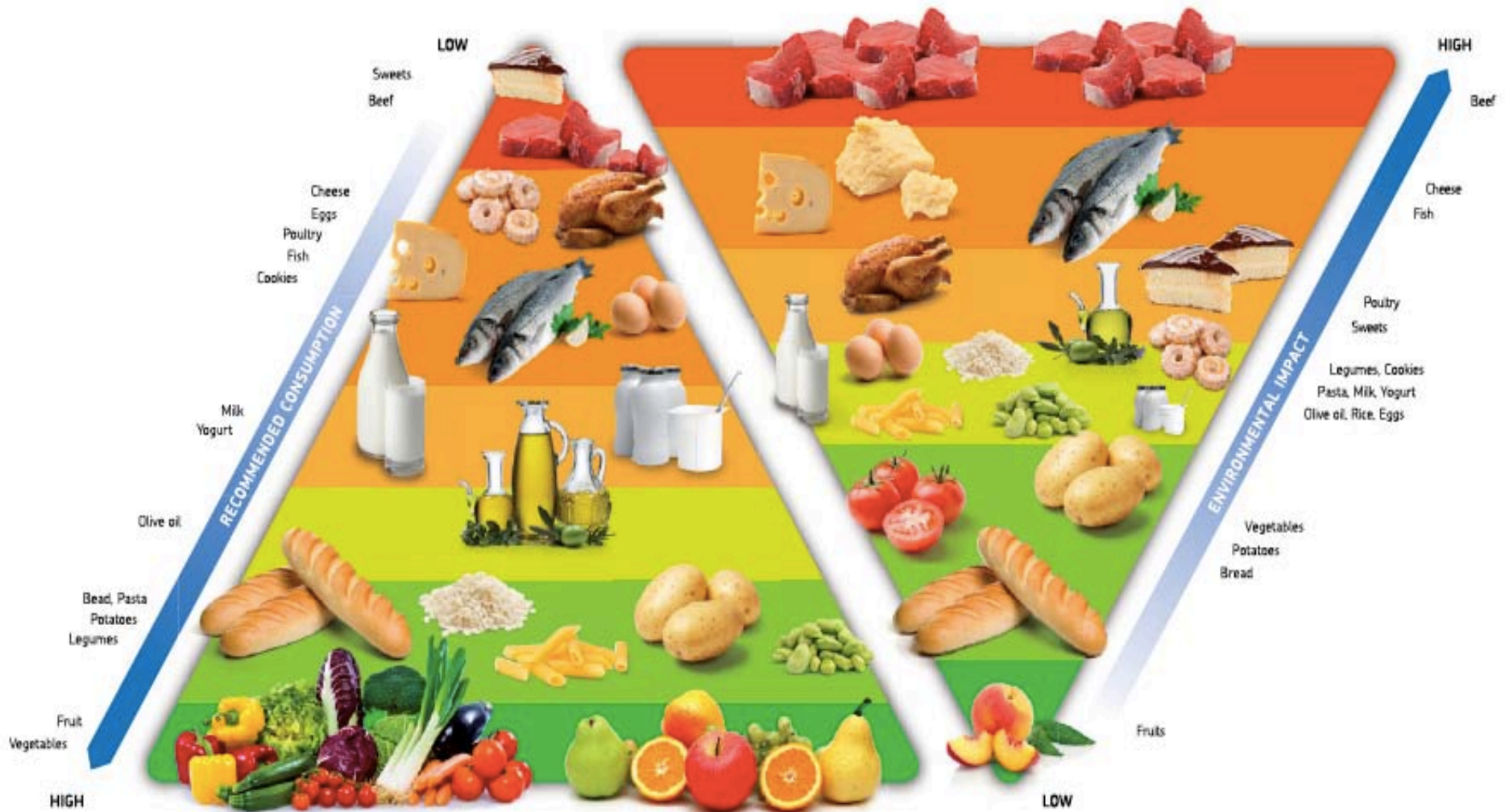
Typical municipal water prices in Canada and other countries (per cubic metre)



SOURCE: ENVIRONMENT CANADA

FOOD

ENVIRONMENTAL PYRAMID

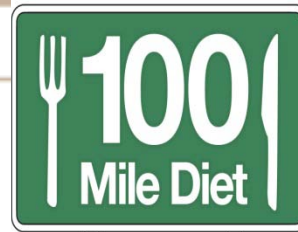
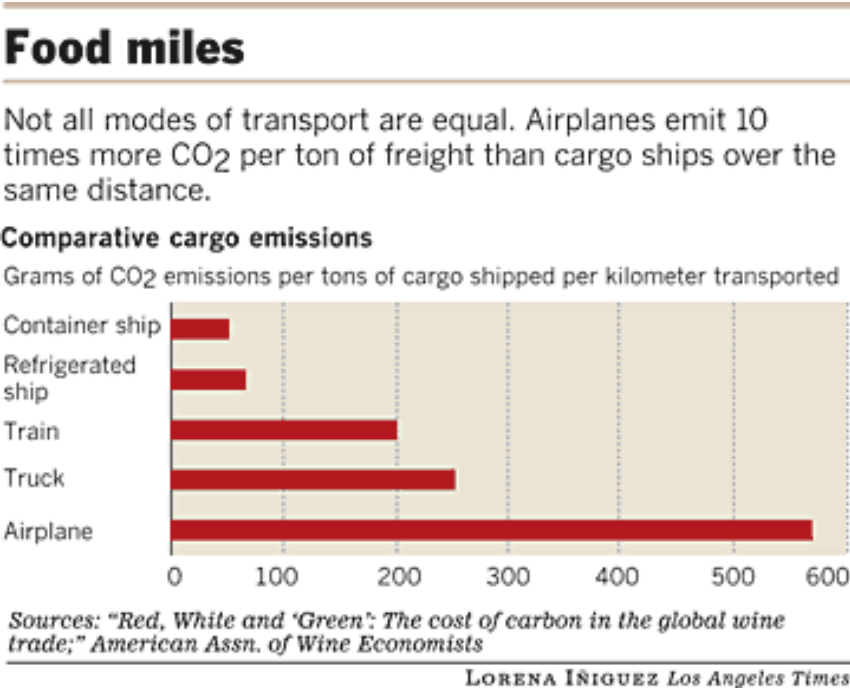


FOOD PYRAMID

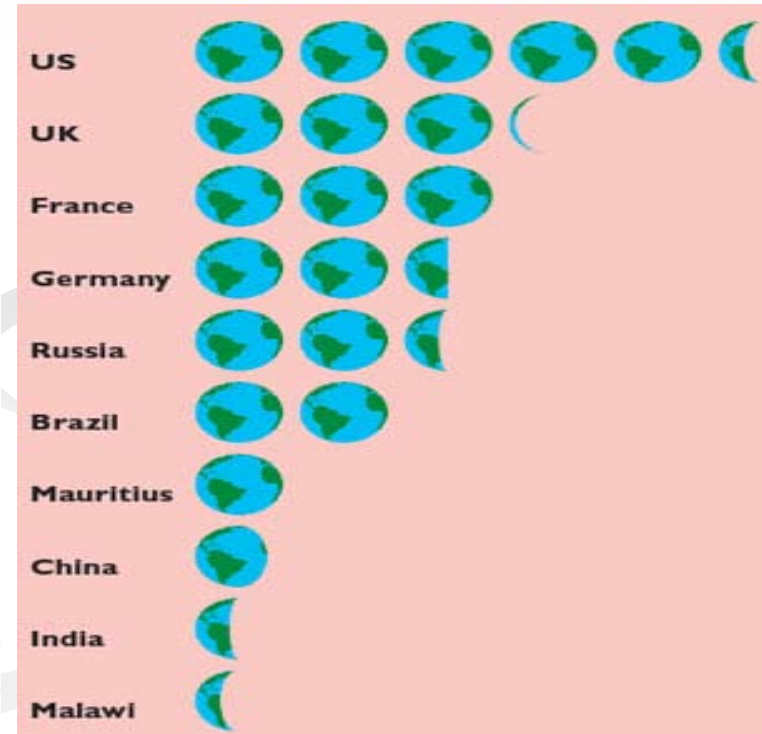
ENVIRONMENT COST OF IMPORTED FOOD

FOOD MILES

A MAJOR CONTRIBUTION - TODAY'S CARBON EMISSION



Local Eating
For Global Change.

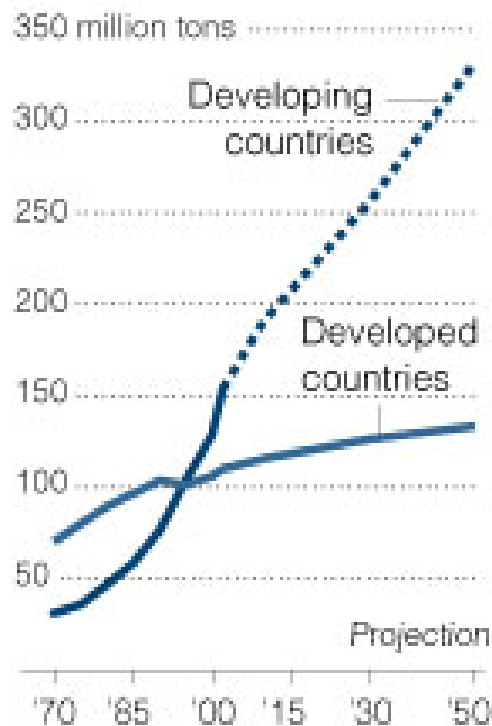


ENVIRONMENTAL COST OF NON VEGETARIAN FOOD

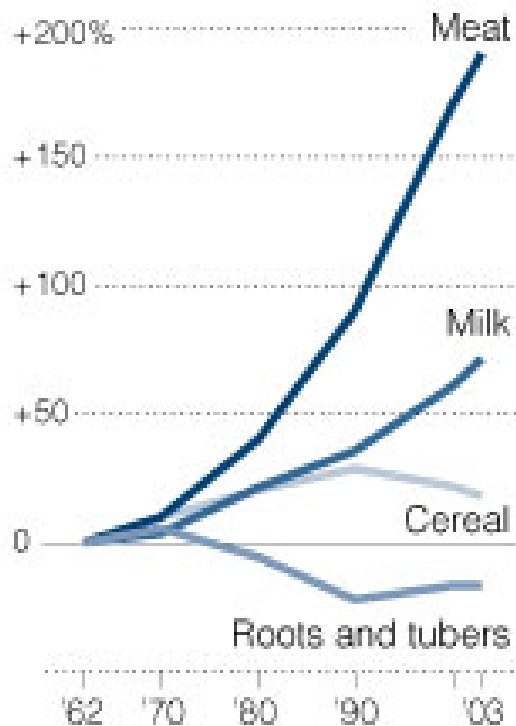
Meat Consumption and CO₂ Emissions

According to a report by the United Nations Food and Agriculture Organization, livestock generates 18 percent of greenhouse gas emissions. The problem is expected to grow, as developing countries increase their consumption of meat and byproducts.

Meat production

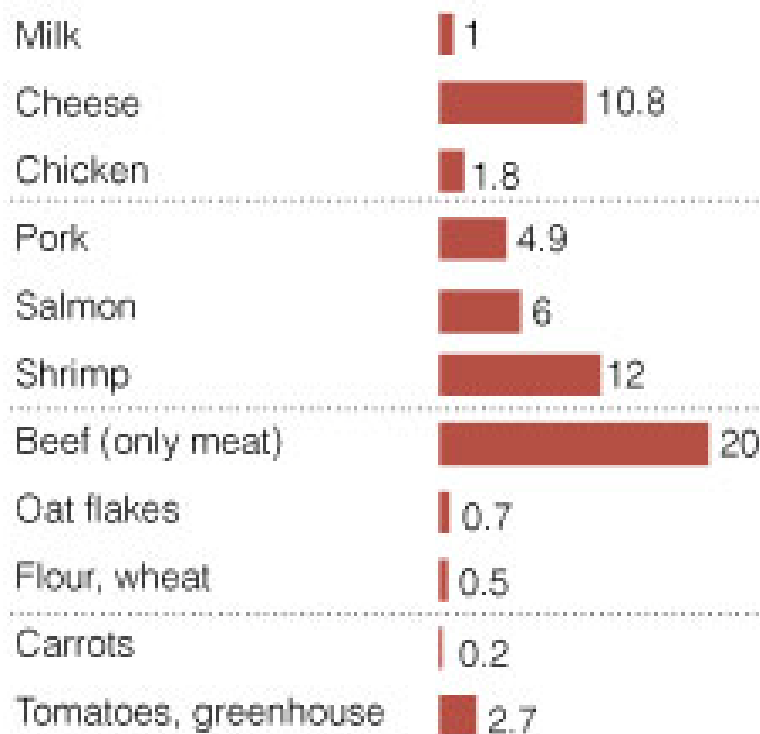


Food consumption in developing countries



CO₂ produced

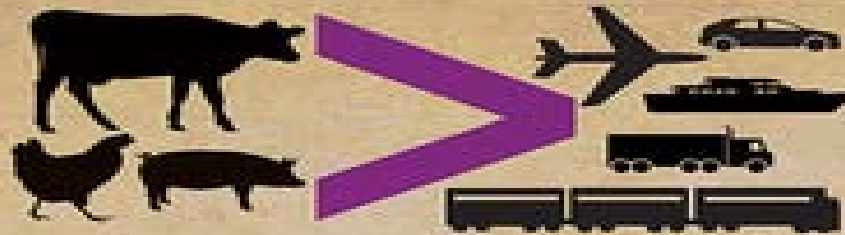
Pounds of CO₂ per pound of product



HOW VEGETABLES

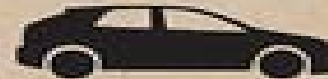


CAN SAVE THE
WORLD



Livestock is responsible for **18%** of worldwide greenhouse gases. That's more than those emitted by all forms of transportation **combined**.

Runoff from factory farms pollutes our waterways more than all other industrial sources combined.



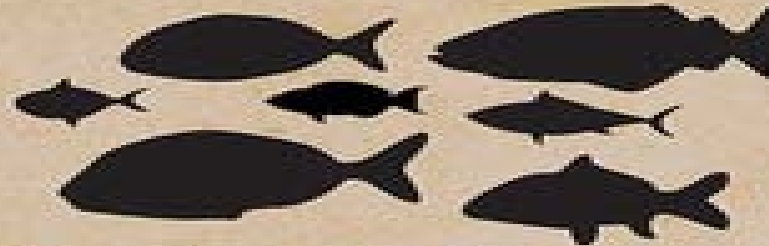
Annual beef consumption of a family of 4 takes more than 260 gallons of fuel and creates 2.5 tonnes of CO₂, as much as a car in 6 months



Nitrous Oxide is about **300 times** more potent as a global warming gas than CO₂. The meat and dairy industries account for **65%** of worldwide nitrous oxide emissions



football field
of land is
bulldozed
every 60
seconds
to create
more room
for farmed
animals



75% of the world's fisheries are
either fully exploited, overexploited
or have collapsed



In Latin America, over 70% of the
Amazonian forests have been cut
down to make grazing fields

40:1

It takes 40 calories of energy to produce one calorie of beef. It takes up to 16 pounds of grain to produce just 1 pound of animal flesh



1/10 of the grain that China feeds to livestock could make up for the diets of 120 million malnourished people



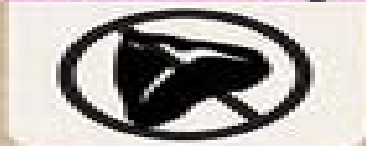
At least 4/5 of the world's hungry children live in the countries with a food surplus, part of which is the grain production for livestock feed.

Take Action

A small decrease has huge impact

Aside from decreasing your risk of heart disease, certain cancers, E. coli, and obesity, **cutting down** on your meat consumption is **one of the most effective** ways to fight global climate change. It will make a bigger impact than switching to a hybrid car, it will save you money and can be done immediately with ease.

Monday



Support Sir Paul McCartney's Meat Free Monday campaign, which seeks to cut CO2 emissions by encouraging people to go meatless once a week

If everyone in America did this, the CO2 savings would be the same as taking more than a half-million cars off the roads. One person alone would also save 40,000 gallons of water per year.

On average one would do more for the planet by going vegetarian one day a week than by switching to a totally local diet

Another option can be to try and be a "Flexitarian" - a vegetarian who occasionally eats meat or being a vegetarian or vegan only until 6p.m., which is what cookbook author Mark Bittman does.

FOOD PACKAGING



**THE ENVIRONMENTAL IMPACT OF FOOD PACKAGING
OFTEN EXCEEDS ALL OTHER INPUTS THAT IS REQUIRED
TO GET THE FOOD TO YOU**

ENVIRONMENTAL IMPACT OF PERSONAL TRANSPORTATION



THE TREND

Rising to meet the green transportation challenge

Cycling



+180%

1994 - 2004

Walking



+44%

1994 - 2004

Transit
Use



+50%

1999 - 2009

Gasoline
Sales



-7%

1999 - 2008

Vehicles
Entering City



-10%

1995 - 2005

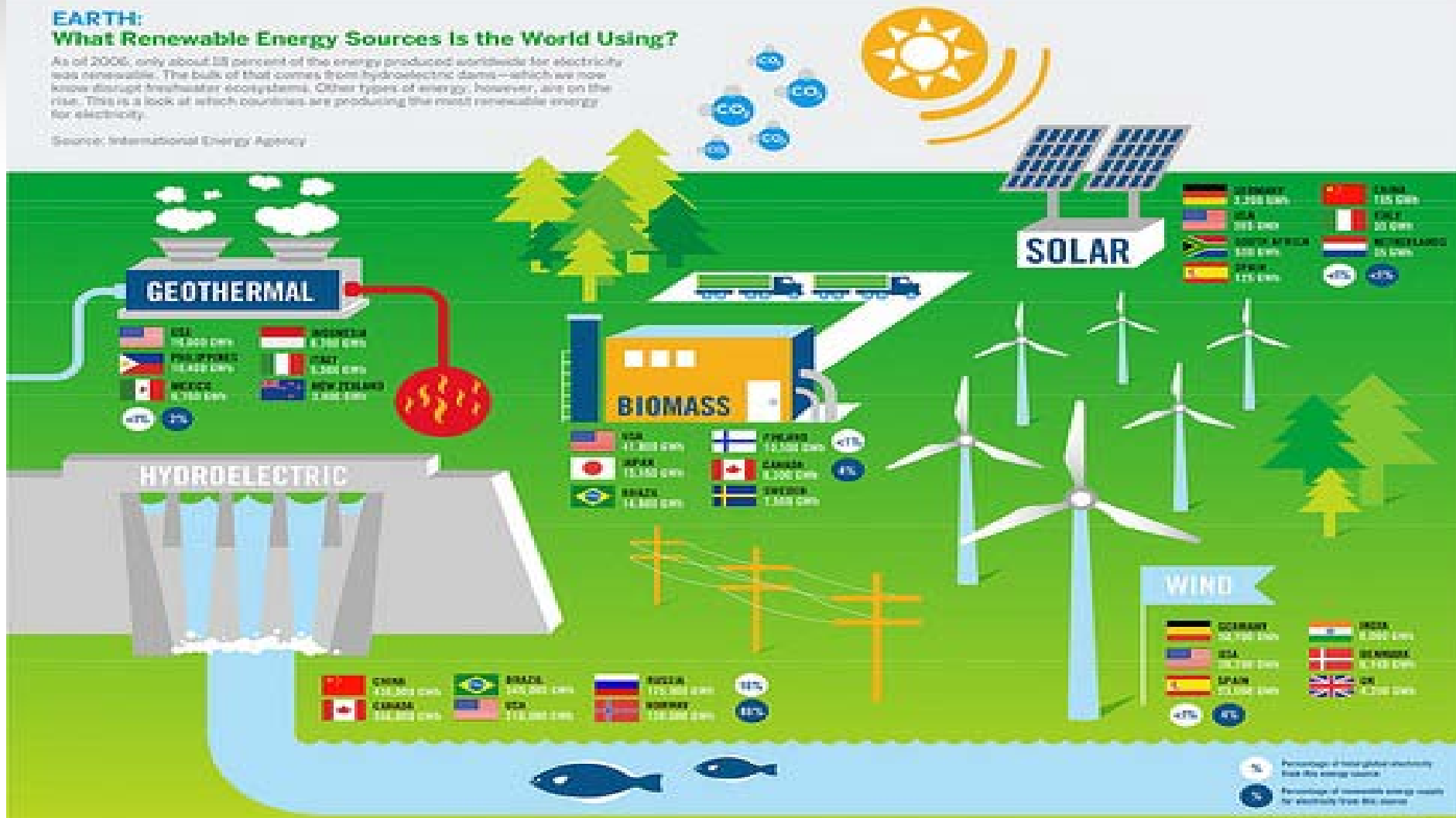
SOURCE: CITY OF VANCOUVER

ALTERNATE SOURCES OF POWER

EARTH: What Renewable Energy Sources is the World Using?

As of 2006, only about 18 percent of the energy produced worldwide for electricity was renewable. The bulk of that comes from hydroelectric dams—which we now know disrupt freshwater ecosystems. Other types of energy, however, are on the rise. This is a look at which countries are producing the most renewable energy for electricity.

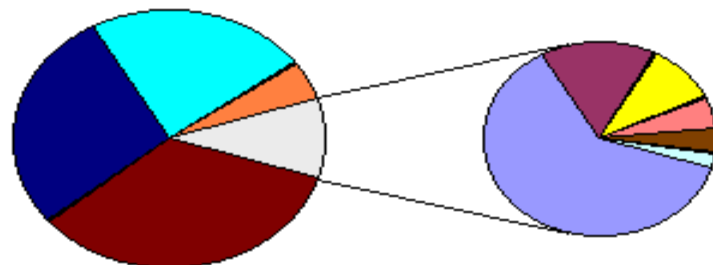
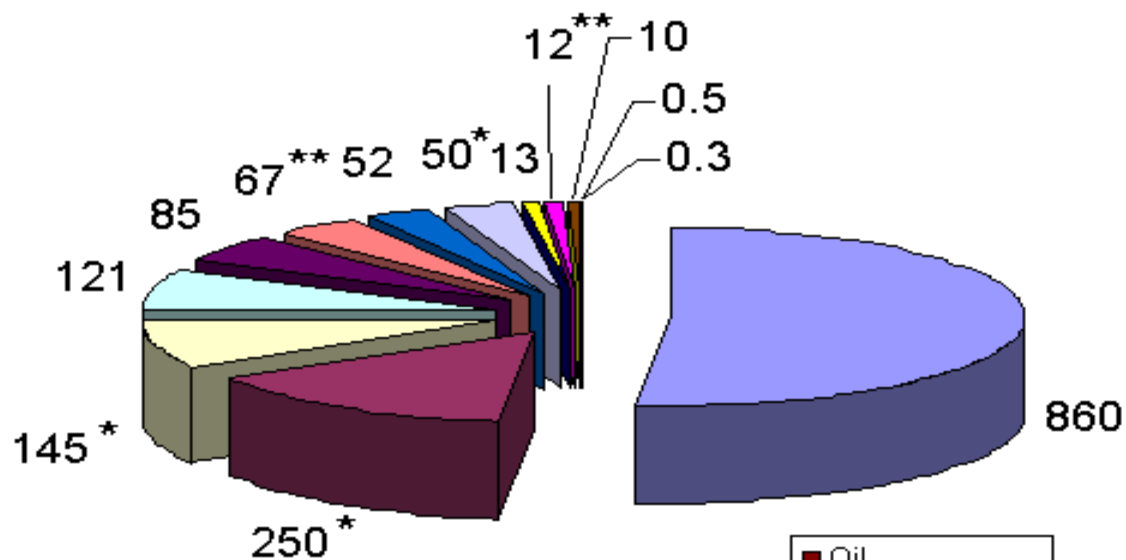
Source: International Energy Agency



Legend:
 - Percentage of total global electricity from this energy source.
 - Percentage of renewable energy needed for electricity from this source.

WE HAVE A LONG WAY TO GO

Renewable energy, end of 2008 (GW)



Total vs. Renewable

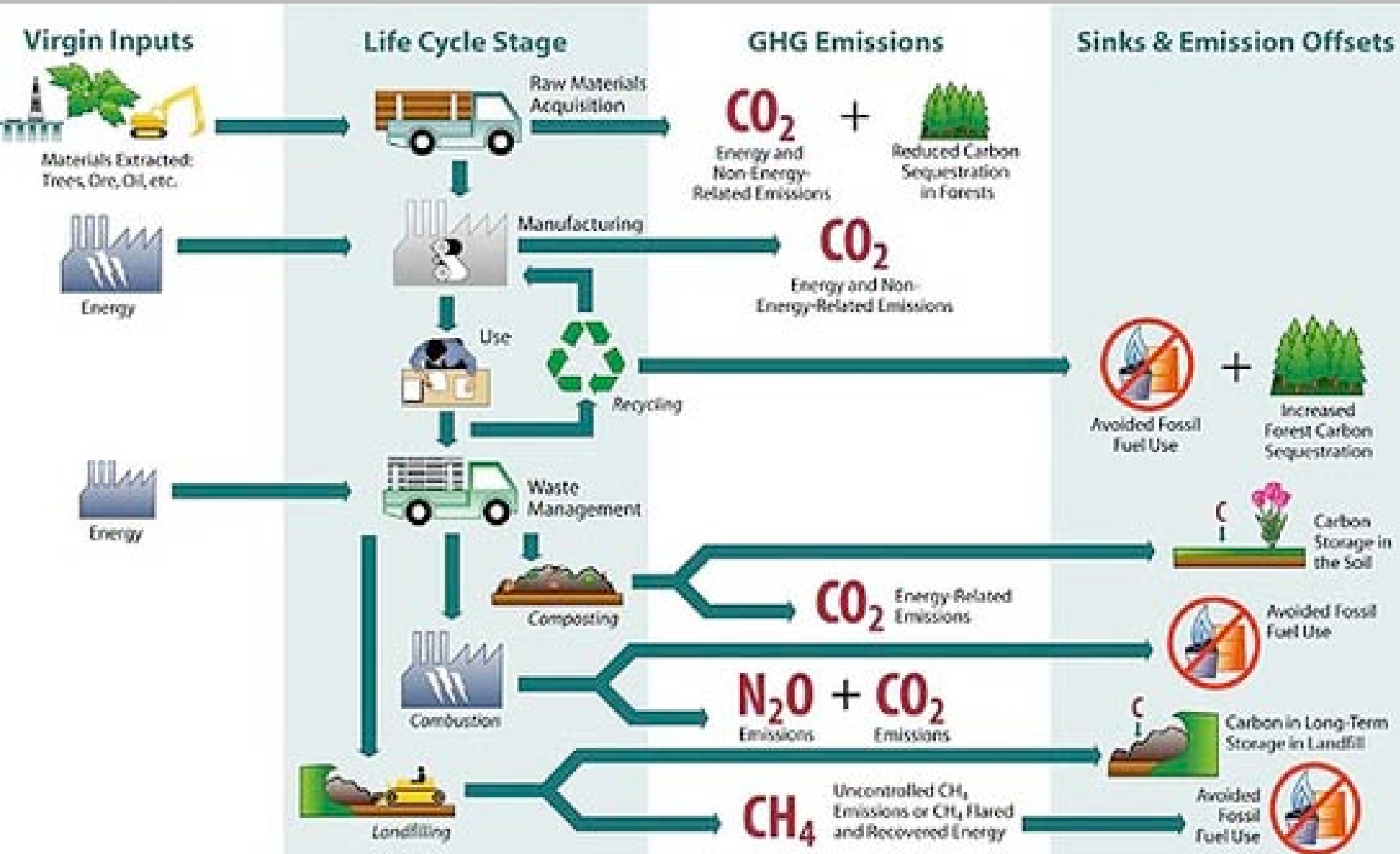
- Oil
- Coal
- Natural Gas
- Nuclear Energy
- Hydroelectricity
- Biomass
- Solar
- Biofuel
- Geothermal
- Wind

- Large hydropower
- Biomass heating*
- Solar collectors for hot water/space heating*
- Wind power
- Small hydropower
- Ethanol production**
- Biomass power
- Geothermal heating*
- Solar PV, grid-connected
- Biodiesel production**
- Geothermal power
- Concentrating solar thermal power (CSP)
- Ocean (tidal) power

* GWth

** Billion liters/year

RECYCLING





How do we improve energy efficiency

Use energy efficient appliances

Select appliances that are right size for your application

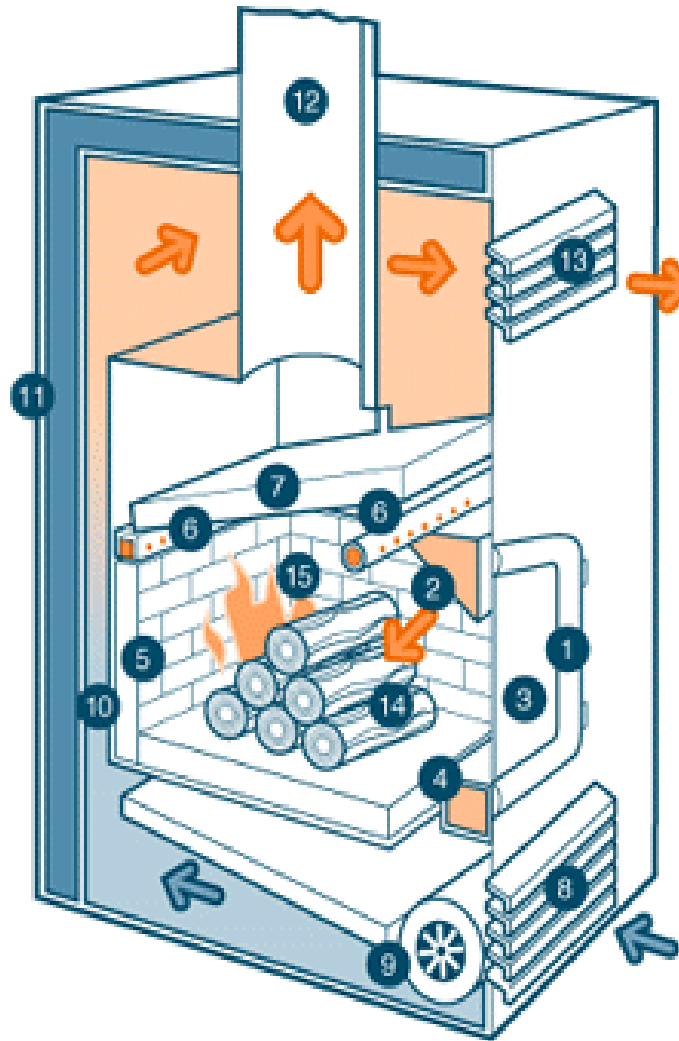
Use the most energy efficient application to heat and cool

Use energy efficient lighting

We will look now how we can make our houses greener – primarily concentration on energy efficiency

Advanced Wood Burning Fire Places

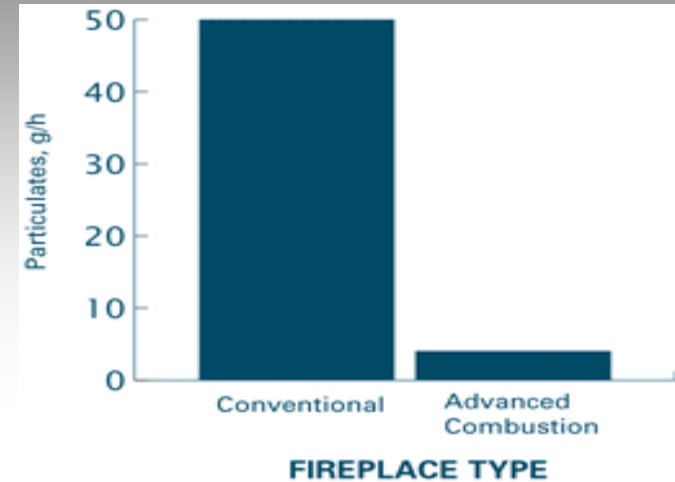
1. Tight-fitting, gasketed glass door
2. Heated air wash for glass door
3. Pyro-ceramic glass for infrared heat transmission
4. Preheated primary combustion air
5. Refractory insulating liner for combustion chamber
6. Preheated secondary combustion air
7. Insulated baffle
8. Cool room air convection inlet
9. Variable speed "squirrel cage" circulating fan
10. Convection chamber
11. Insulated outer casing



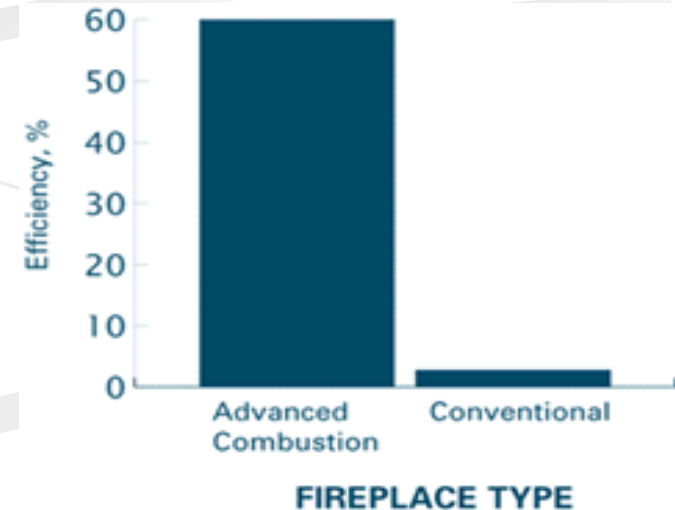
13. Heated room air convection outlet

14. Primary combustion zone

15. Secondary combustion zone



Pollutants



Efficiency

Solar tubes

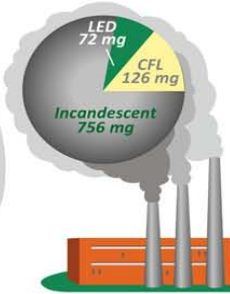


Total Yearly Amount of CO₂ Produced Per Household

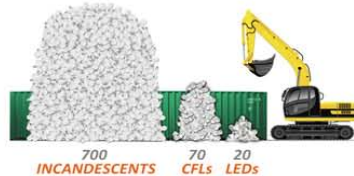


Over 35 Years...

The Use of Your Bulbs will Release Toxic Mercury into the Air:



You'll Throw Away:

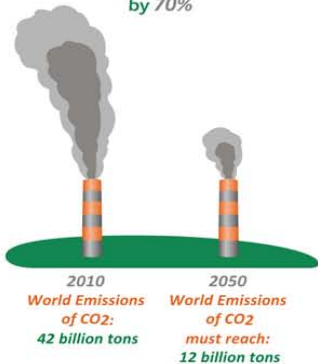


Your CFLs will Release into Landfills:

42 mg of Toxic Mercury

The Future of LEDs

In Order to Stop Global Warming, the World Must Reduce Carbon Emissions by 70%



20% of the World's Energy Use is from Lighting

That can be Reduced to 4% with LED Lighting



YOU USED TO BUY

YOUR CHOICES NOW

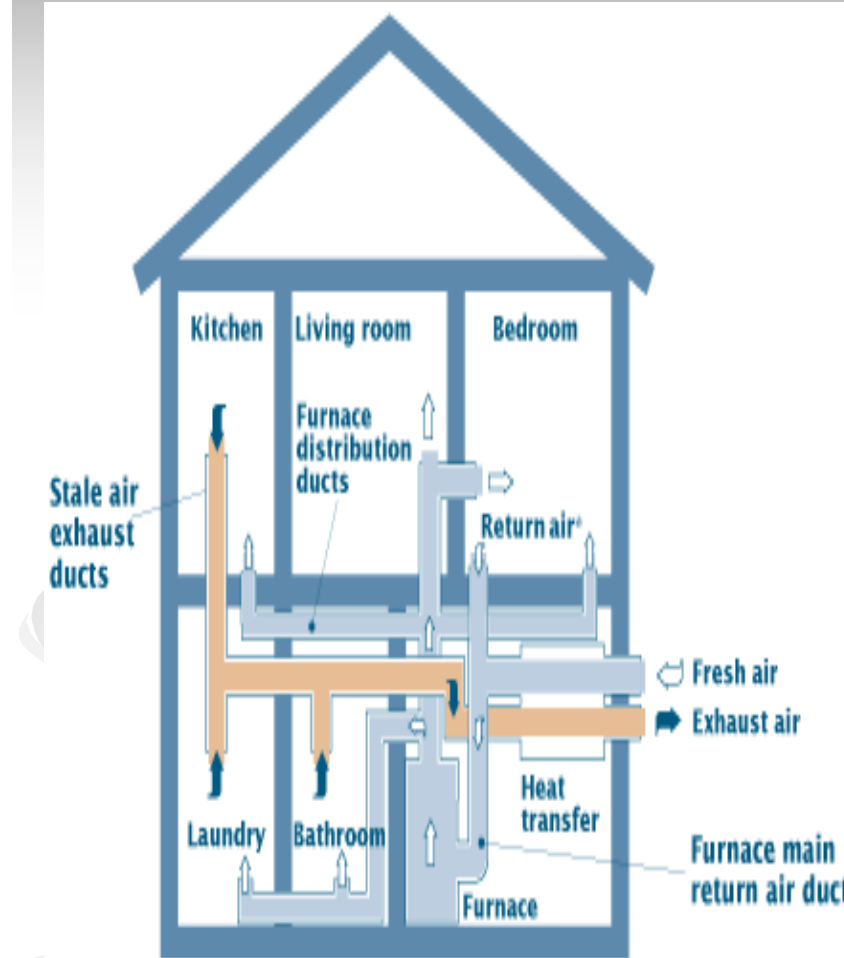
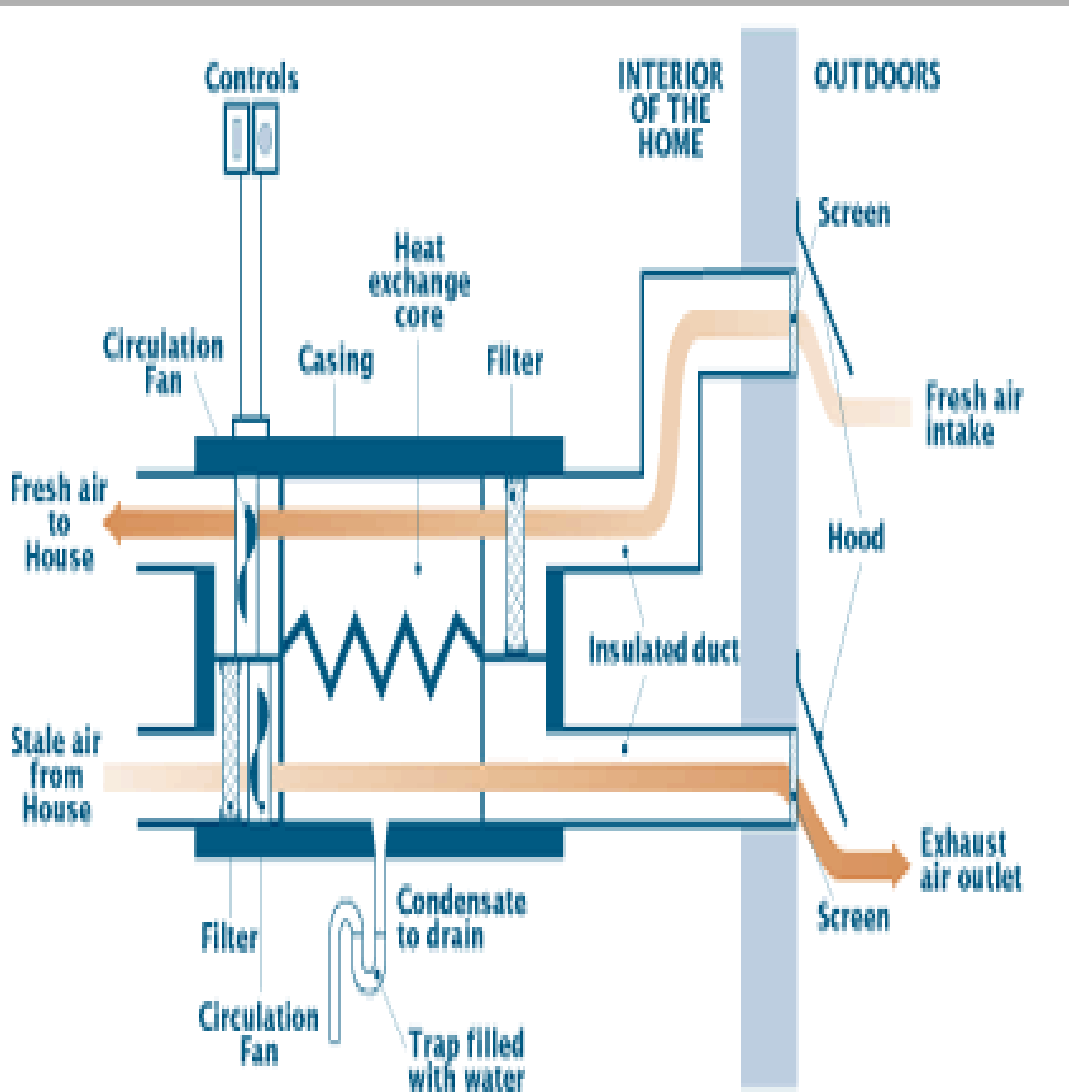
← **LEAST EFFICIENT**

MOST EFFICIENT →

	Standard Incandescents	New Halogen Incandescents	CFLs	LEDs
450 lumens	40 W* \$4.82/yr**	29 W \$3.49/yr	9 W \$1.08/yr	8 W \$0.96/yr
800 lumens	60 W \$7.23/yr	43 W \$5.18/yr	14 W \$1.69/yr	13 W \$1.57/yr
1100 lumens	75 W \$9.03/yr	53 W \$6.38/yr	19 W \$2.29/yr	17 W \$2.05/yr
1600 lumens	100 W \$12.05/yr	72 W \$8.67/yr	23 W \$2.77/yr	Not available today
	RATED LIFE = 1 year***	RATED LIFE = 1-3 years	RATED LIFE = 6-10 years	RATED LIFE = 15-25 years

* energy use ** estimated energy cost per year *** rated life is based on 3 hours of use per day

Heat Recovery Ventilator



*Furnace return air may come from more than one location.

(Note: All the parts shown here may not be found on all HRVs.)

Average Annual heating load for an Average Home in Giga Joules in Toronto - 2004

	Efficiency	Cost / GJ (\$)	Old detached	New Detached	Semi-Detached	Townhouse
Constructed			Prior to 1990	After 1990	After 1990	After 1990
Floor area			2000 sq ft	2000 sq ft	1500 sq ft	1000 sq ft
Annual heating load (GJ)			95	65	45	35
Annual Heating costs in \$ (does not include any fixed customer costs)						
Electricity - resistance	100%	25.05	2380	1628	1127	877
Electricity- Heat pump - air	230%	25.75	1035	708	490	381
Electricity-Heat pump-Ground source	330%	25.75	721	493	342	266
Gas-fired-conventional furnace	60%	11.35	1857	1271	880	684
Gas - High efficiency condensing furnace	95%	11.35	1173	803	556	432
Oil – conventional furnace	60%	17.82	2392	1637	1133	881
Oil – High Efficiency – furnace	89%	17.82	1613	1104	764	594
Wood – Medium Efficiency Furnace	65%	6.27	916	627	434	338

Common House Hold Equipment Power Consumption

Values are based on the usage of an Average 2000 sq ft Canadian Home

	Annual power usage (KWH)		Cost of power		Annual Savings	
	Least efficient	Most efficient	Least efficient	Most Efficient	%	\$
Refrigerator	767	559	\$71	\$52	27%	\$19
Freezer	588	552	\$55	\$51	6%	\$3
Electric Range	858	639	\$80	\$59	26%	\$20
Dishwasher	700	344	\$65	\$32	51%	\$33
Washing Machines	1102	264	\$102	\$24	76%	\$78
Cloth Dryer	950	898	\$88	\$83	5%	\$5
Misc + Small appliances	1500	1500	\$139	\$139	0%	\$0
Lighting	5840	1460	\$541	\$135	75%	\$406
Air-conditioning	8640	5082	\$801	\$471	41%	\$330
Total	20945	11298	\$1,942	\$1,047	46%	\$894

Comparison between the least efficient to the most efficient currently available in the market

Figures are based on the usage by an Average Canadian Home - actual figures may vary based on individual usage and size of equipment

Misc. and small appliances included microwave, toaster, electric kettle, TV, computers, entertainment centers, etc.

An average Canadian Home has 40 bulbs - Lighting consumption based on 100W and average 4 hrs day on a bulb

CFL bulbs are 75% more efficient - than incandescent - Most efficient (assumes all lighting is by CFL)

Air-conditioning - Least efficient in market with EER of 10 and most efficient in market with EER of 17

Some Good tips

- Reduce your thermostat from 25 deg C to 20 deg C during spring, winter and fall season and you will save around 20% on your heating bill.
- Use a programmable thermostat and set back your night temperature to 18 deg C. You can save an additional 2% on your heating bill
- Use a programmable thermostat and set back your room temperature to 18 deg C during unoccupied time at your home. You can save an additional 1% on your heating bill for every 3 hours of daily unoccupied period.

Your commitment

- As a part of the world community, we are morally bound to honor the KYOTO protocol.
 - The KYOTO protocol is essential if we have to pass on this planet in a shape equal or better than how we inherited it.
 - We have adequate knowledge and technology to reduce our energy consumption. Only the effort has to be put in.
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