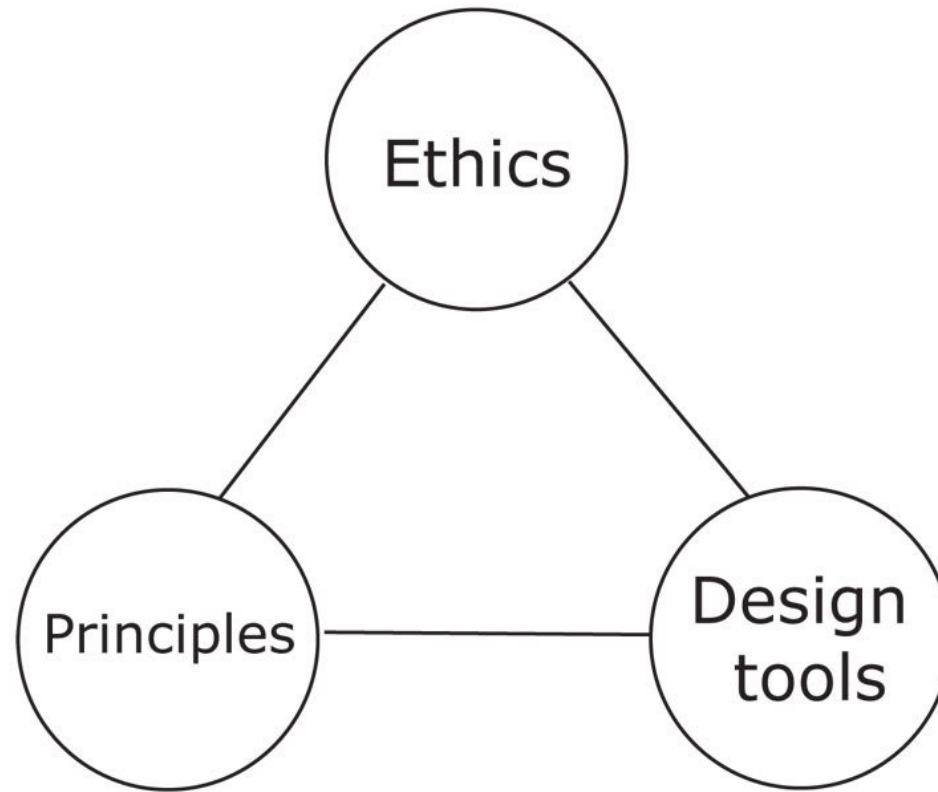


# Our Energy Future

## Permaculture







# Cesar Manrique

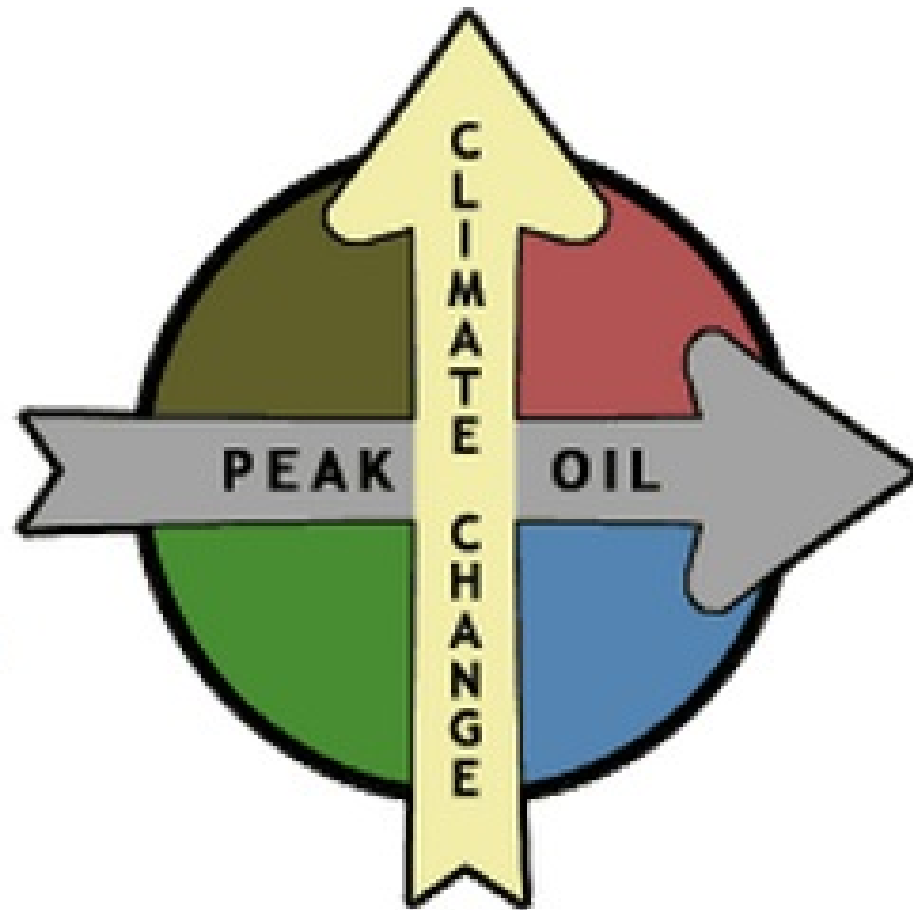


# Cesar Manrique

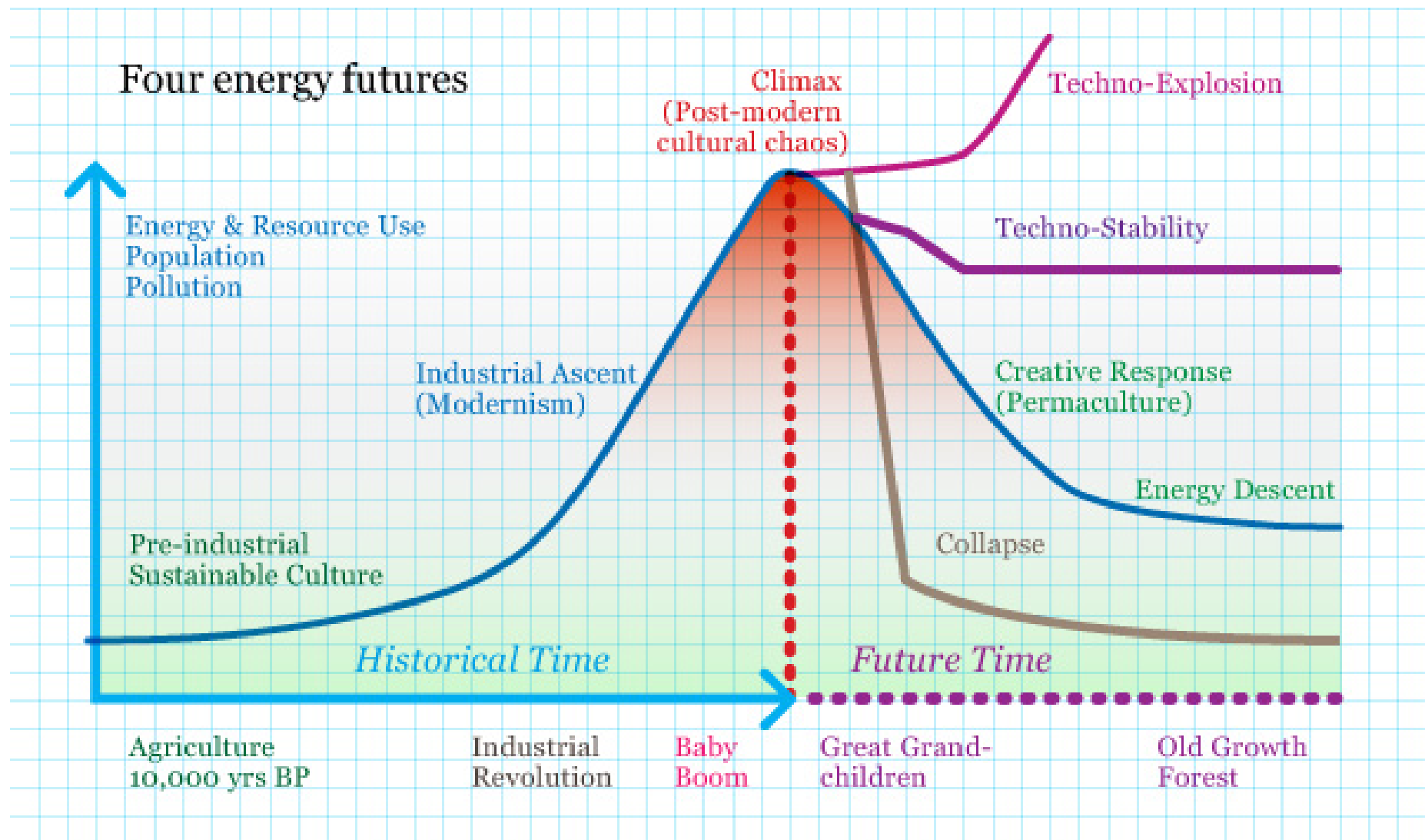
I believe that we are witnessing an historical moment  where the huge danger to the environment is so evident that we must conceive a new responsibility with respect to the future. 

César Manrique, 1987

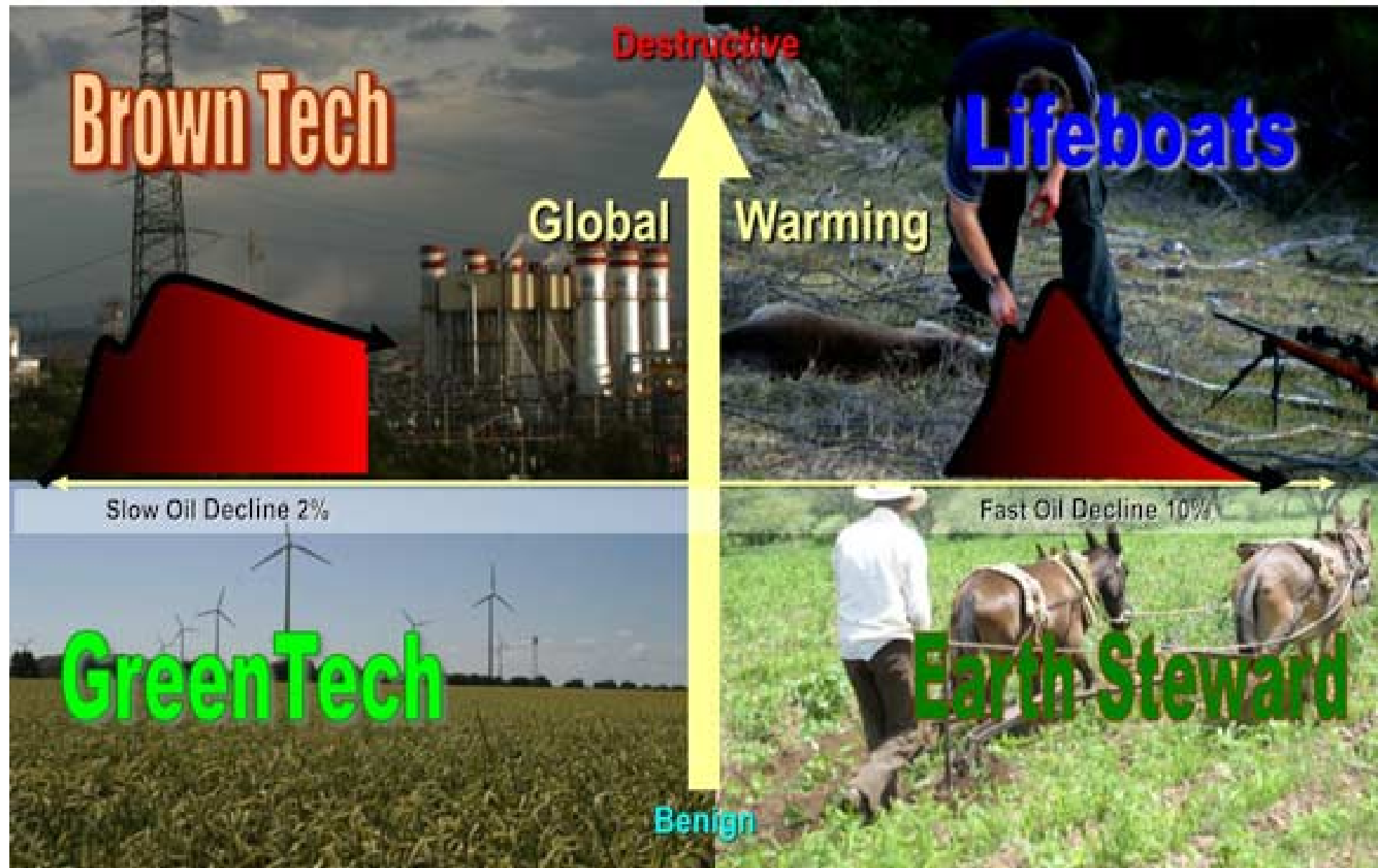




# Future scenarios



# *Energy Descent Scenarios (2020-2050)*



# Energy

- There is lots of it, it is just that in natural systems it is generally very diffuse
- We have been spoiled by fossil fuels, lost perspective
- There are no substitutes for oil, nothing is as energy dense



# Key point

- It is not about how MUCH energy there is... there is an endless amount,
- it is about how DENSE it is.. Before it can become useful and economically usable
- The RATE or efficiency at which we use energy defines what is a viable resource

# 1 Gallon Oil

- 20 days manual labour
- 4 weeks work!

# Things to remember #1

- Warm air rises
- This is a very important principle in learning how to work with energy naturally
- Match the patterns, In nature energy occurs in patterns. Make hay while sun shines. Day/night, seasonal wind rain sun

# Its all about flow

- Our long term energy position is rather like you have a billion dollars in the bank but you have no cards or transfers and can only get \$100 a day out of the ATM....



# Things to remember #2 Entropy

- Friction – drag factor
- Energy dissipates
- No such thing as a free lunch
- 2<sup>nd</sup> law of thermo-dynamics
- Energy profit ratio
- EROEI or EROI

# second law of thermodynamics

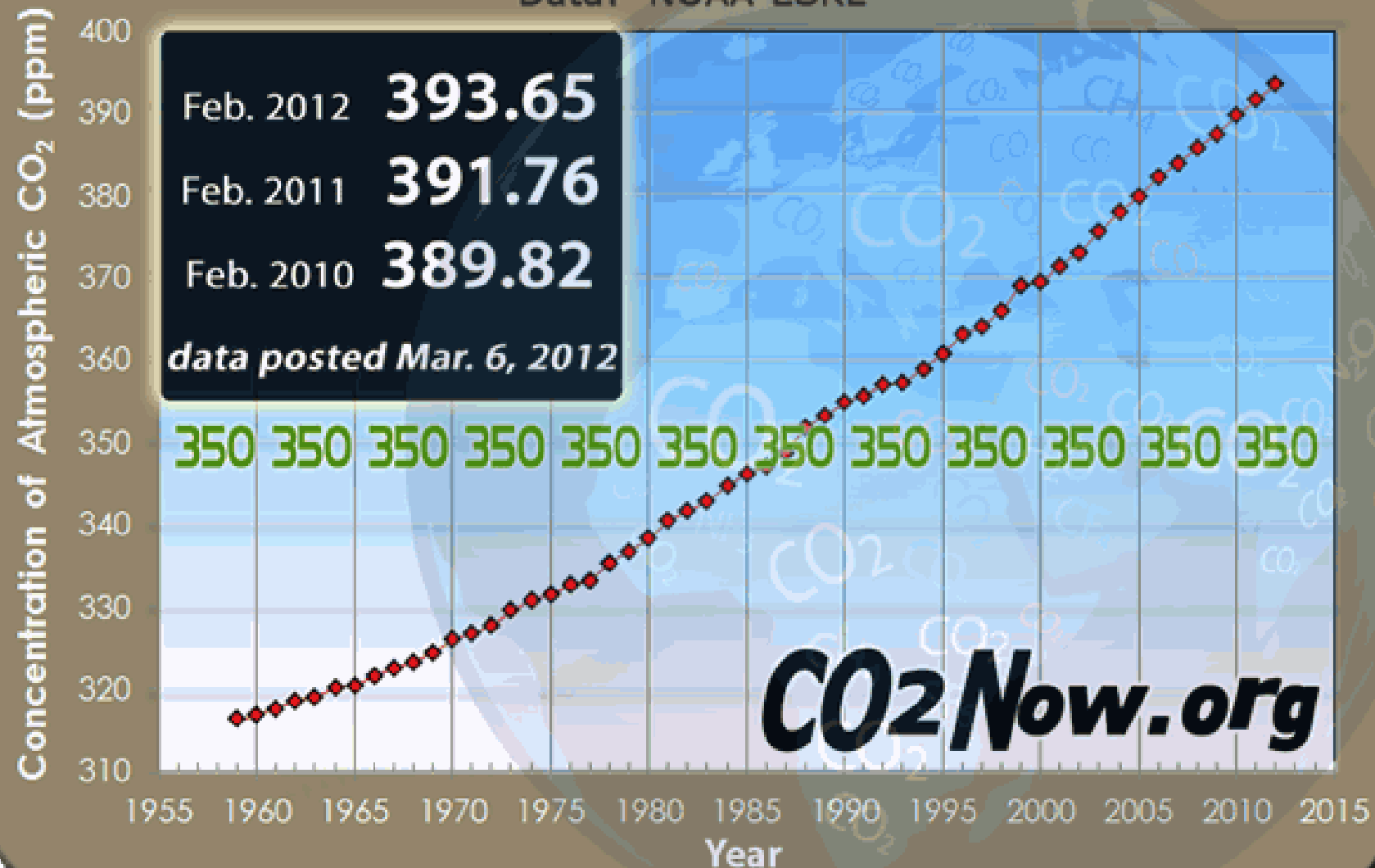
- From Wikipedia, the free encyclopedia
- The **second law of thermodynamics** is an expression of the tendency that over time, differences in temperature, pressure, and chemical potential equilibrate in an isolated [physical system](#). From the state of [thermodynamic equilibrium](#), the law deduced the principle of the increase of [entropy](#) and explains the phenomenon of [irreversibility](#) in nature. The second law declares the impossibility of machines that generate usable energy from the abundant internal energy of nature by processes called [perpetual motion of the second kind](#).

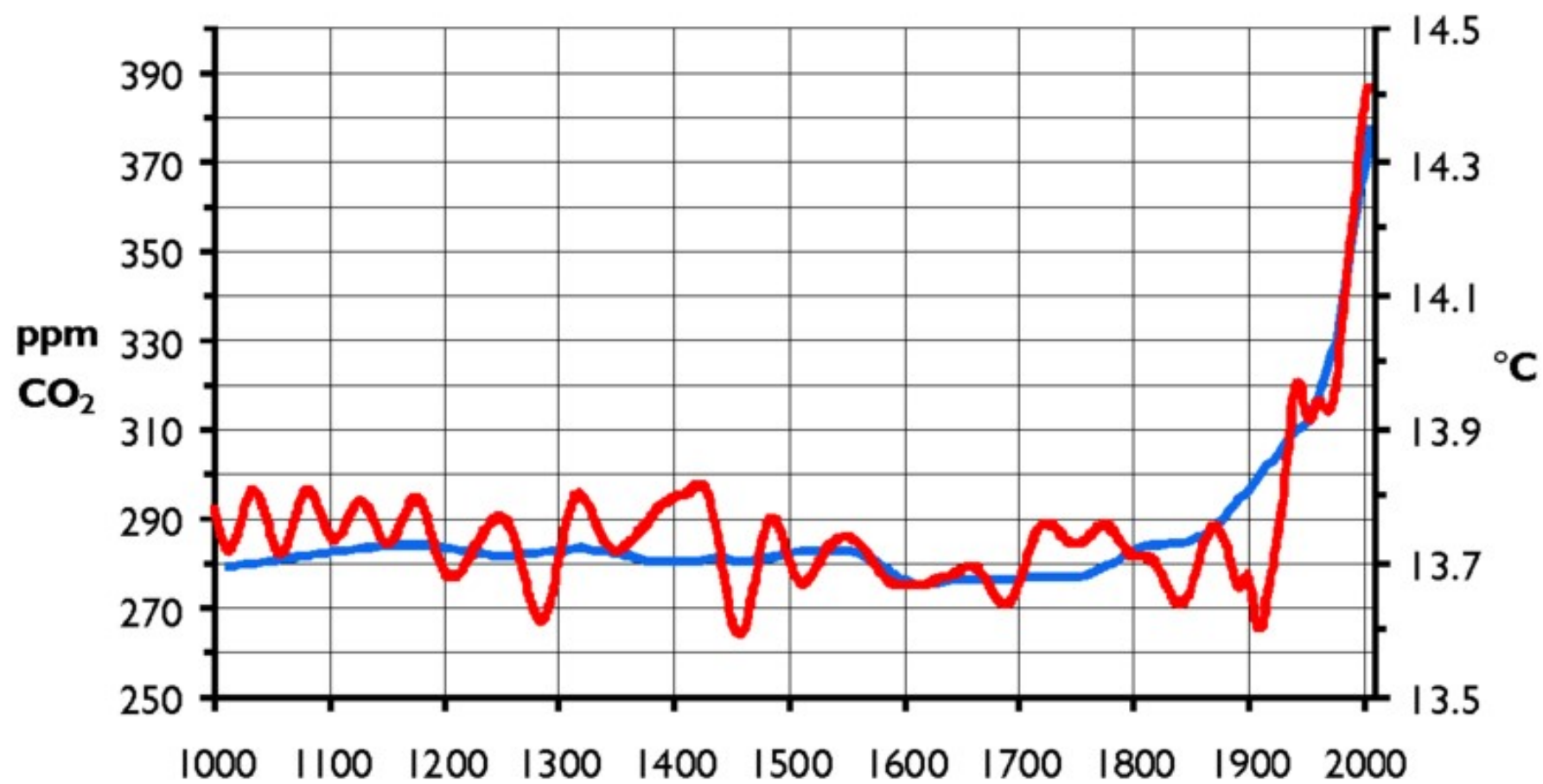
# Atmospheric CO<sub>2</sub>

February 1959 - February 2012

February CO<sub>2</sub> | Year Over Year | Mauna Loa Observatory

Data: NOAA-ESRL



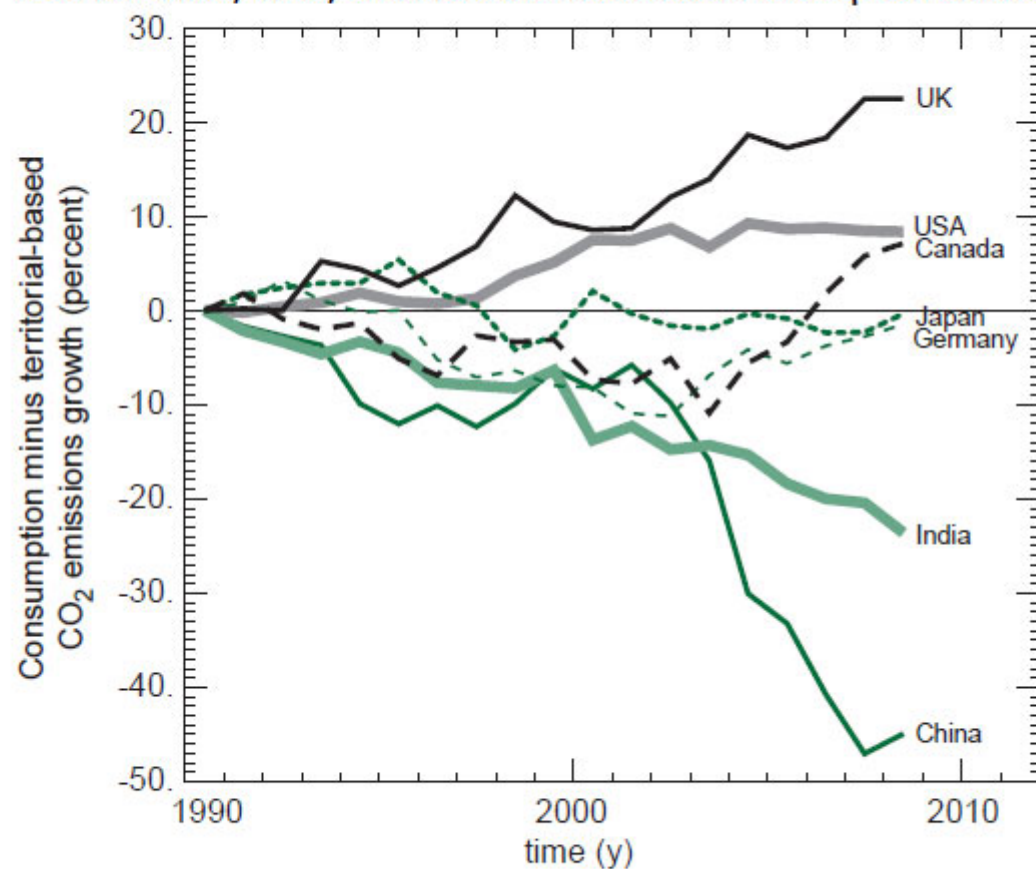




- UK's legally binding target under the Kyoto protocol to cut greenhouse gas emissions by 12.5% below 1990 levels by 2008-2012
- Climate Change Act 2008 requirement (to cut emissions of green house gas emissions by 80% below 1990 levels by 2050)

Carbon Dioxide reduction targets

Figure 3—Growth difference between consumption-based and territorial-based CO<sub>2</sub> emissions from 1990 for China, India, and industrial nationals in the top ten emitters.<sup>29</sup>



Source: UK Energy Research Centre (UKERC)



# Skeptical Science

Getting skeptical about global warming skepticism



Home Arguments Software Resources Comments Translations About

Search...

GO



Posts Comments Email

CHRISTY CROCKS

Lindzen Illusions!

MONCKTON MYTHS

SPENCER SLIP UPS

CLIMATE MYTHS FROM POLITICIANS

Interactive History of Climate Science

PRUDENT PATH

Lessons from Predictions

OA not OK

TREND CALCULATOR

## MOST USED Climate Myths

and what the science really says...

- 1 Climate's changed before
- 2 It's the sun
- 3 It's not bad
- 4 There is no consensus

## Explaining climate change science & rebutting global warming misinformation

Scientific skepticism is healthy. Scientists should always challenge themselves to improve their understanding. Yet this isn't what happens with climate change denial. Skeptics vigorously criticise any evidence that supports man-made global warming and yet embrace any argument, op-ed, blog or study that refutes global warming. This website gets skeptical about global warming skepticism. Do their arguments have any scientific basis? What does the peer reviewed scientific literature say?

Newcomers,  
start here

The Big  
Picture

## Monckton Misleads California Lawmakers - Now It's Personal (Part 1)

Posted on 29 March 2012 by dana1981

As Peter Hadfield noted, Monckton has used his current "very busy tour" as an excuse to avoid debating him. I attended one of the stops on Monckton's current tour at the California State Capitol on 21 March 2012 to see just what Monckton deemed more important than facing up to Hadfield's uncovering of Monckton's most recent misrepresentations of his sources. The answer: misinforming my fellow Californians,

Winner of the 2011

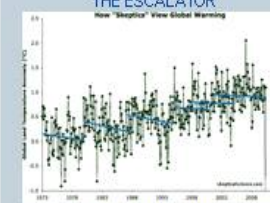


Australian  
museum

Eureka Prize  
Advancement of  
climate change  
knowledge

THE ESCALATOR

How "Skeptical" View Global Warming



(free to republish)

THE DEBUNKING HANDBOOK

# www.skepticalscience.com

# Energy Profit Ratio

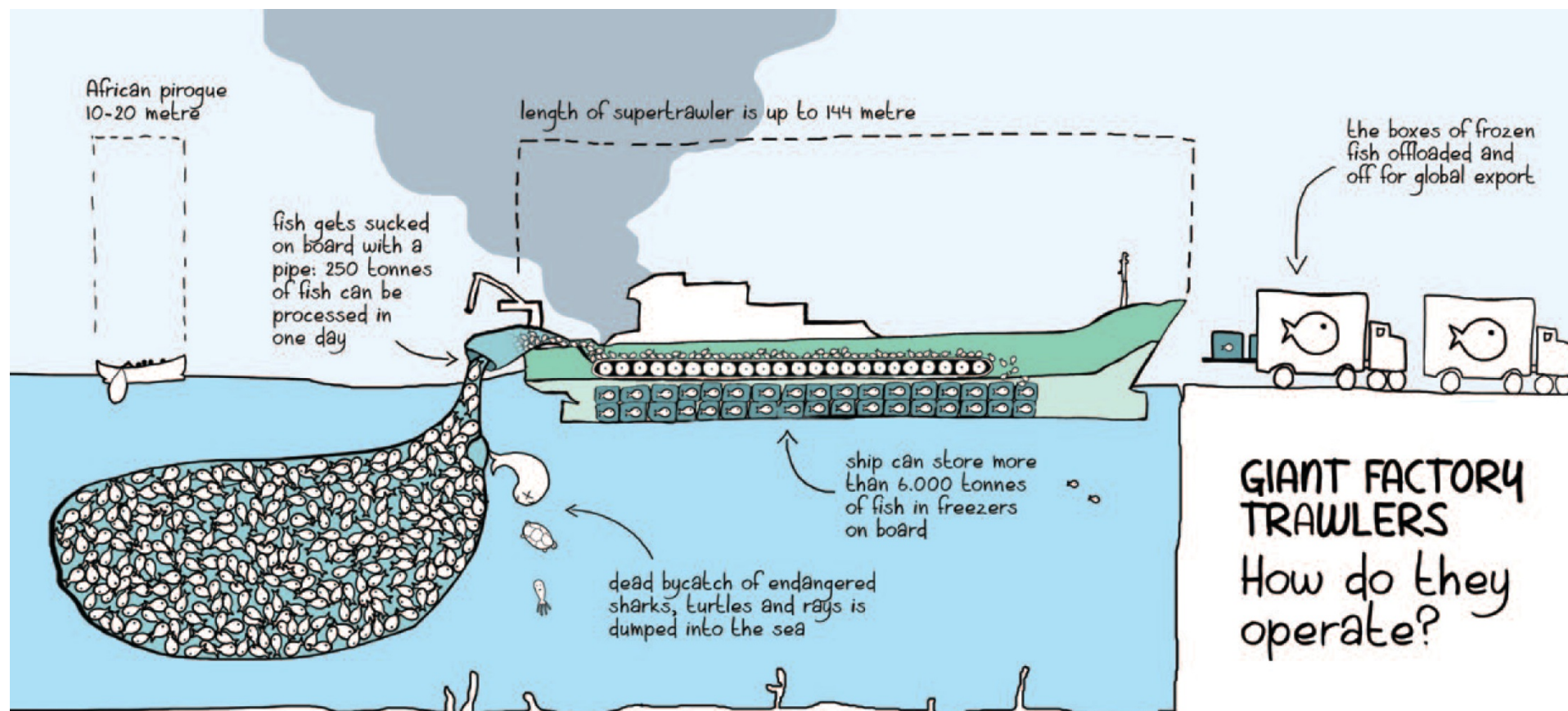


# EPR of food















# EPR

Agribusiness food production

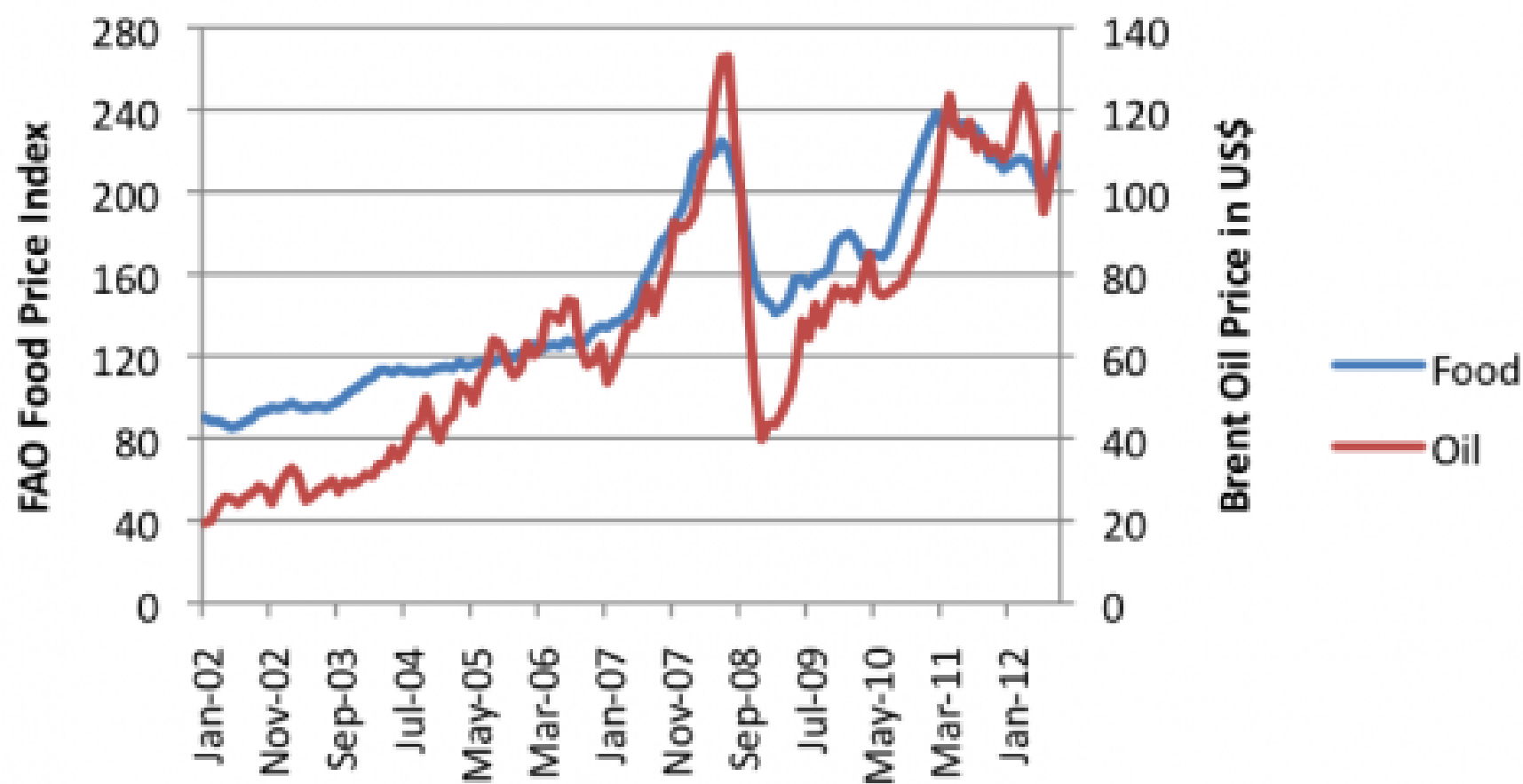
10 calories oil for 1 calorie food out

Industrial fishing

16 calories of oil energy in for one food out

Subsistence horticulture One calorie human  
energy in for 1.2 – 3.3 out??

## Comparison of Food and Oil Prices

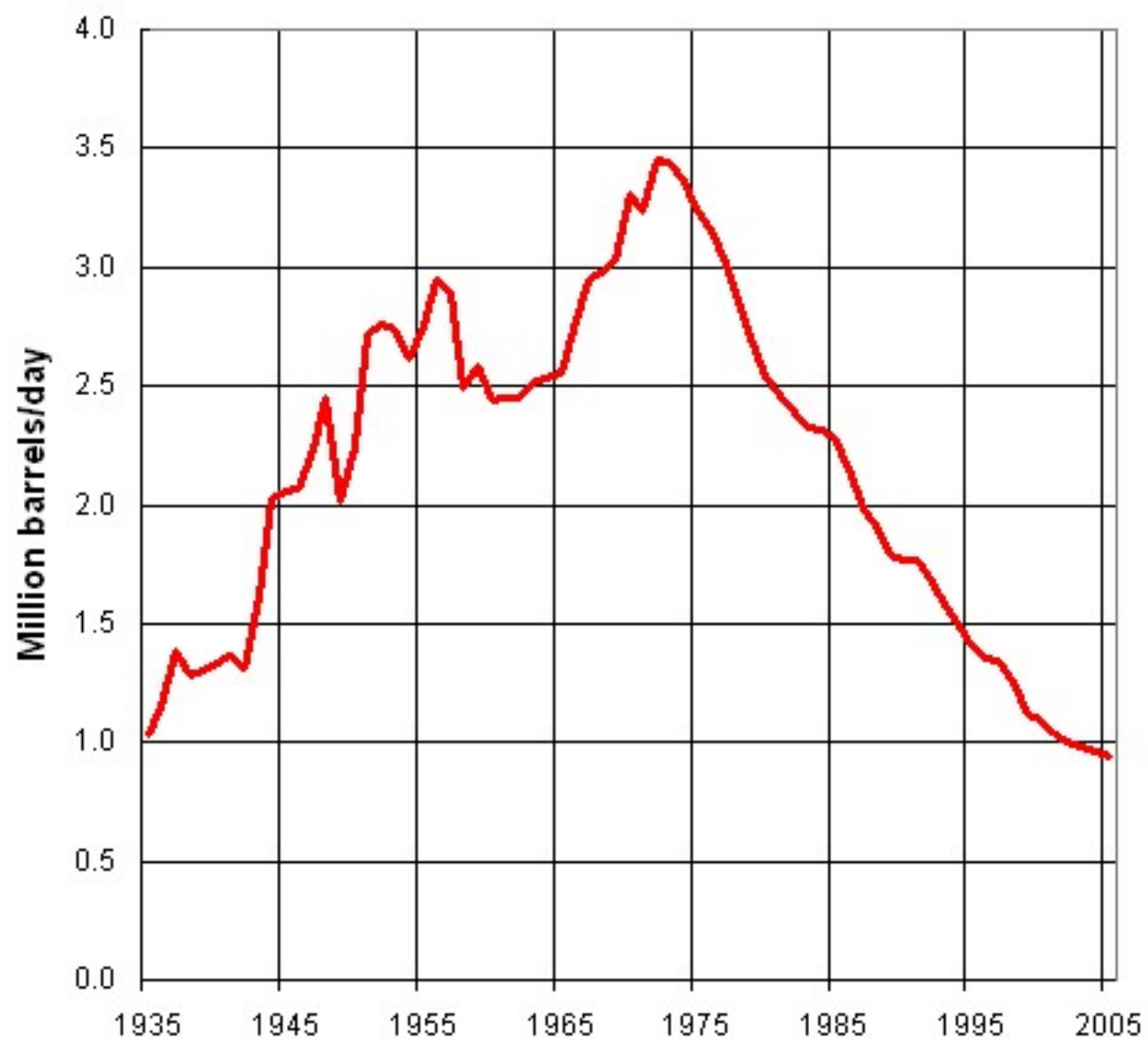


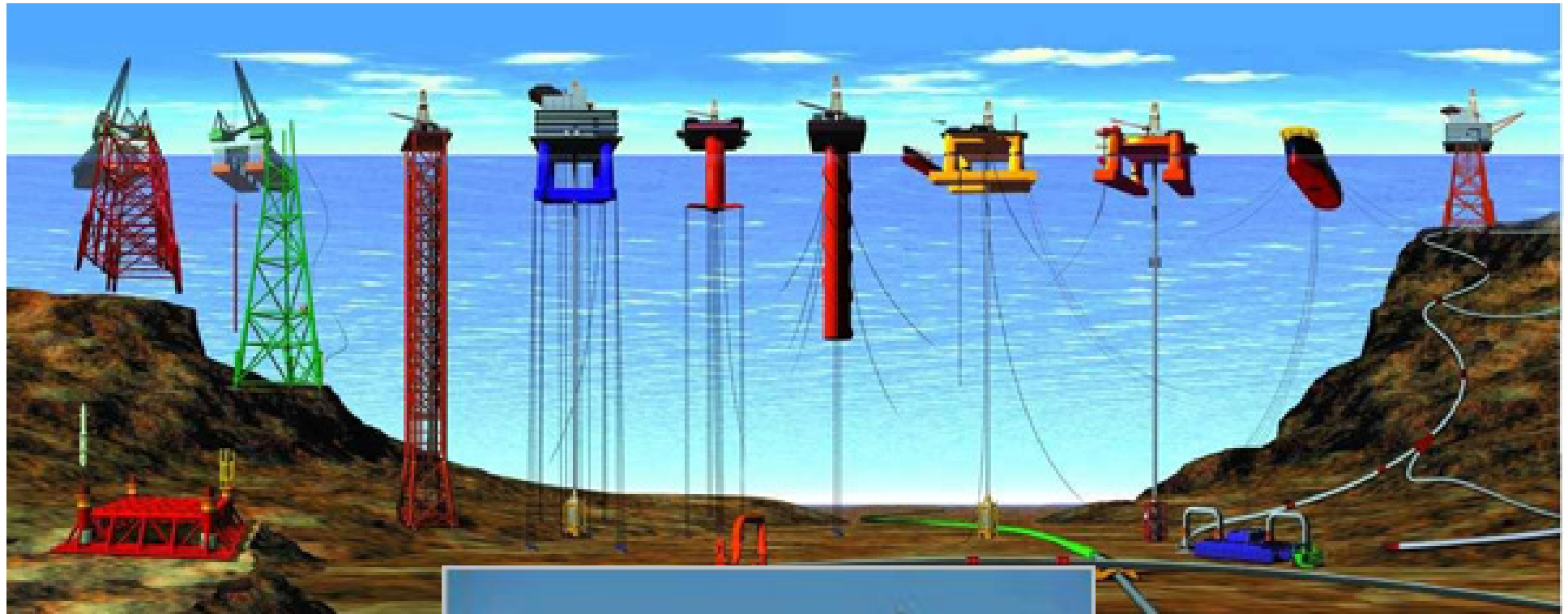
# EROI of Oil



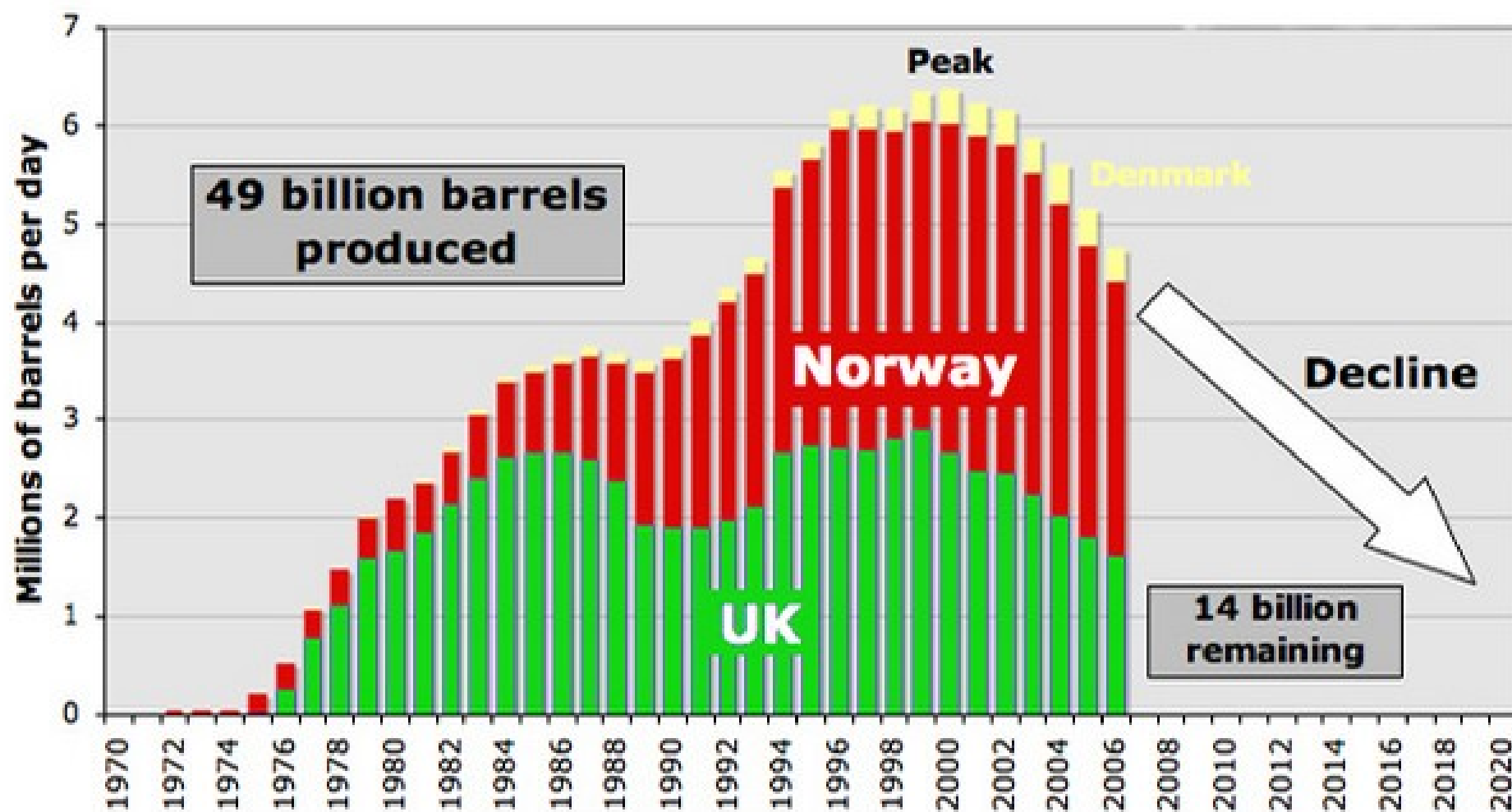


## Texas Oil Production





# North Sea Oil Production







**Oil Sands: 10:1-2:1**

# Ugandan porter principle

- 50 kg max load
- 2 kg food per day per porter
- Max journey 25 days
- For a 24 day trip, 48/50 kilos of baggage are food for the porter

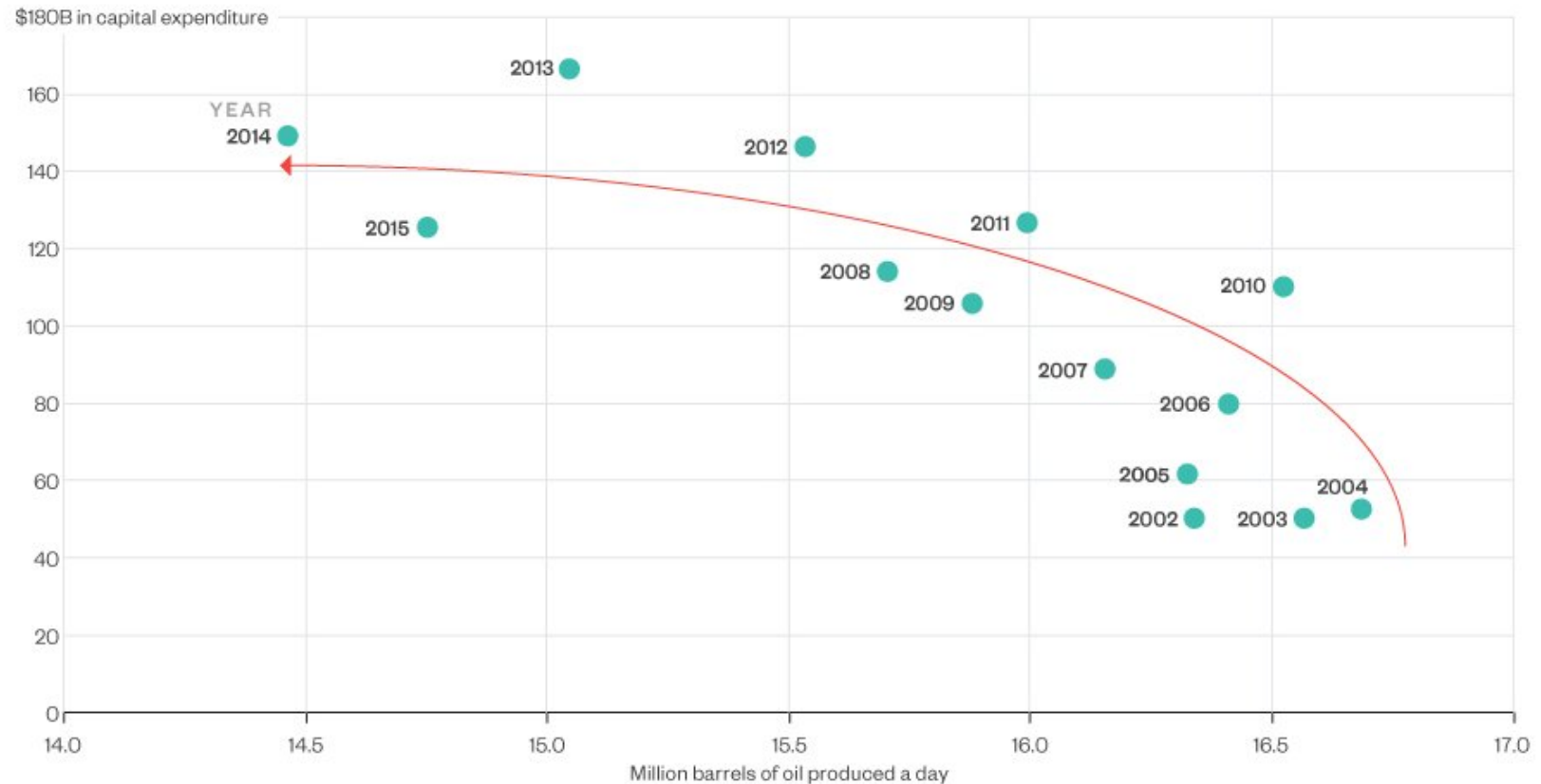
# Net energy

- Its not about how much of a resource there is,
- it is about what is the net energy gain in the extraction and synthesis of that resource into a usable fuel

# Oil investment vs return

## Trouble with the Curve

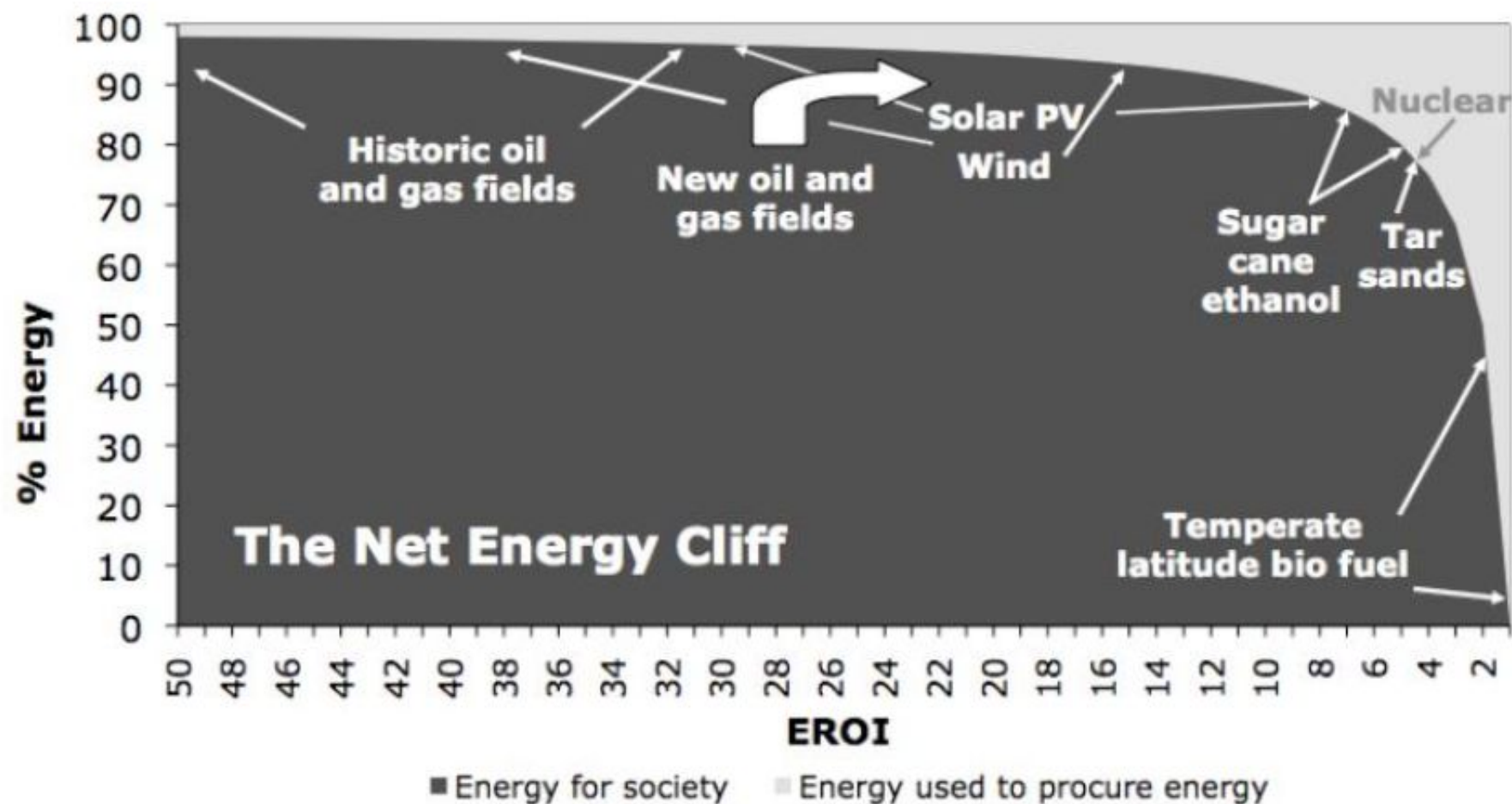
Big Oil's capital expenditure has exploded but production has fallen by 1.6 million barrels a day since 2002



Note: Big Oil refers to Exxon Mobil, Chevron, Royal Dutch Shell, BP and Total.

Sources: the companies, Bloomberg, Bain

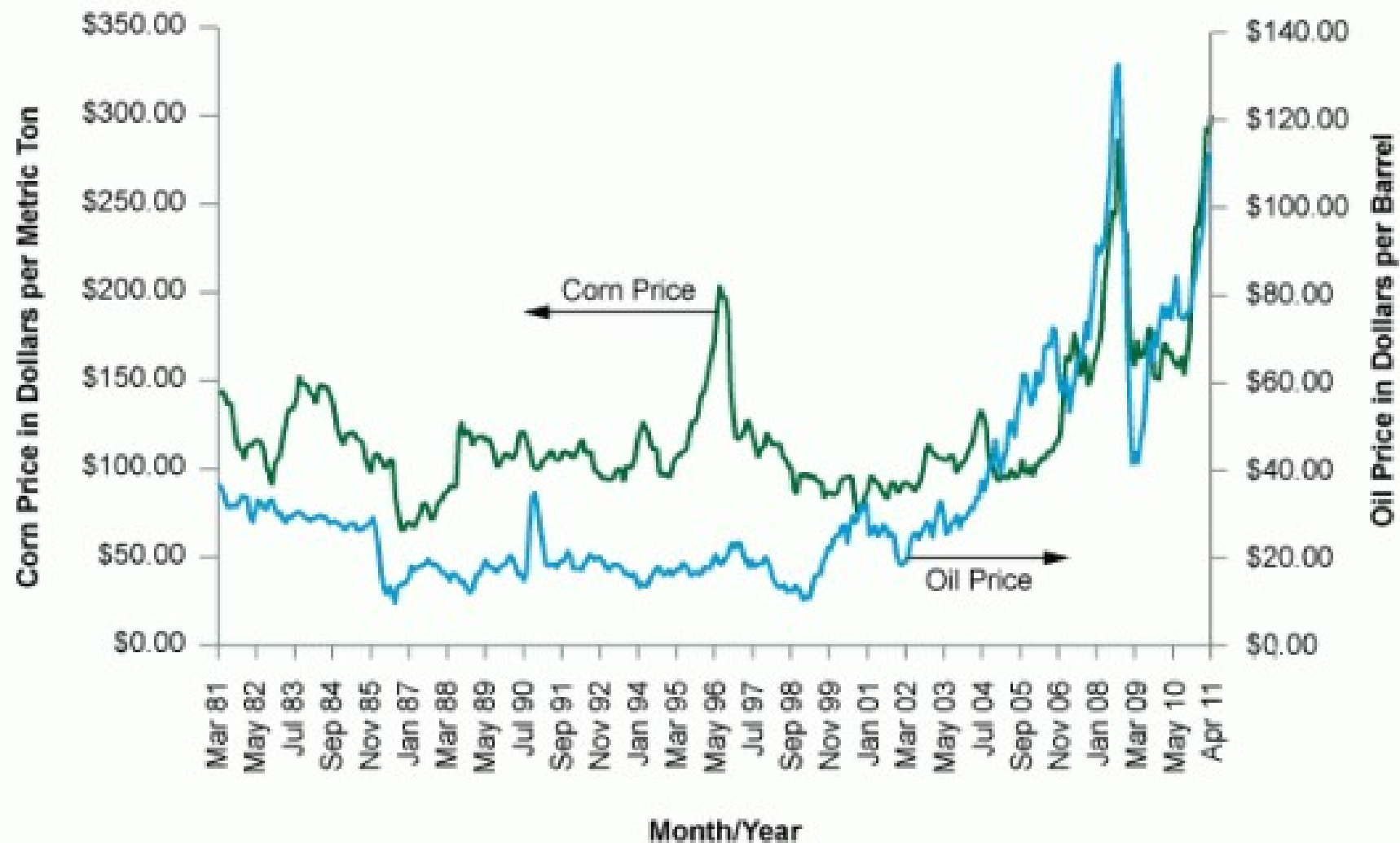






## Corn Prices Are Increasingly Tracking Oil Prices, Especially During Price Spikes.

Monthly U.S. corn and crude oil prices: March 1981 to April 2011



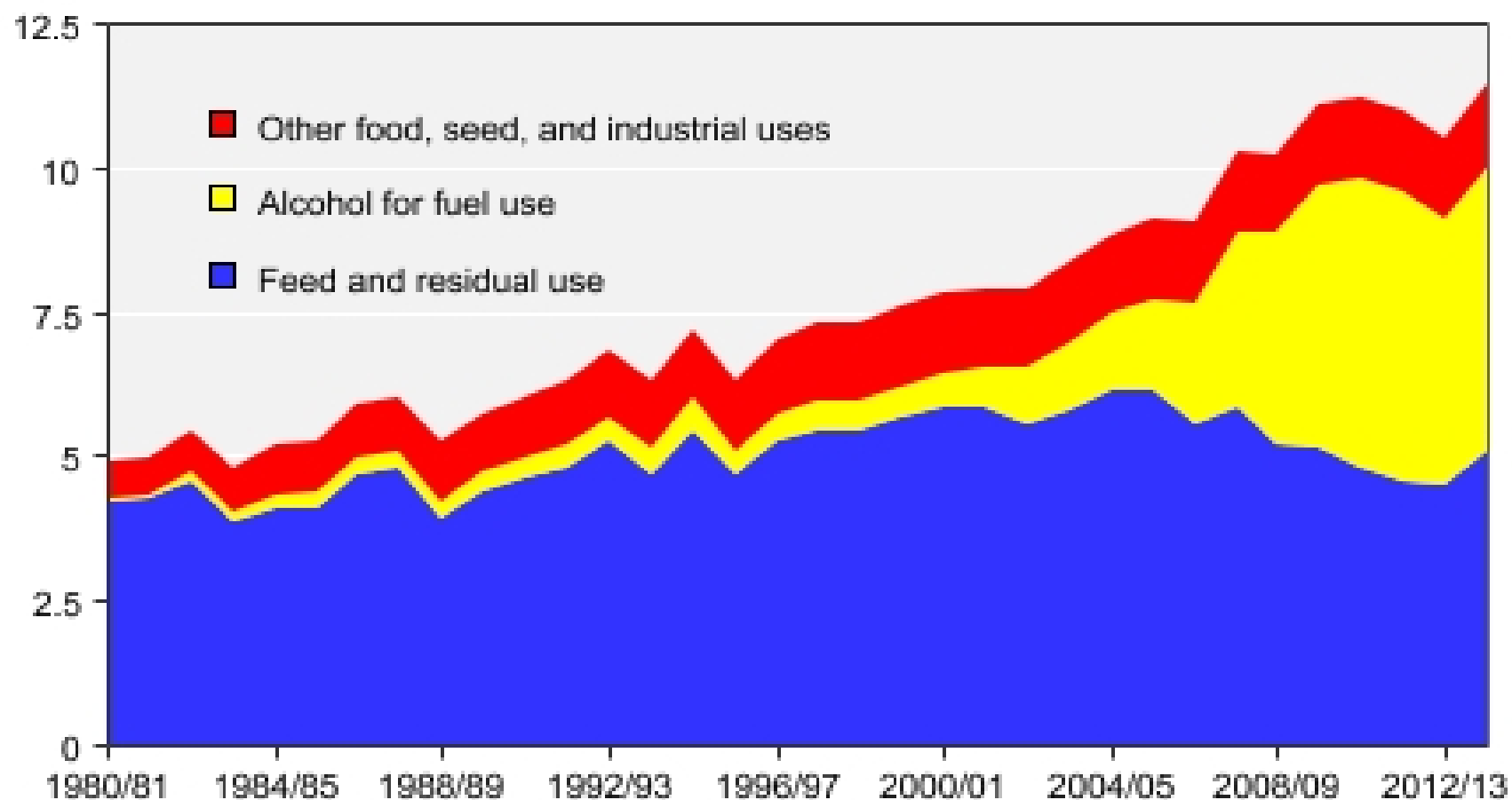
Sources: USDA National Agricultural Statistical Service (Corn) and Bloomberg (Oil Price).

Notes: Corn price is for U.S. No. 2 Yellow, FOB Gulf of Mexico, U.S. price, US\$ per metric ton

Oil Price is blended spot price for Dated Brent, West Texas Intermediate (WTI), and the Dubai Fateh, US\$ per barrel

## U.S. domestic corn use

Billion bushels



Source: Calculated by USDA, Economic Research Service.  
Updated: September 2013.



#### Design Notes

This garden design emphasizes the use of soil space for production and reduces the path area and bare soil. Plots are intensely planted with diversity and polycultures. Smaller individual plots are easier to maintain with field crops being reserved to the exterior. This design allows for demonstration plots and techniques at the entrance.

Interim space between garden plots is reserved for beneficial insect habitat and nectary plants. Crops are placed by required visits and harvest. Space is conserved for specific crop types.

Watering regimes are combined.

Space used for paths is reduced.

Farmers may have multiple plots based on crops grown.

Permanent production zones are easier to access and maintain.

Rigid welded fencing reduces the use of posts in round design.

Fenced perimeter reduces predation.

Individual plot are also vegetated fenced to 3 feet high.

Established plants are hand watered. Spring sprinkler is provided

Micro-drip irrigation is encouraged

with access to main line along central path.

#### Dimensions

Approx. 2500 Sq. Ft. growing space

200 Foot Vegetated Fence Perimeter

3 Foot Wide Perimeter Path

60 Foot Diameter Internal Garden Space

2 Foot Wide Secondary and Access Paths

8 Foot Diameter Center Island

12 - 8 Foot Diameter Keyhole Vegetable Gardens

6 - 6 Foot Diameter Herb Spirals

16 - 64 Sq. Ft. Field Crop Plots

#### Materials:

200 feet 2x3 welded wire fencing\*

20 - 5"x 8" posts\*

12 - 25 foot lengths of 2' rabbit fence (300)

5 yds. Wood Mulch

47 yds Compost/Soil ( if needed)

Opt. 200 feet main irrigation line

\*or comparable

#### Vine Crops:

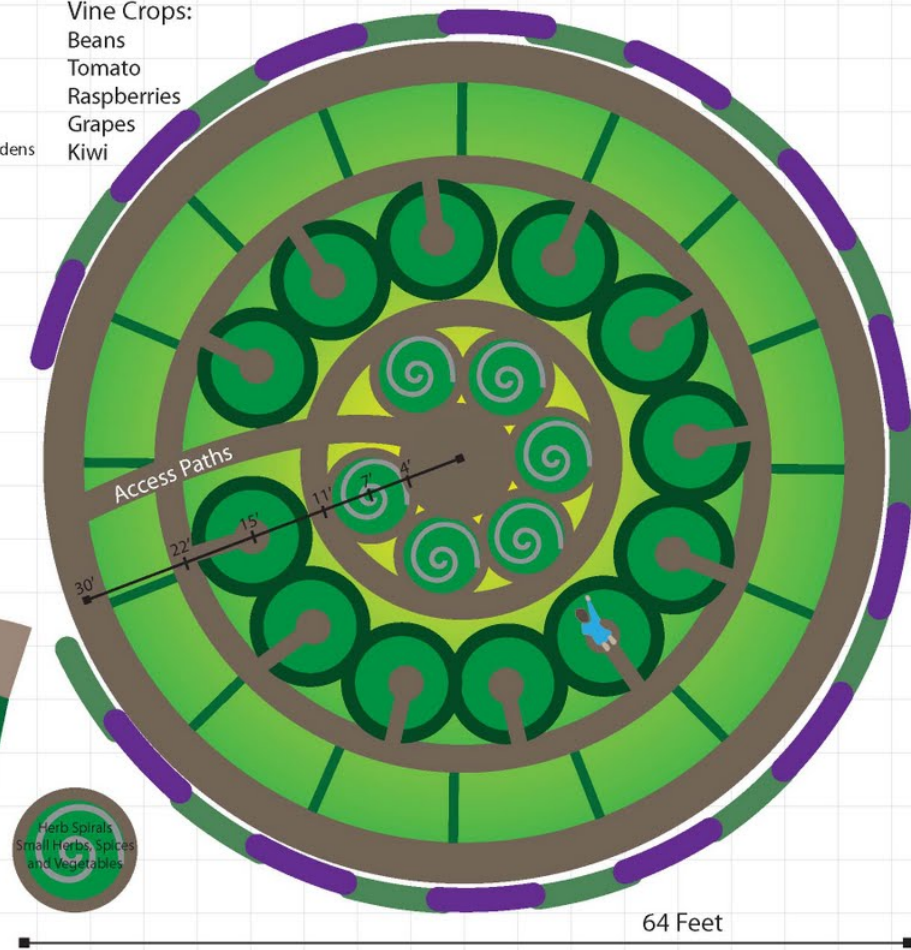
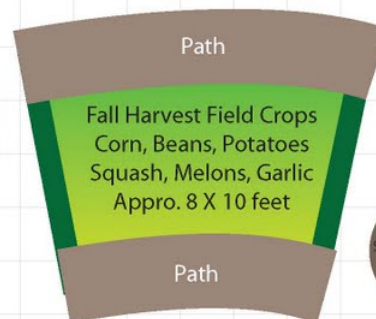
Beans

Tomato

Raspberries

Grapes

Kiwi



Designer:  
Daniel Halsey

Halsey Creative Services, Inc.  
17766 Langford Blvd, Prior Lake, MN 55372  
612-720-5001, 800-455-9884

Project: Mandala Community Garden

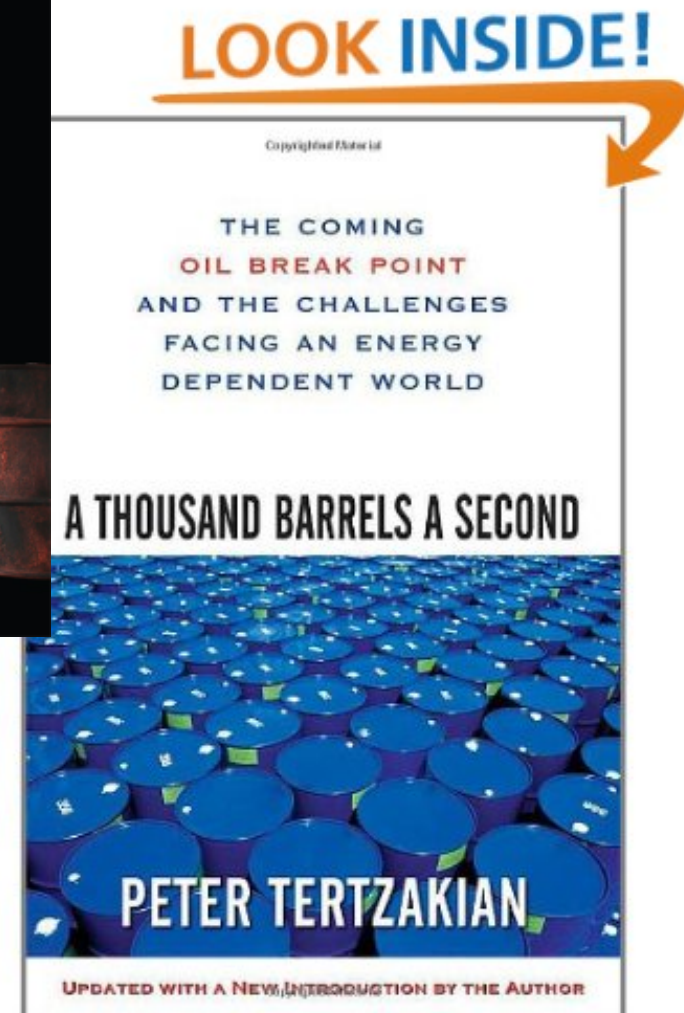
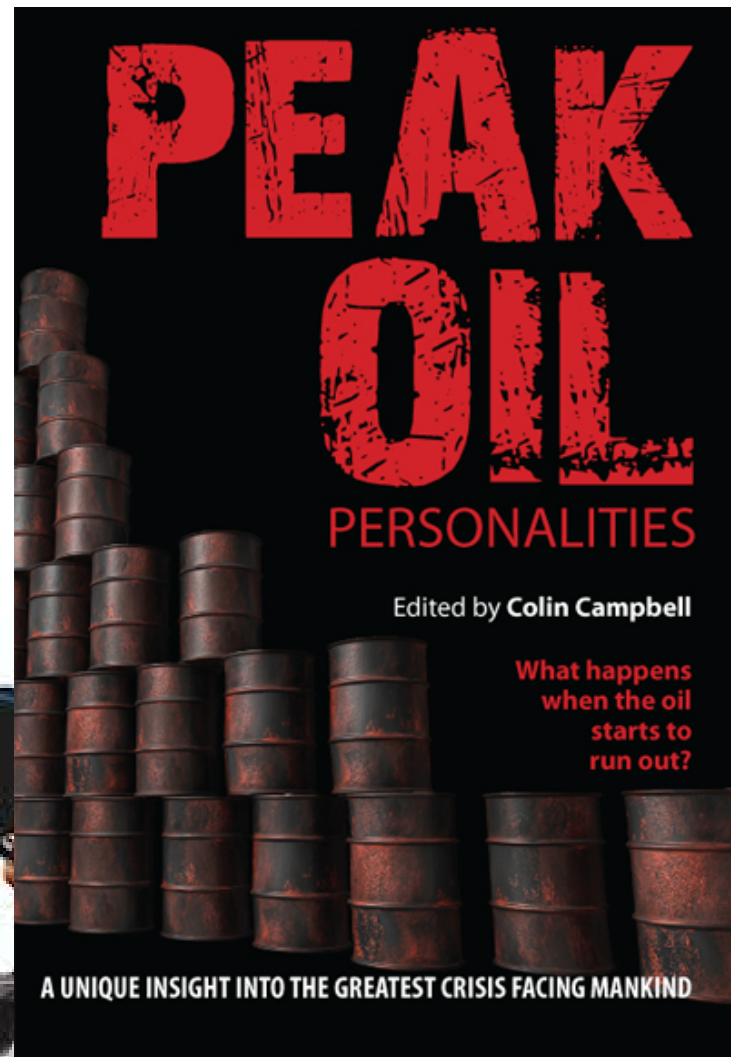
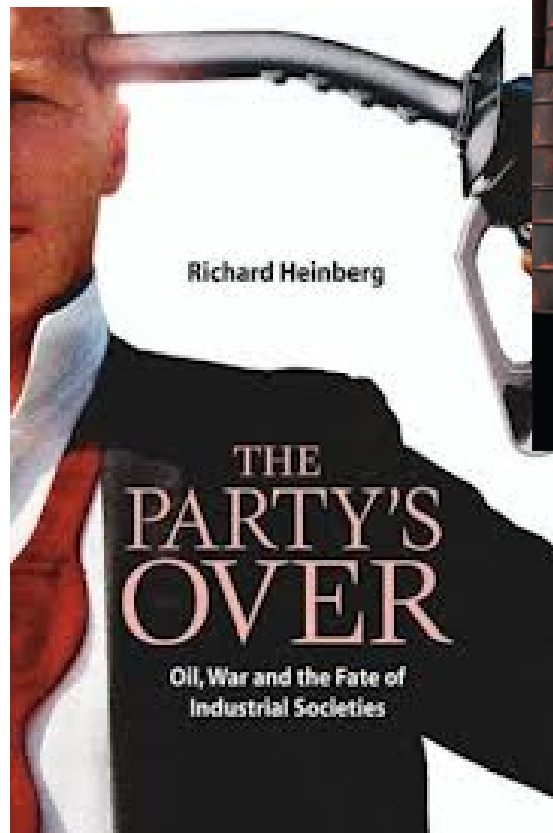
Date: July 2010

Scale: 1 inch = 4 feet

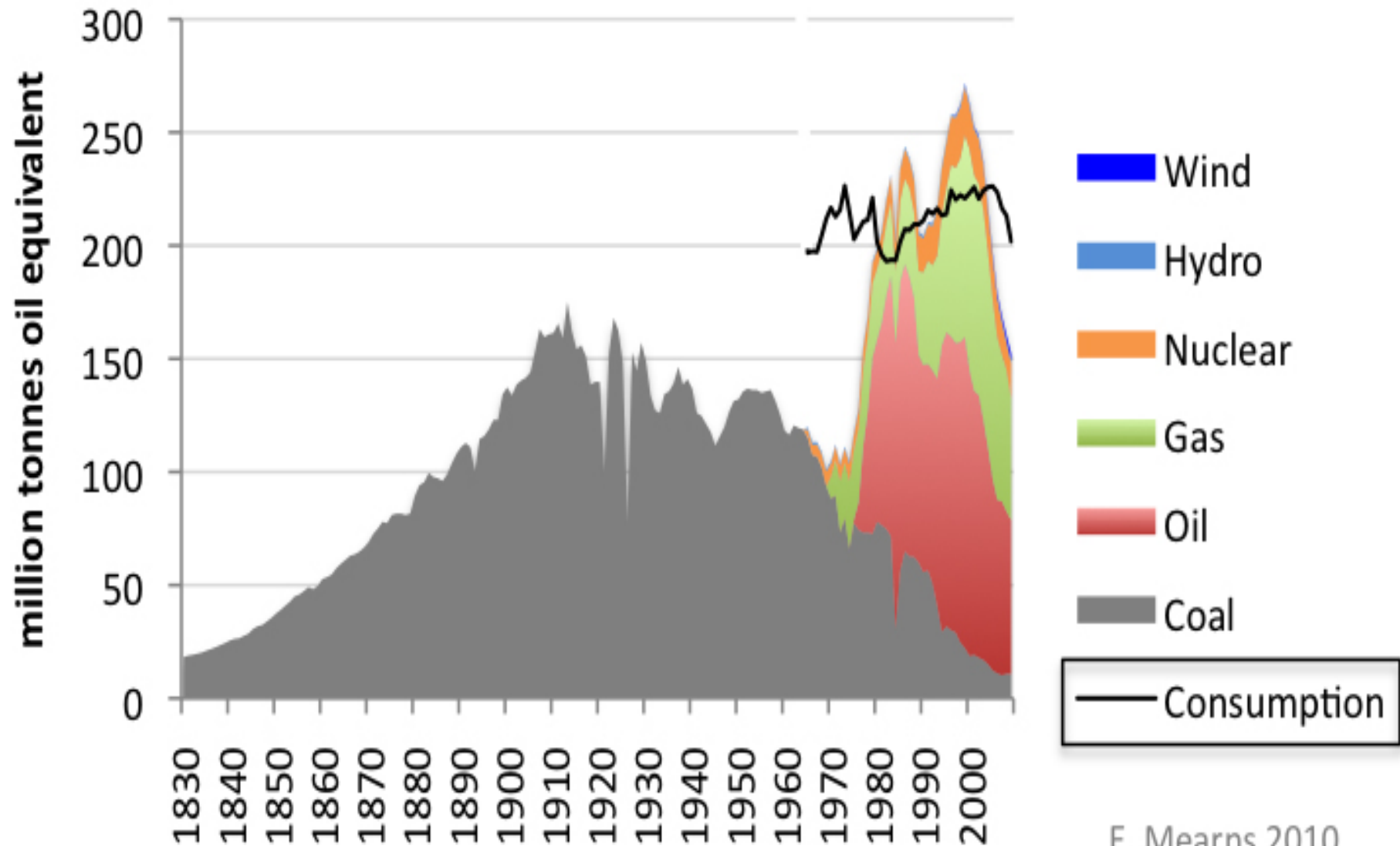
© Daniel Halsey 2010



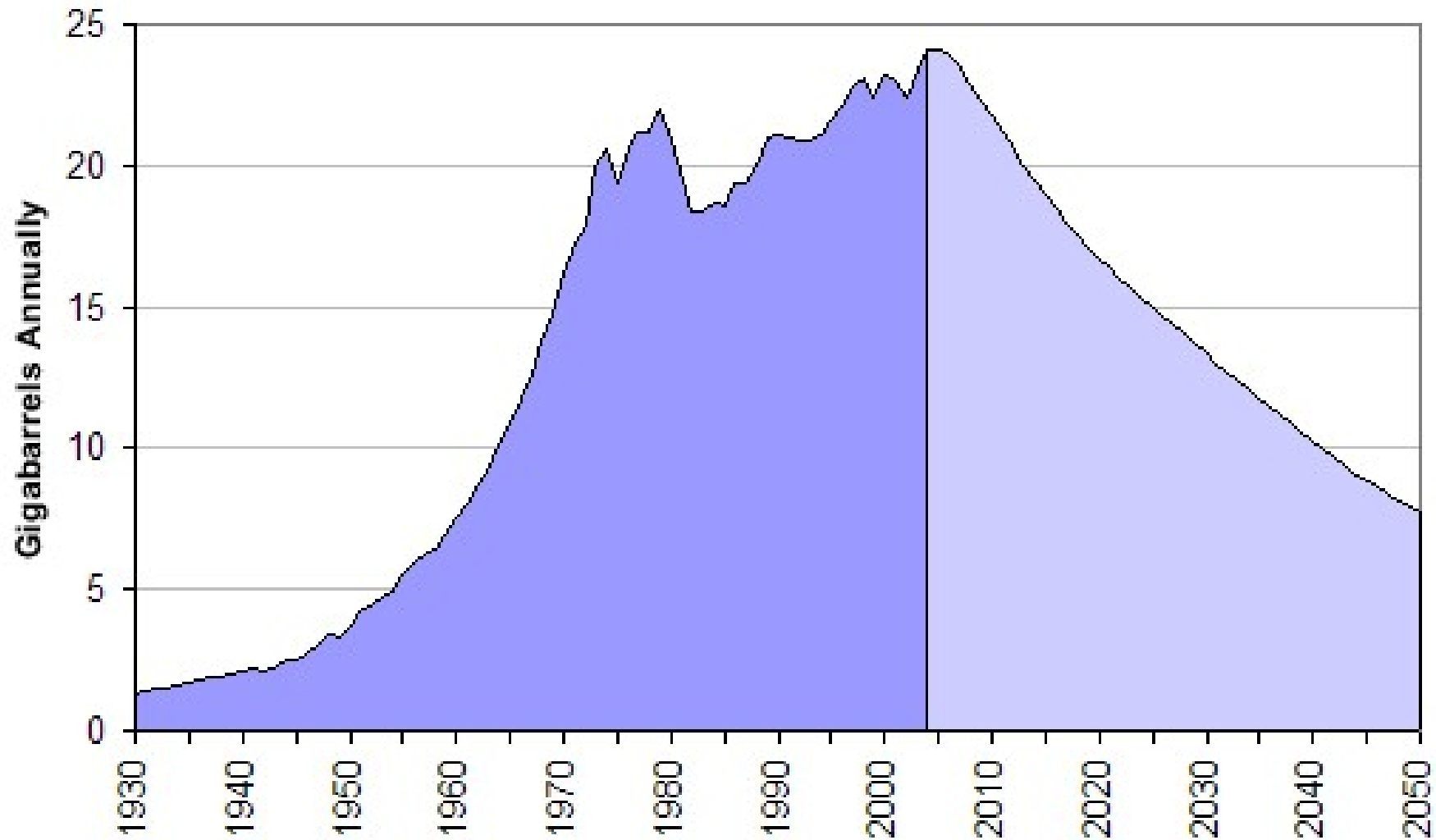
- Peak Oil



# UK primary energy production

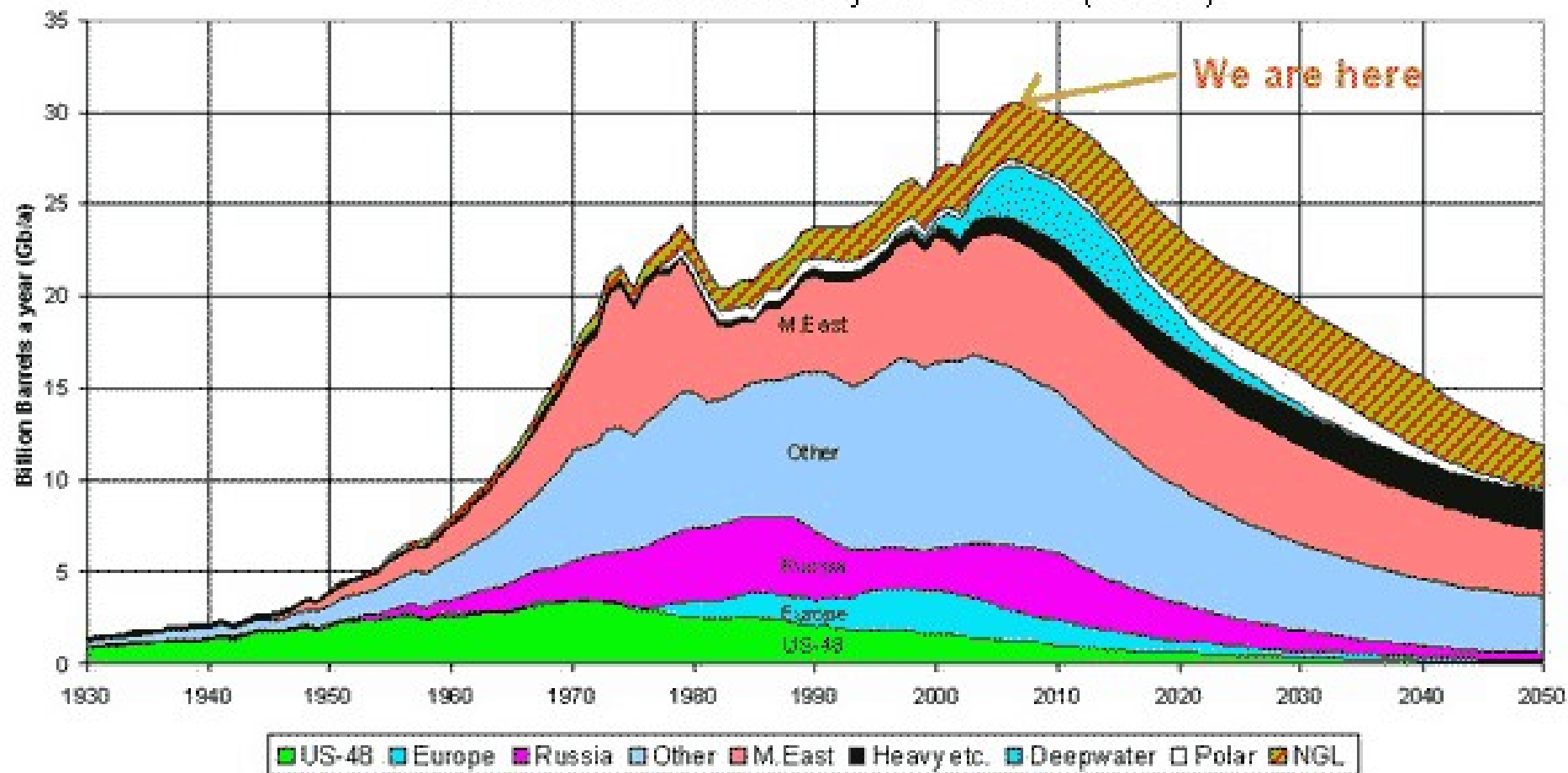


# Global peak?



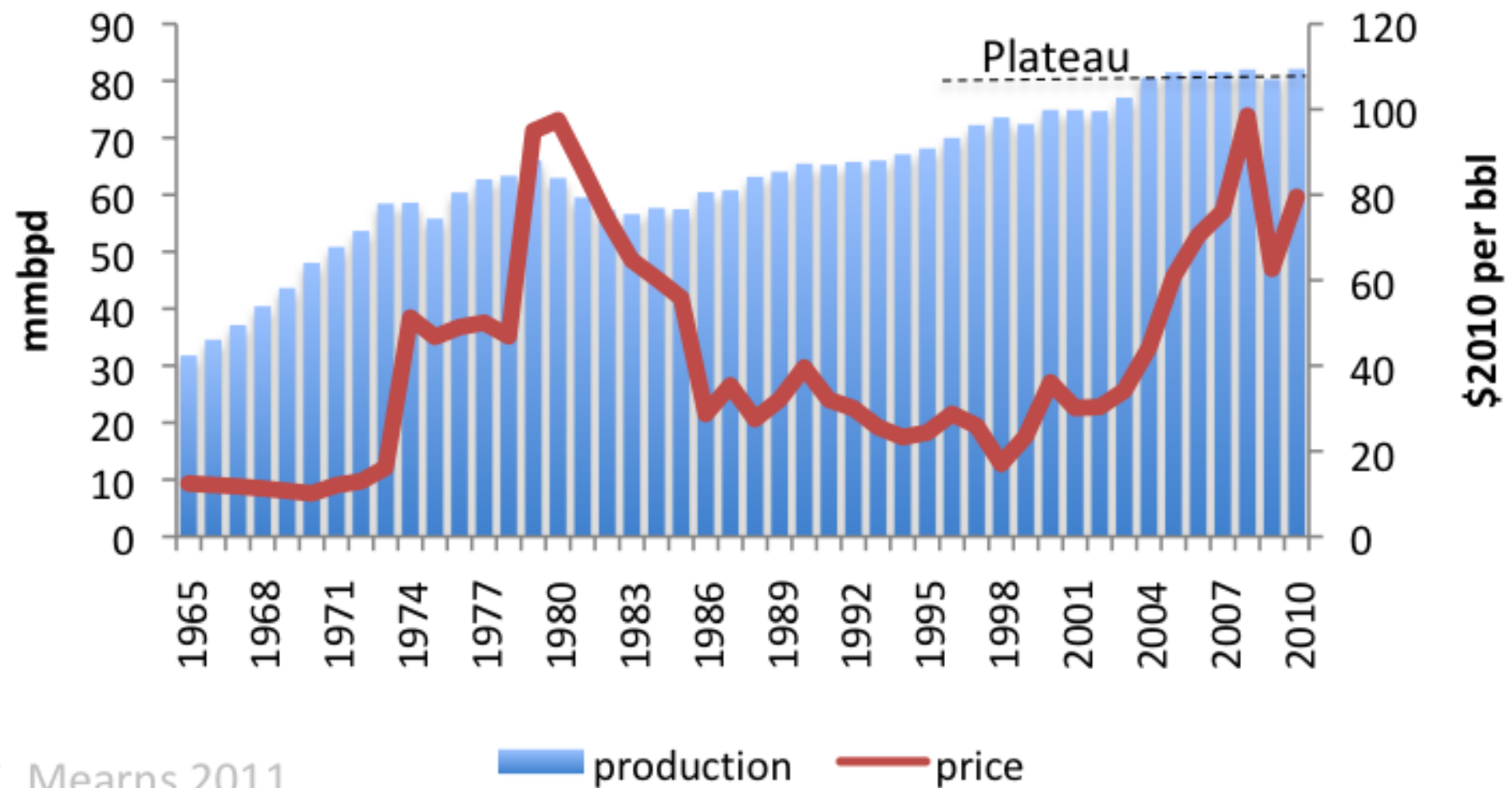
# OIL AND GAS LIQUIDS 2004 Scenario

Association for the Study of Peak Oil (ASPO)



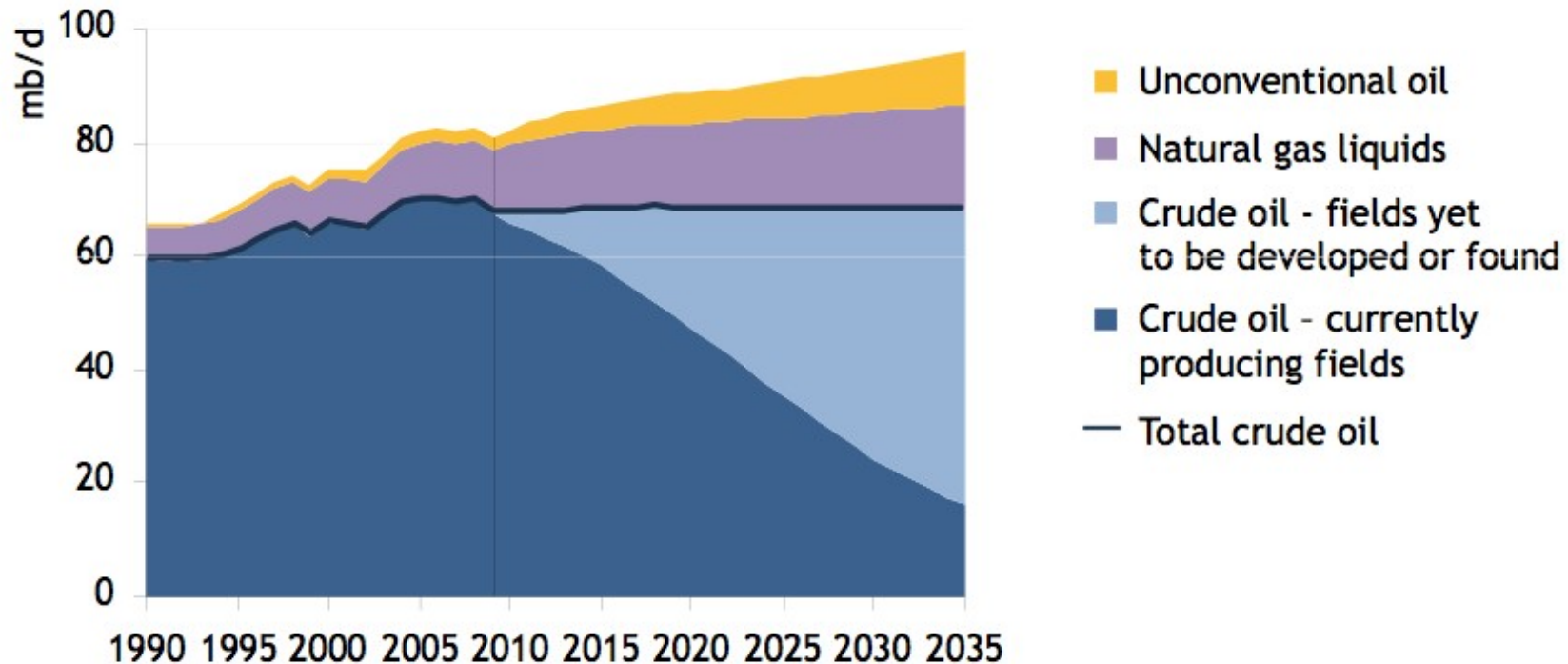


# Global oil production and price



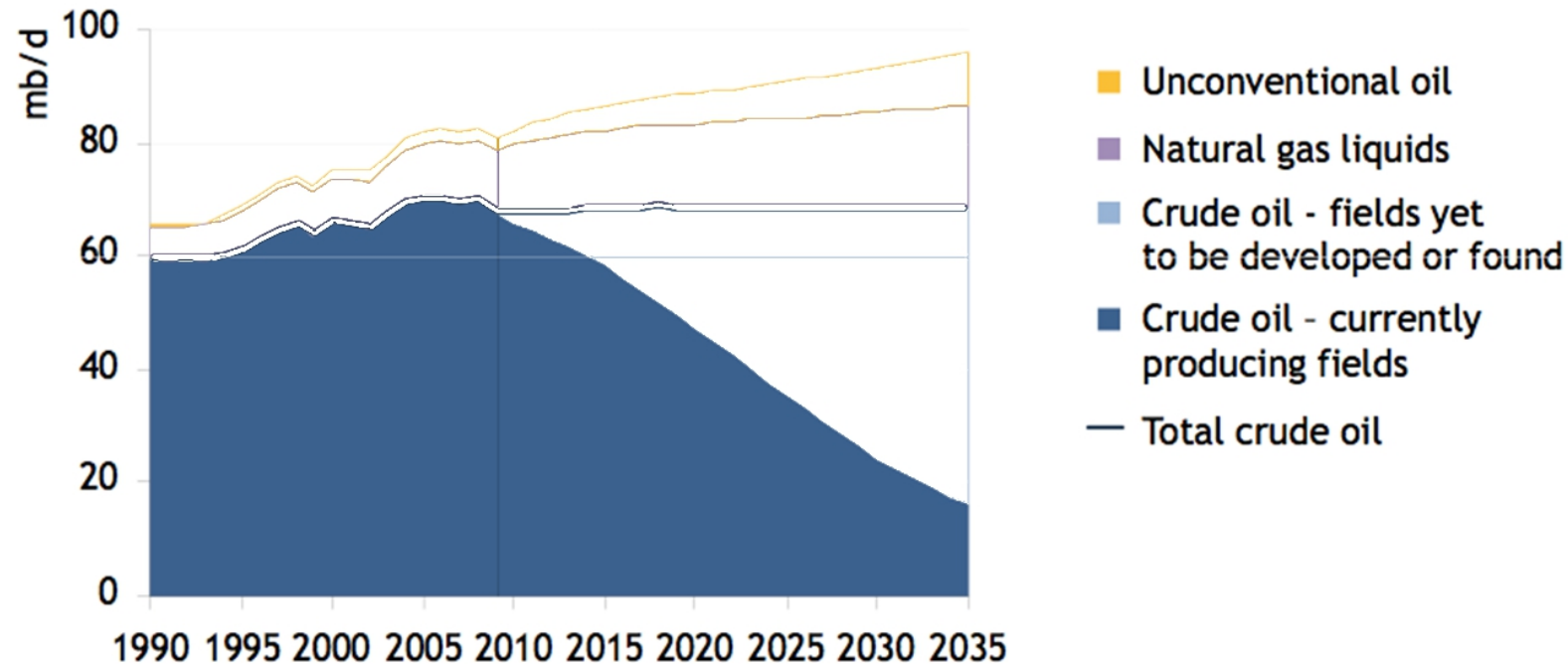
E. Mearns 2011

## World oil production by type in the New Policies Scenario



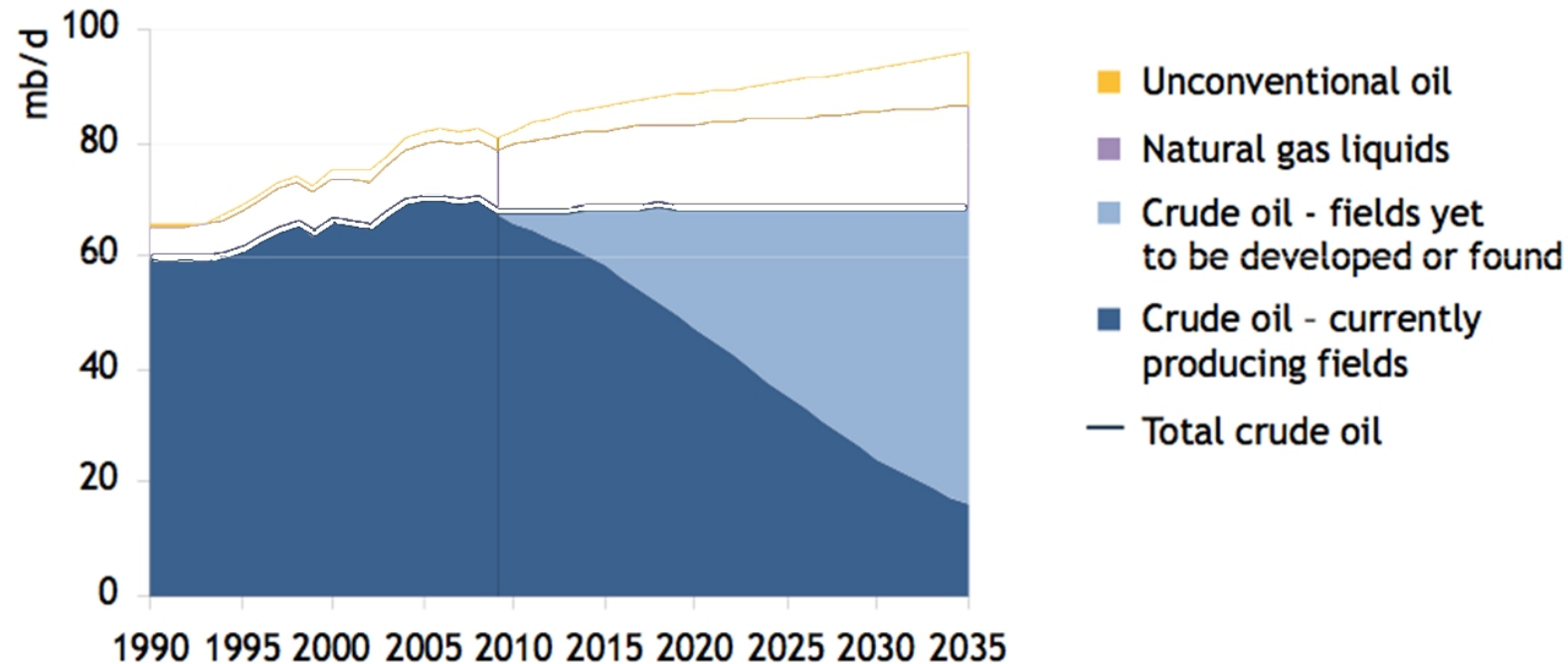
***Global oil production reaches 96 mb/d in 2035 on the back of rising output of natural gas liquids & unconventional oil, as crude oil production plateaus***

## World oil production by type in the New Policies Scenario



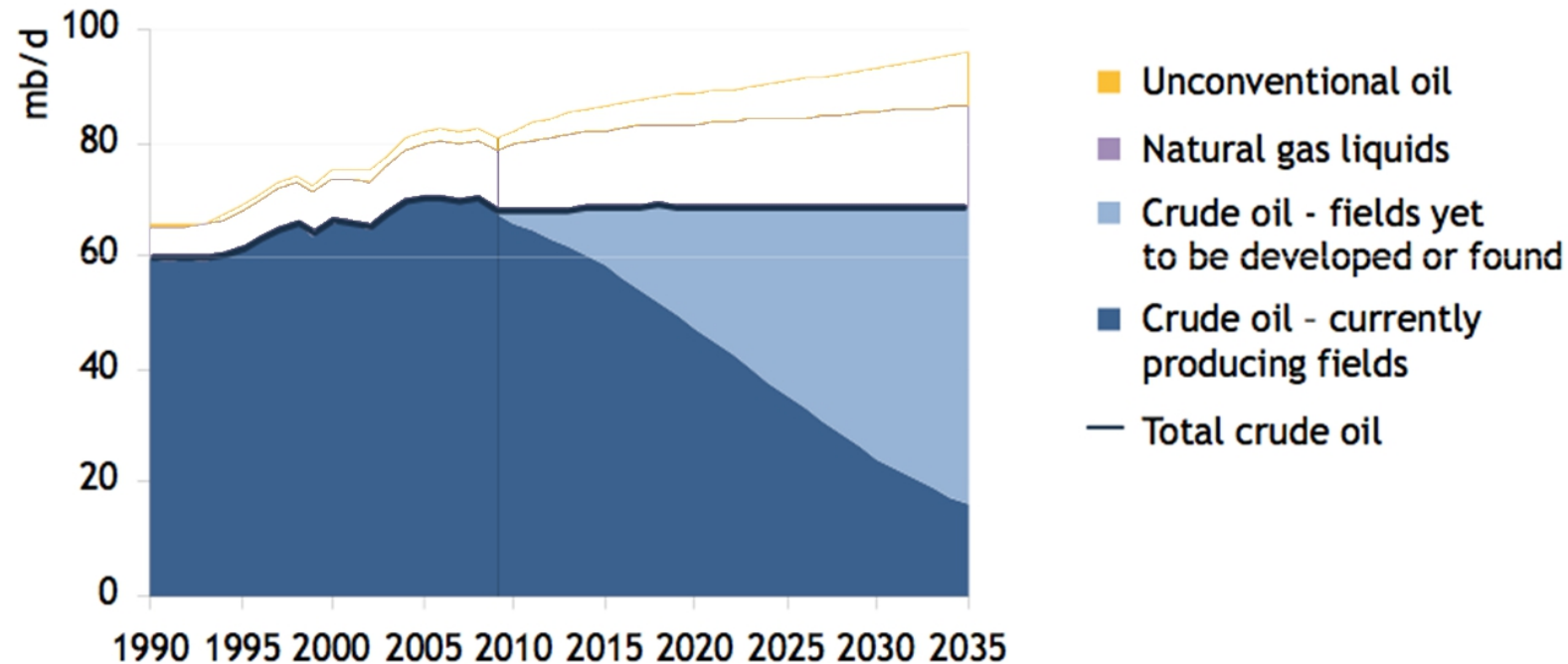
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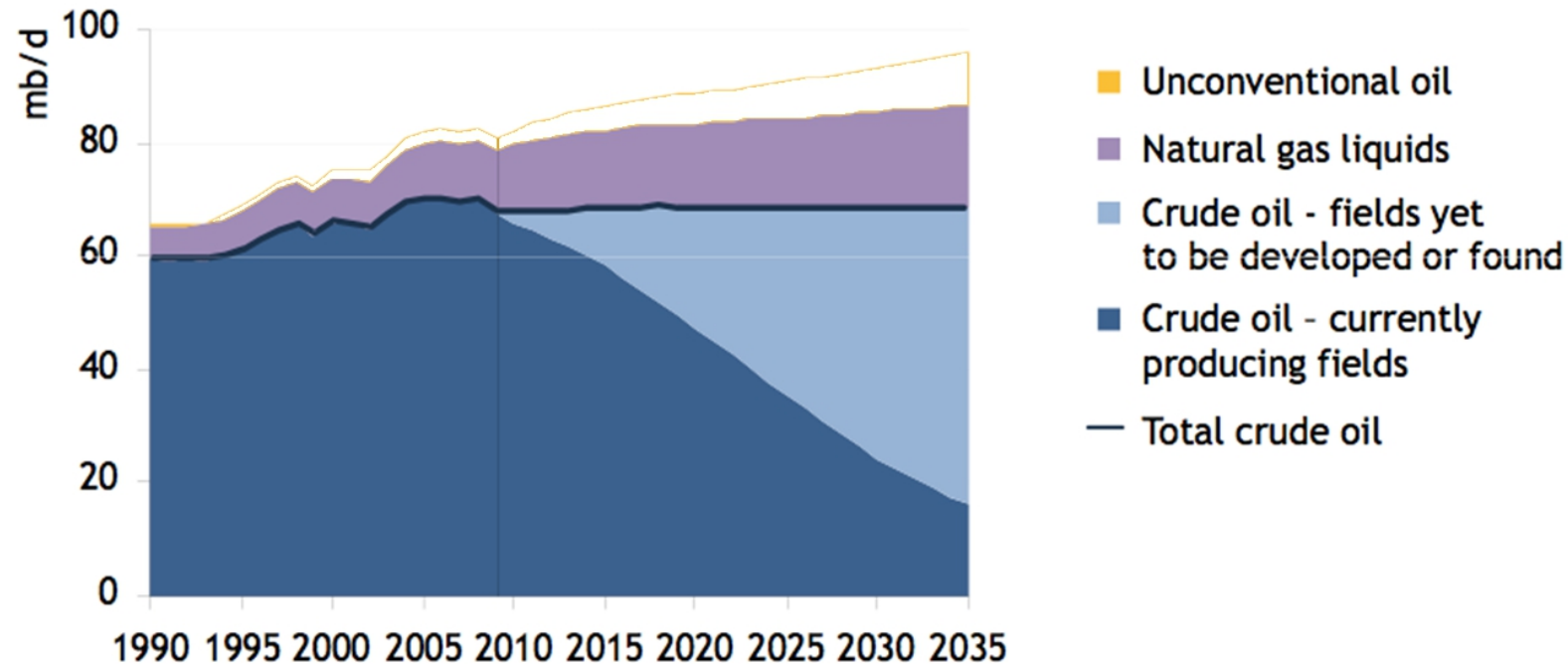
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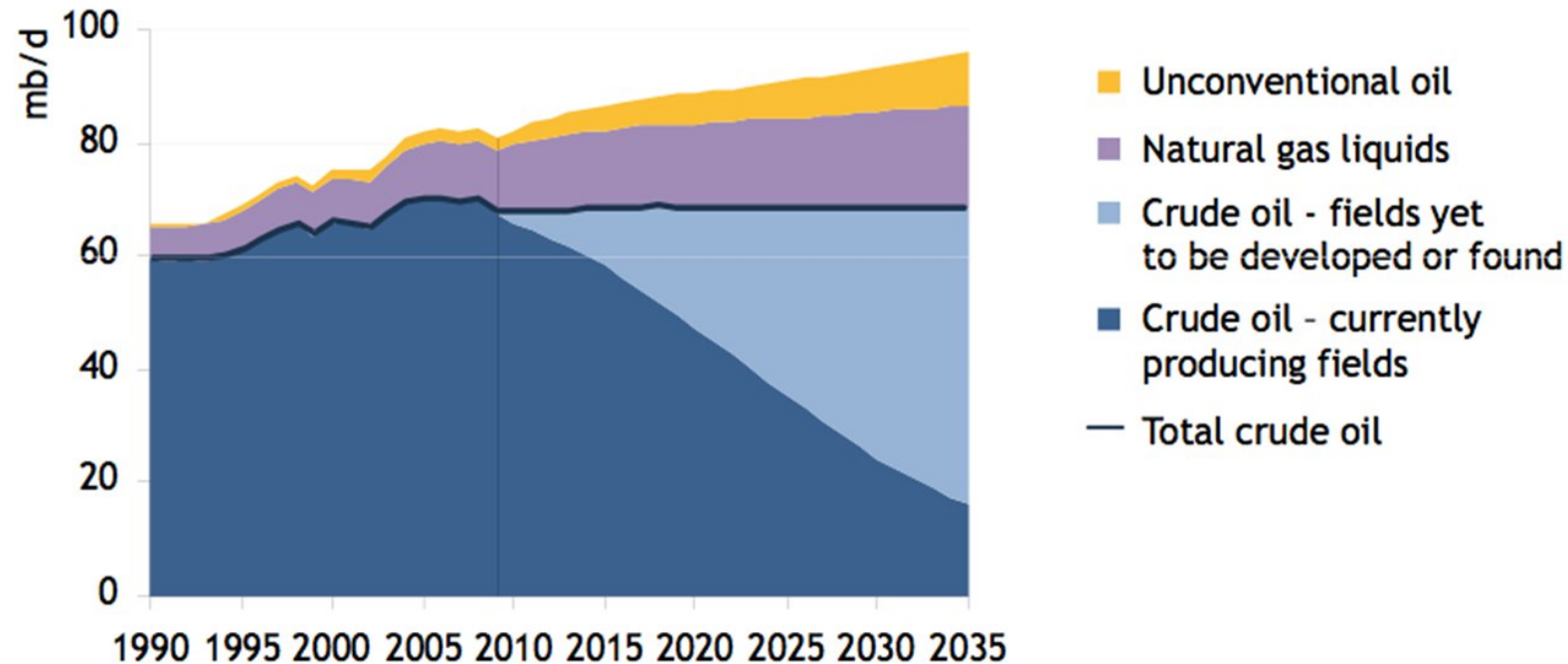
## World oil production by type in the New Policies Scenario



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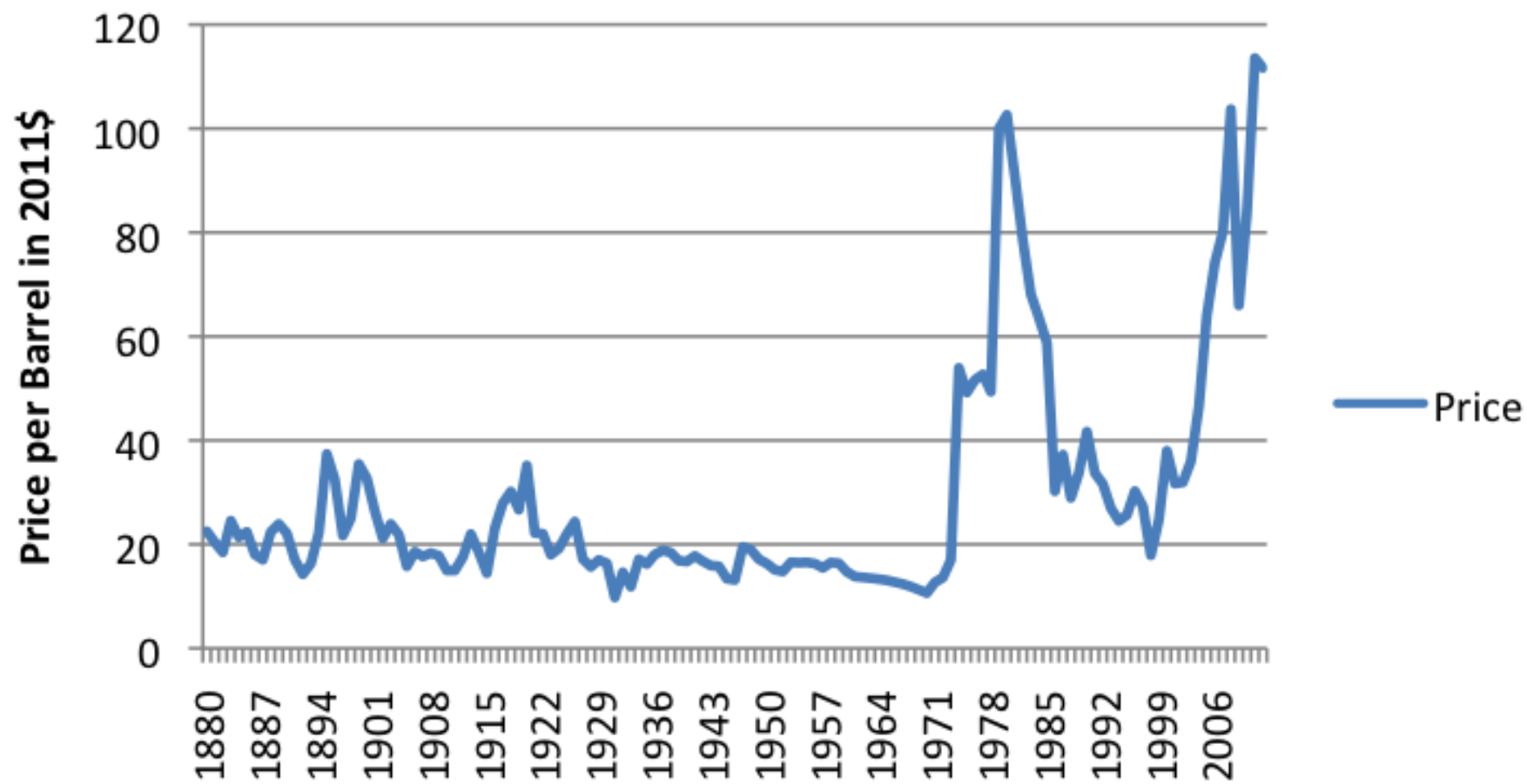


## World oil production by type in the New Policies Scenario



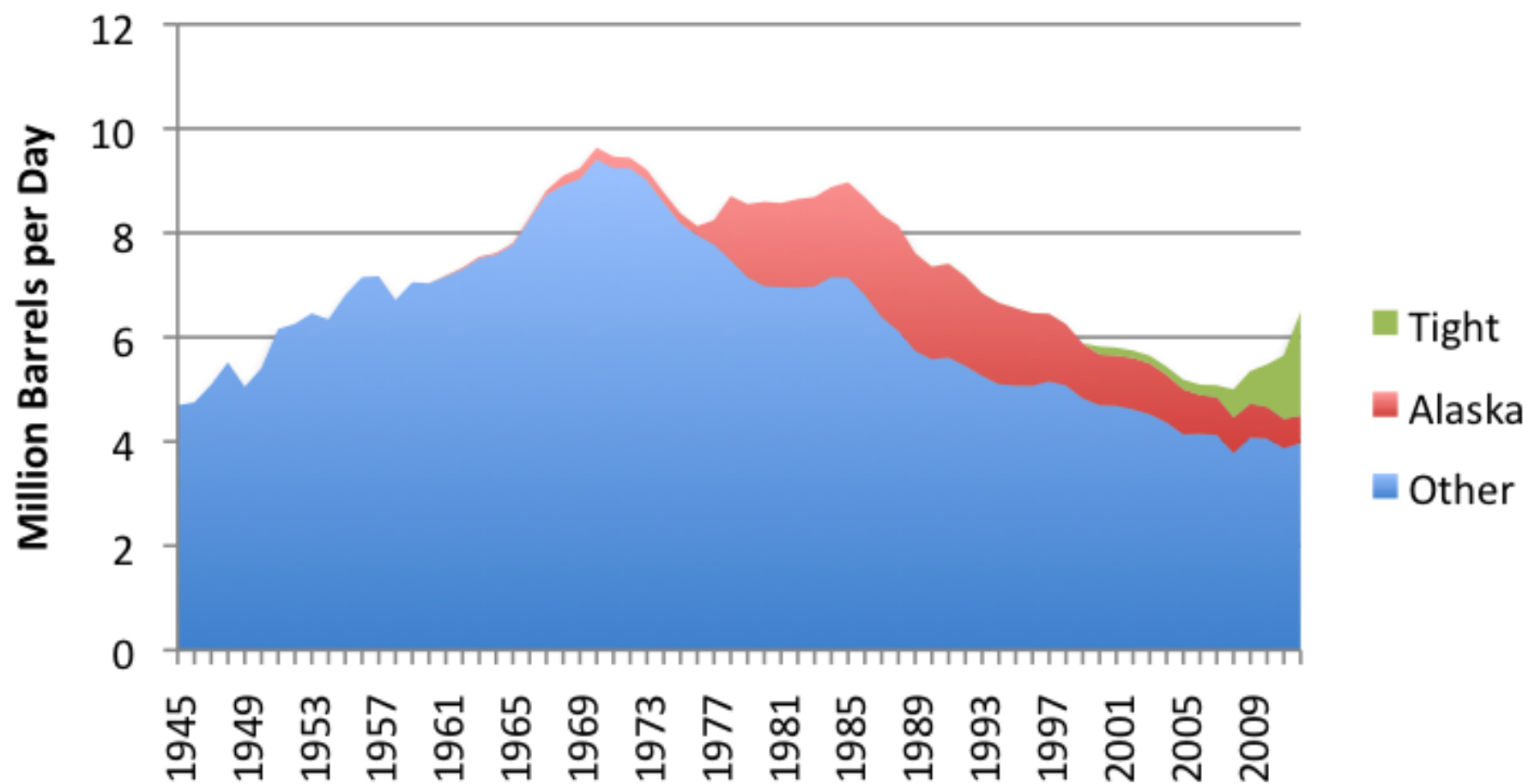
***Global oil production reaches 96 mb/d in 2035 on the back of rising output of natural gas liquids & unconventional oil, as crude oil production plateaus***

## World Oil Price in 2011\$

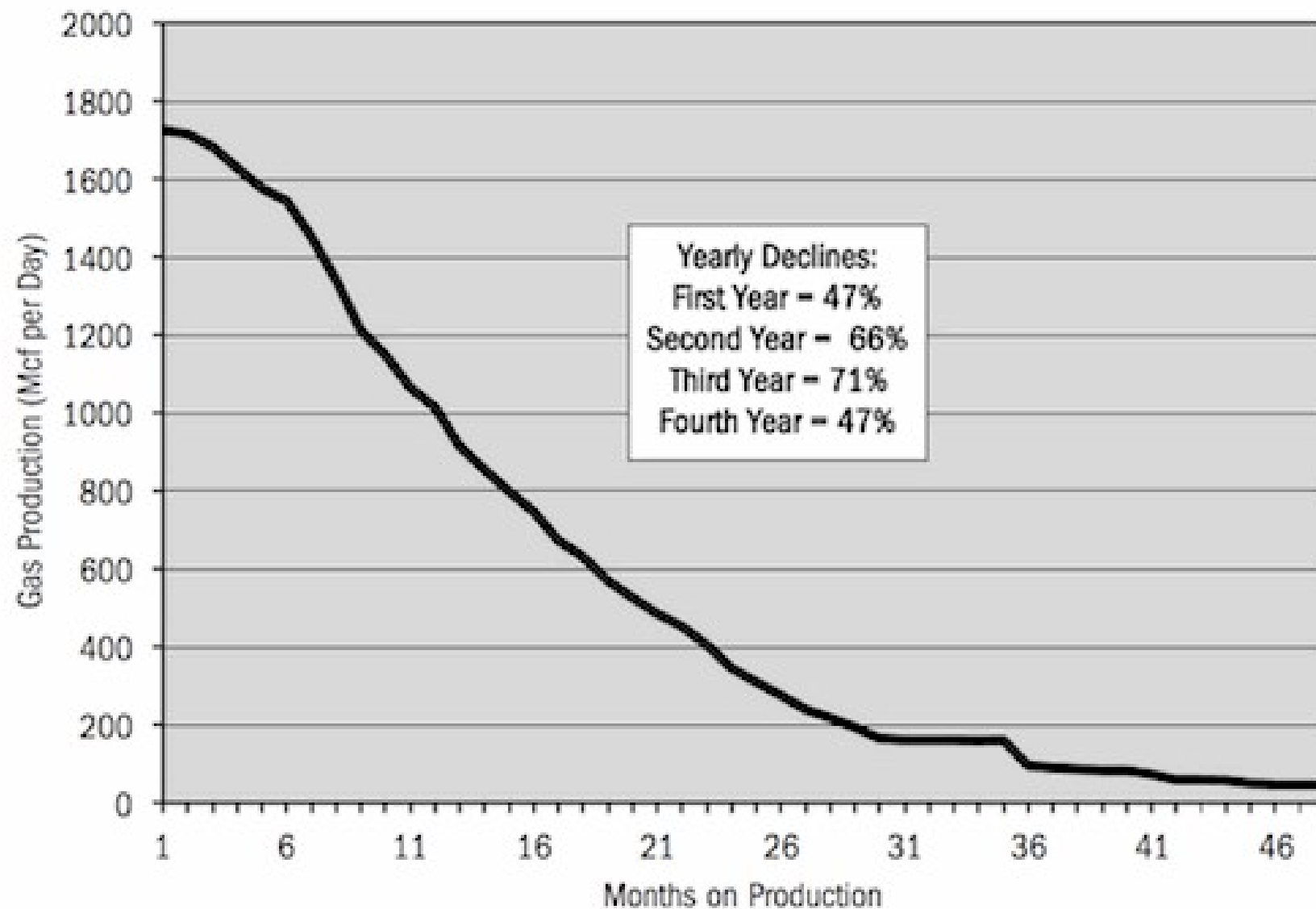




## US Crude Oil Production



## Type decline curve for Marcellus shale gas wells.



Based on data from the most recent four years of this play's production.





# Permaculture design courses



- \* 6 alt. weekends @ RISC Reading  
21st Jan - 02 April
- \* 2 weeks intensive, Mid Wales  
01 May - 14 May
- \* 2 weeks intensive, Uganda,  
20th May - 03 Jun  
More planned for UK and Uganda in 2017  
“Empowering, inspirational and essential ”  
Certificated, internationally recognised courses  
with leading tutors and at top venues.

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courses  
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projects

sector39



[www.PermacultureDesignCourse.co.uk](http://www.PermacultureDesignCourse.co.uk)



# Opportunities for community energy generation



- **Power = Head x Flow x Gravity**
- = height (m) \* flow (l/s) \* 10  
(9.81)

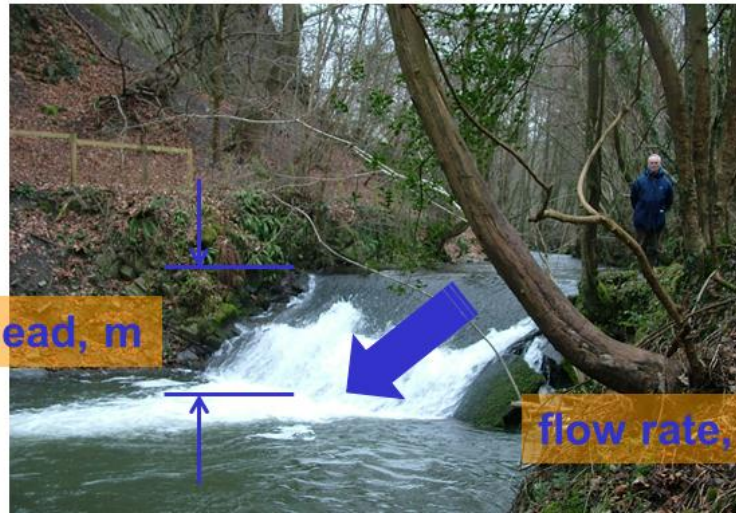
Hydro – the mathematics



Peak (electric power, kWe) is approximately

$$= 0.6 \text{ (efficiency)} \times 9.81 \times \text{head} \times \text{flow rate}$$

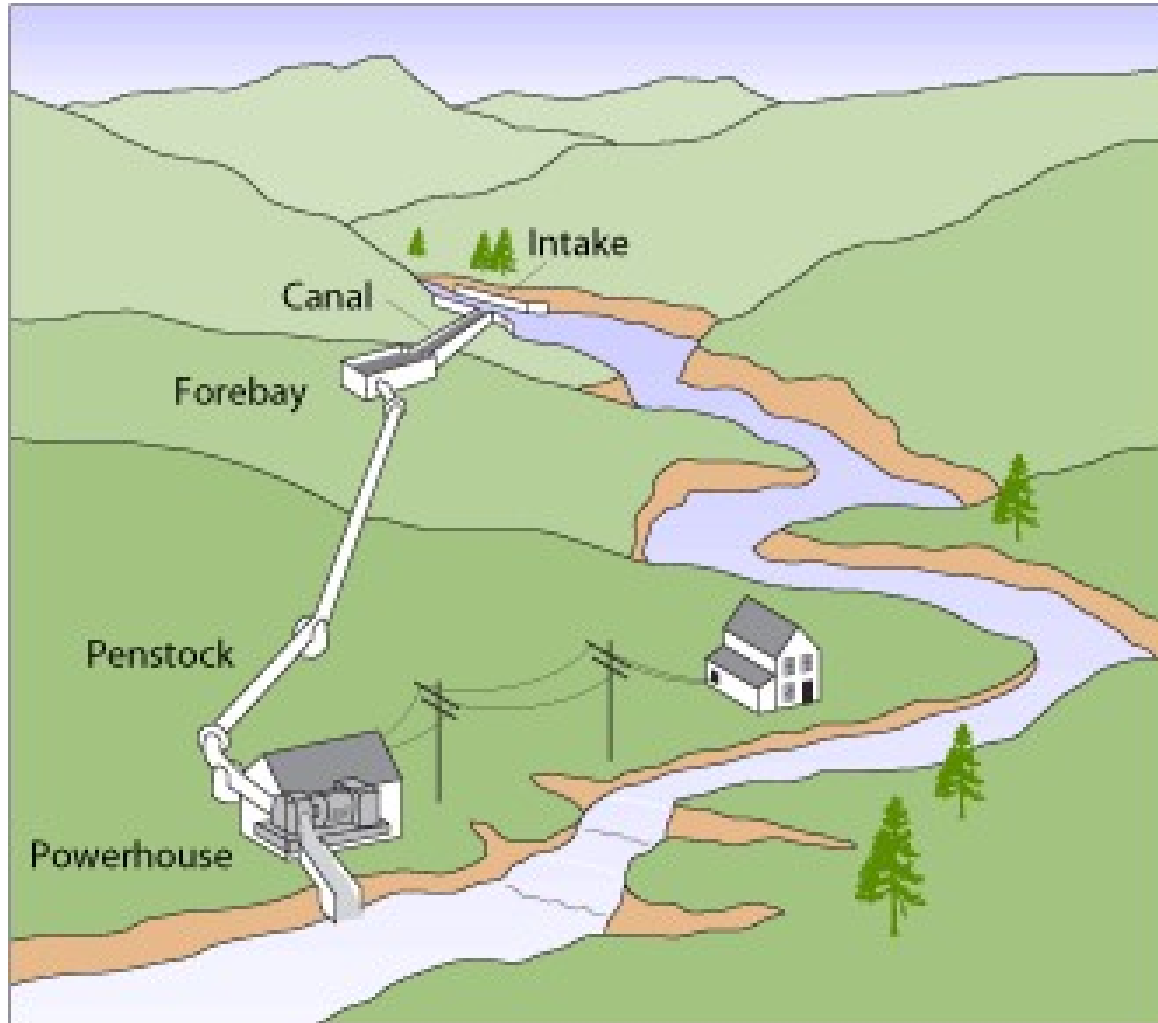
gross head, m



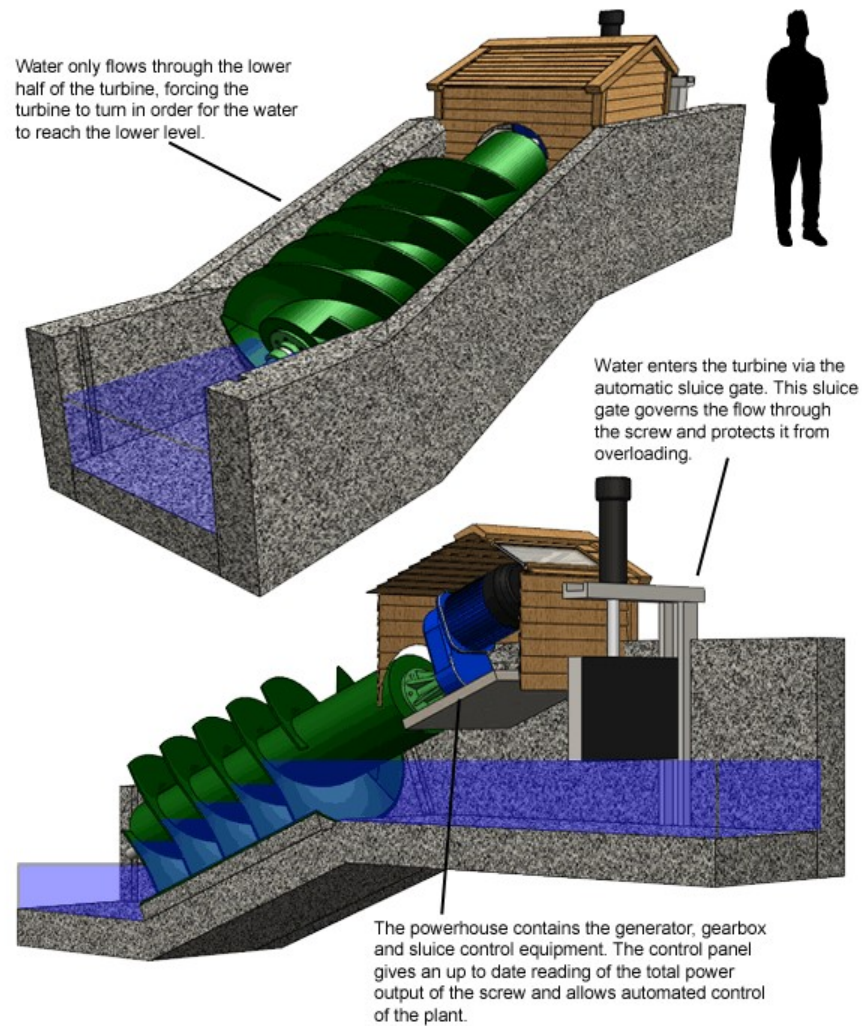
flow rate, m<sup>3</sup>/s



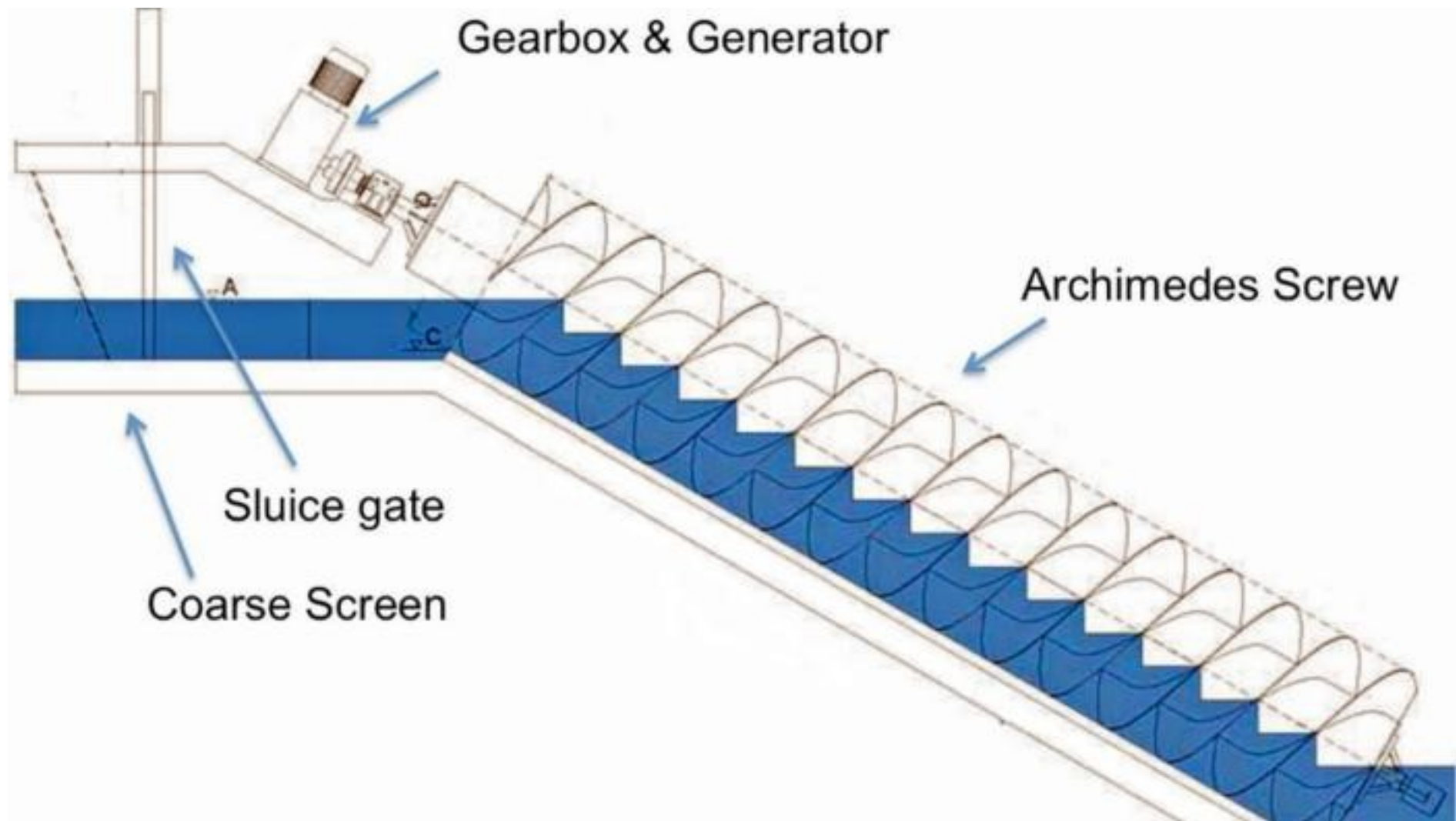
Large scale hydro – high impact



Example of a small hydro scheme



# Archimedes screw type turbine



# Hydro

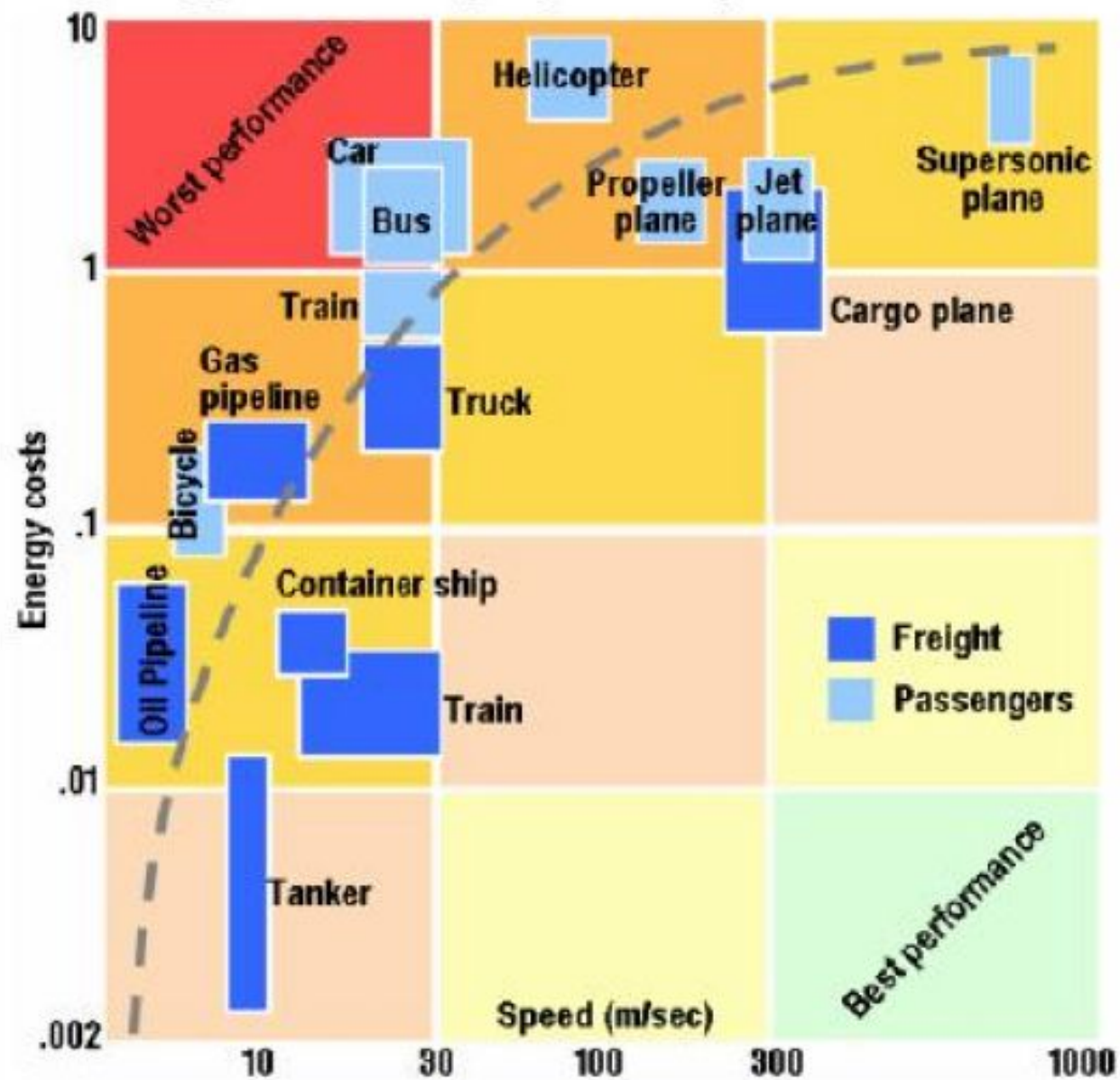
- $P = ghq$
- Gravity, height (m) flow (l/s)



# Transportation will be highly affected by declining EROIS

- Fuel is 30-40% of direct costs for airlines
- Fuels is 20-40 of trucking
- 20-30% of sea freight

## Energy Efficiency by Transportation Mode\*\*



# Part II

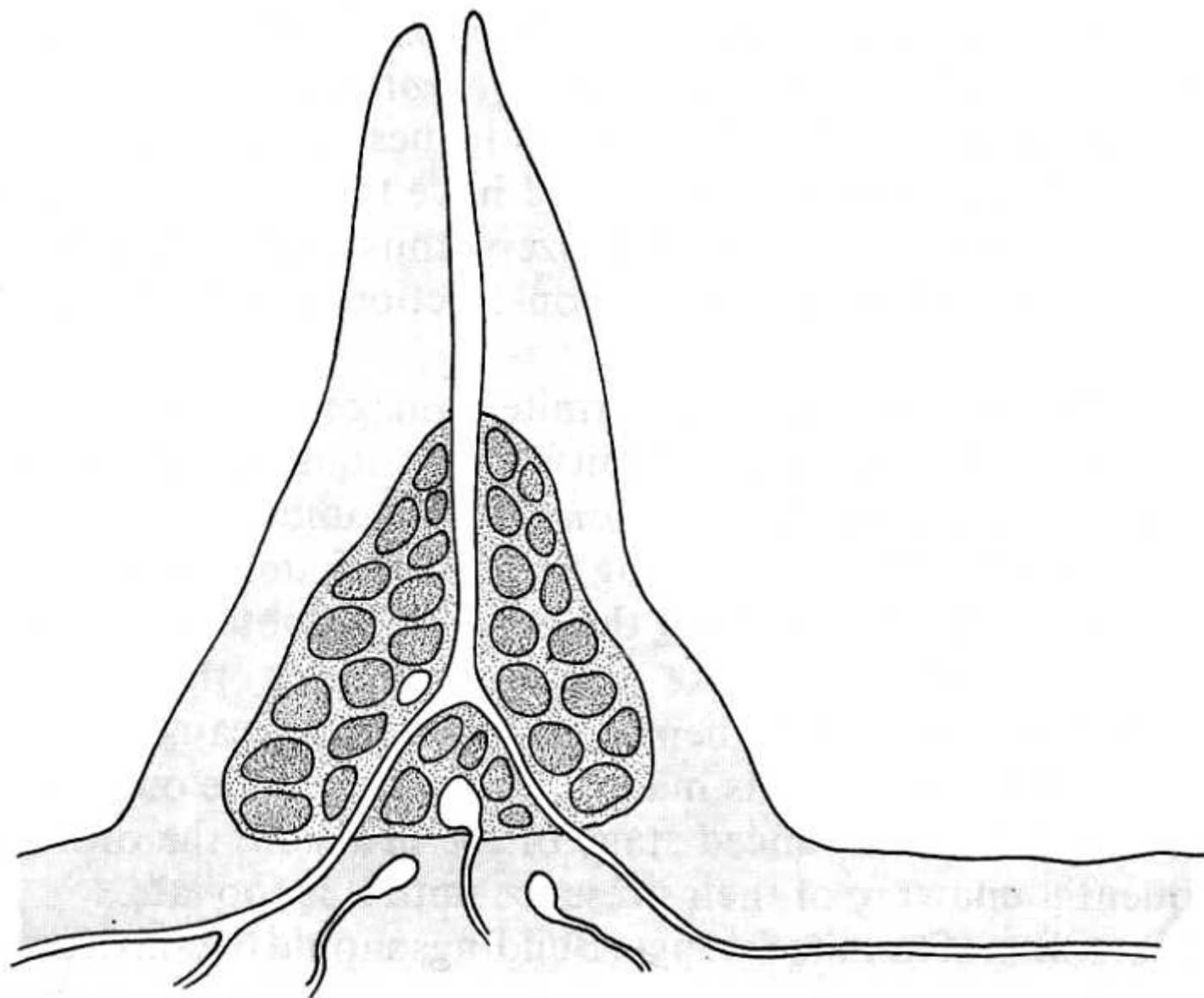
Warm air rises

Catch and store = thermal mass

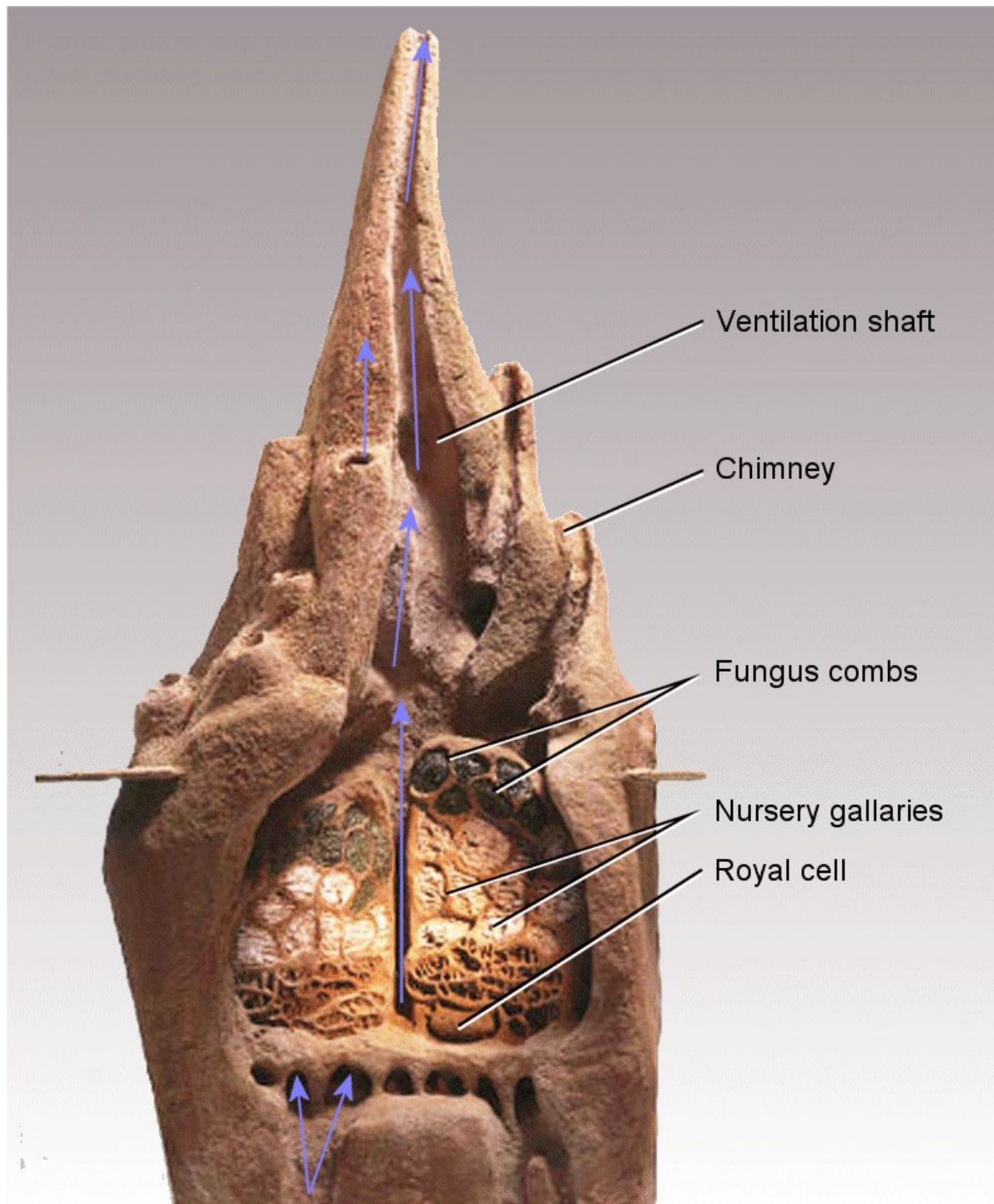
47% of domestic energy is  
consumed as heat

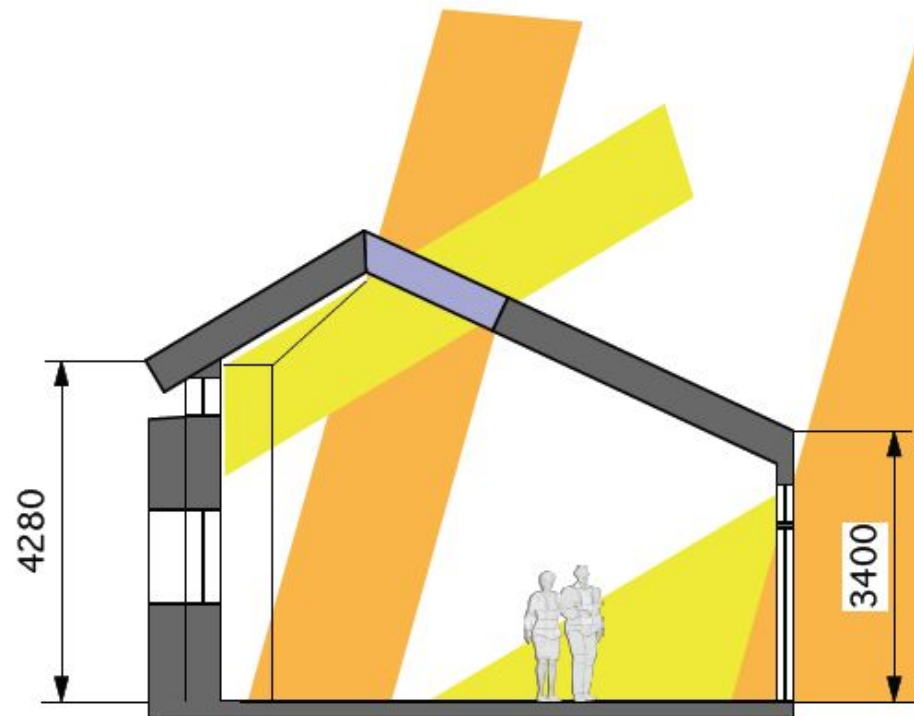
- Energy policy is obsessed with electricity



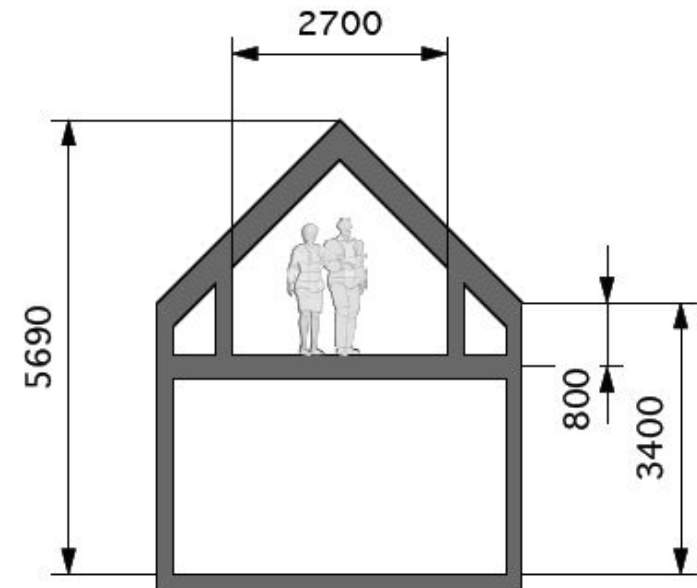








Multi-Purpose Education Room



Heating Room / Office

# Chicken Shack - Permaculture Center

Sections

Scale 1:100

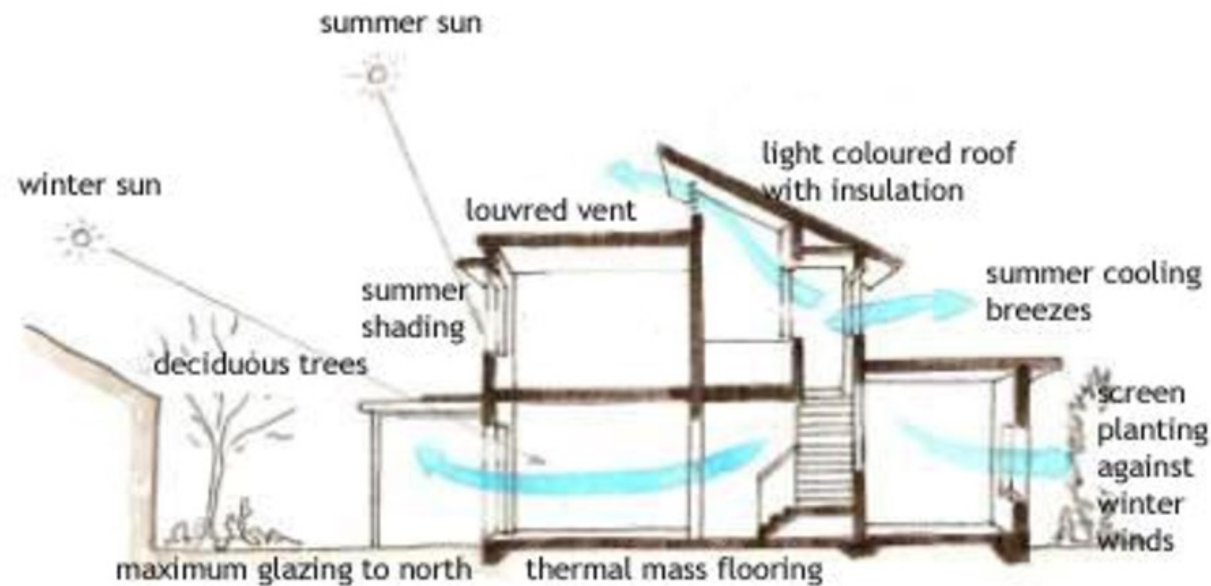


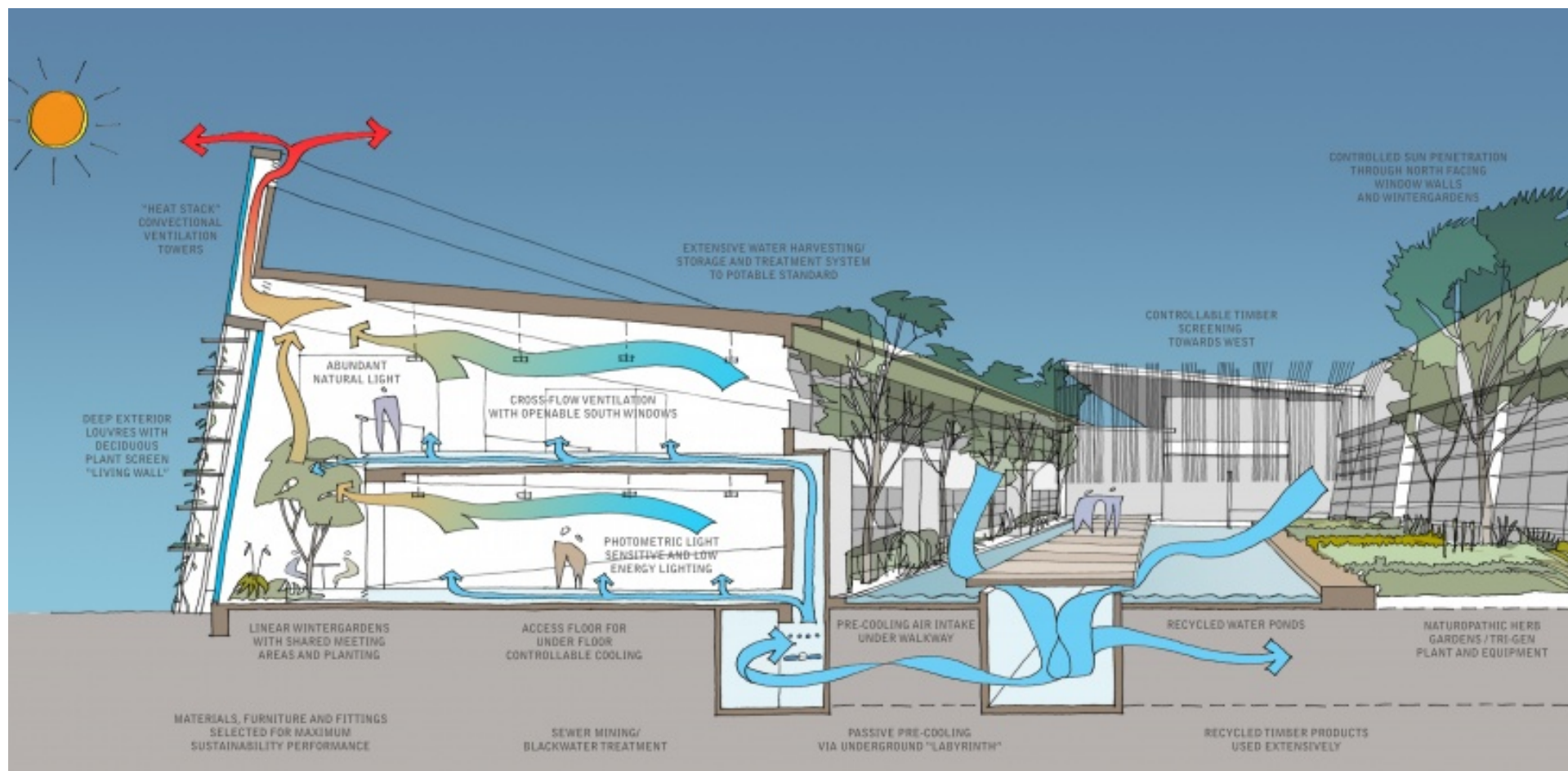




# Passive Cooling Techniques

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- A Grand design













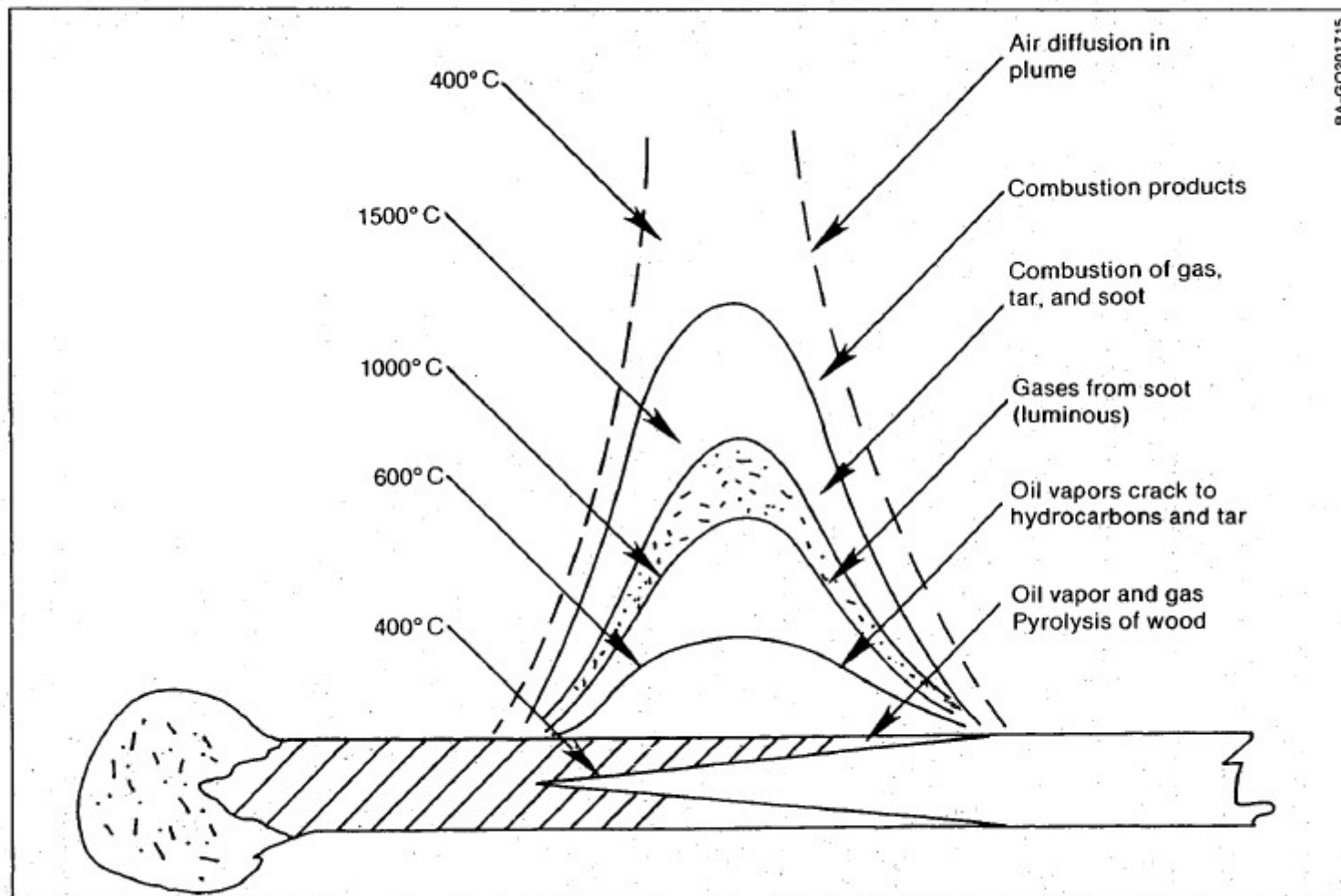




[www.shutterstock.com](http://www.shutterstock.com) · 32890423

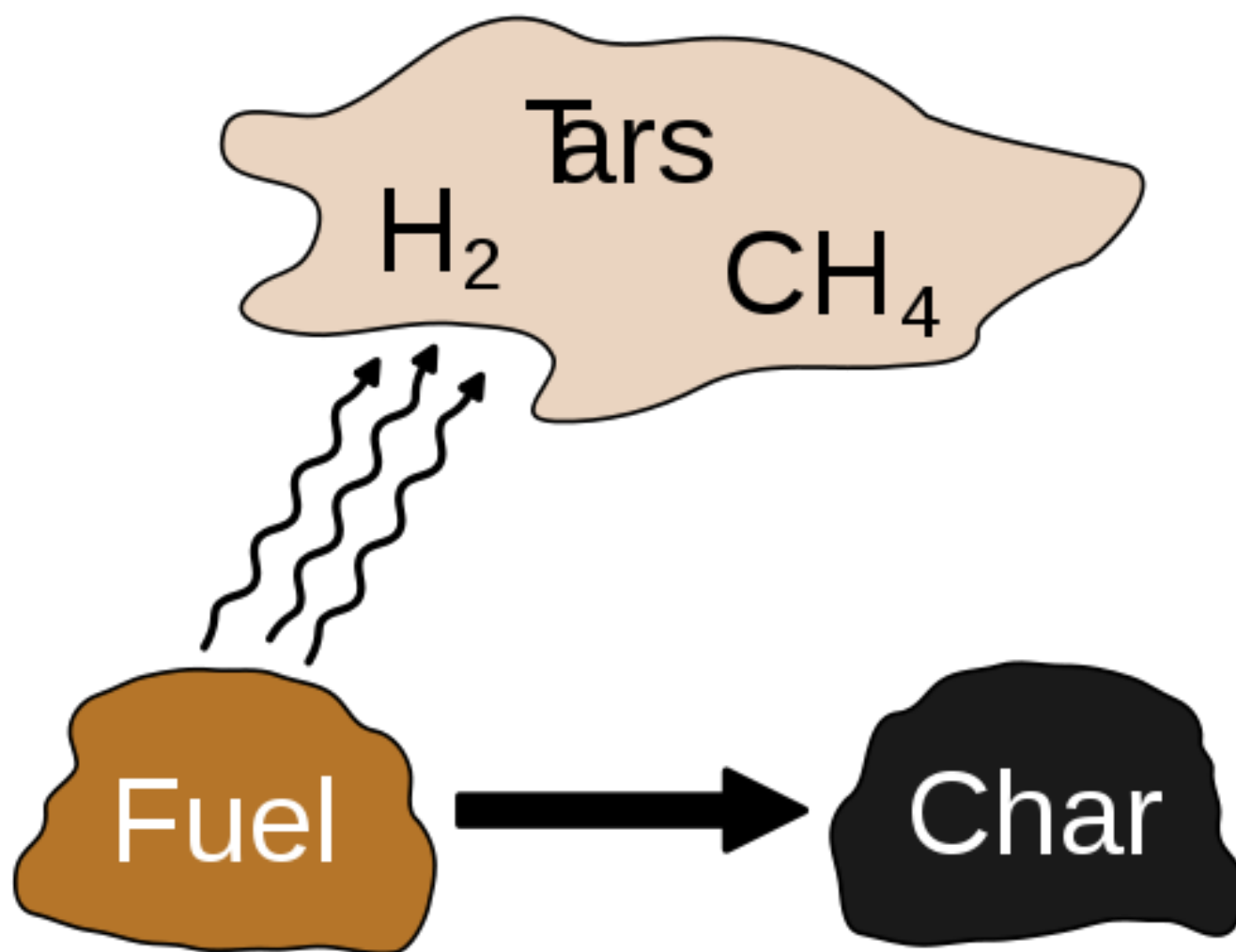






BA-GO201715

Fig. 4-2. Pyrolysis, gasification, and combustion in the flaming match







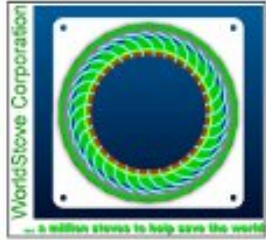




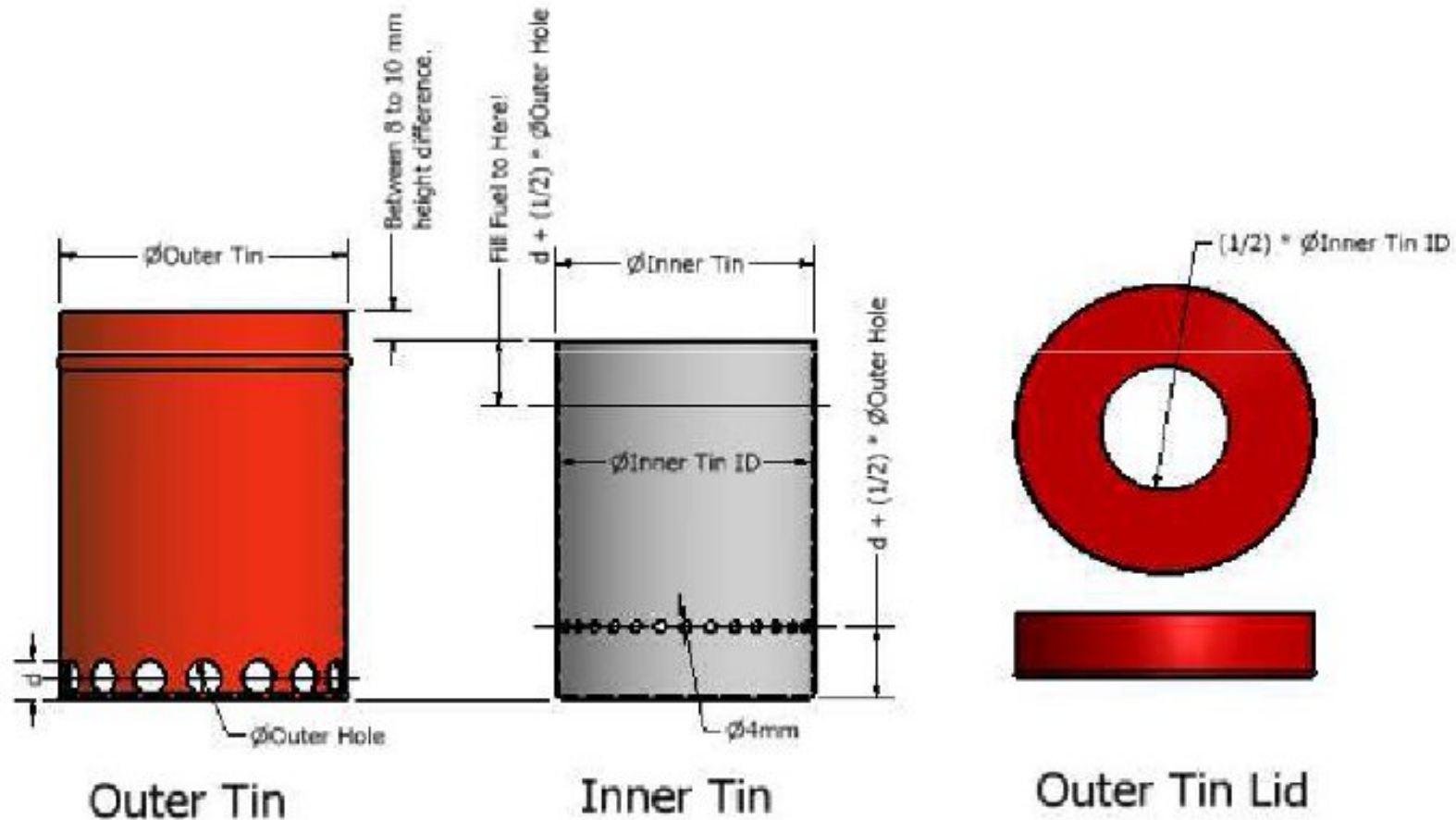


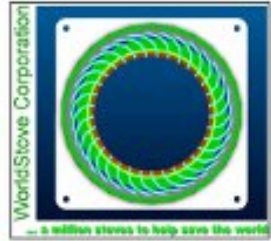




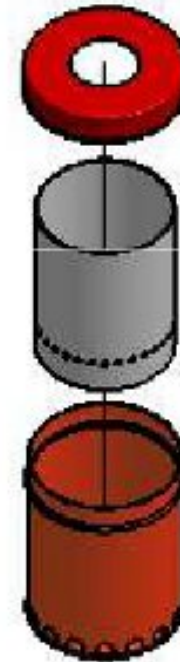
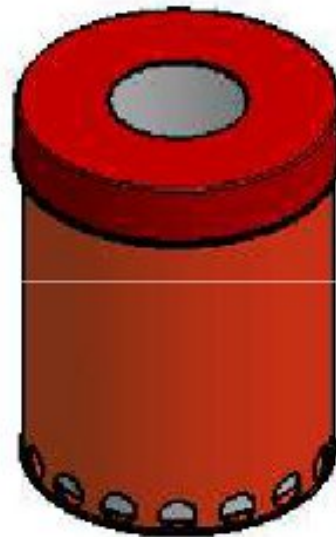
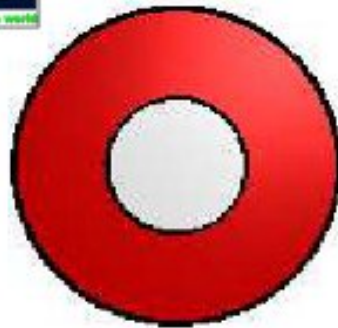


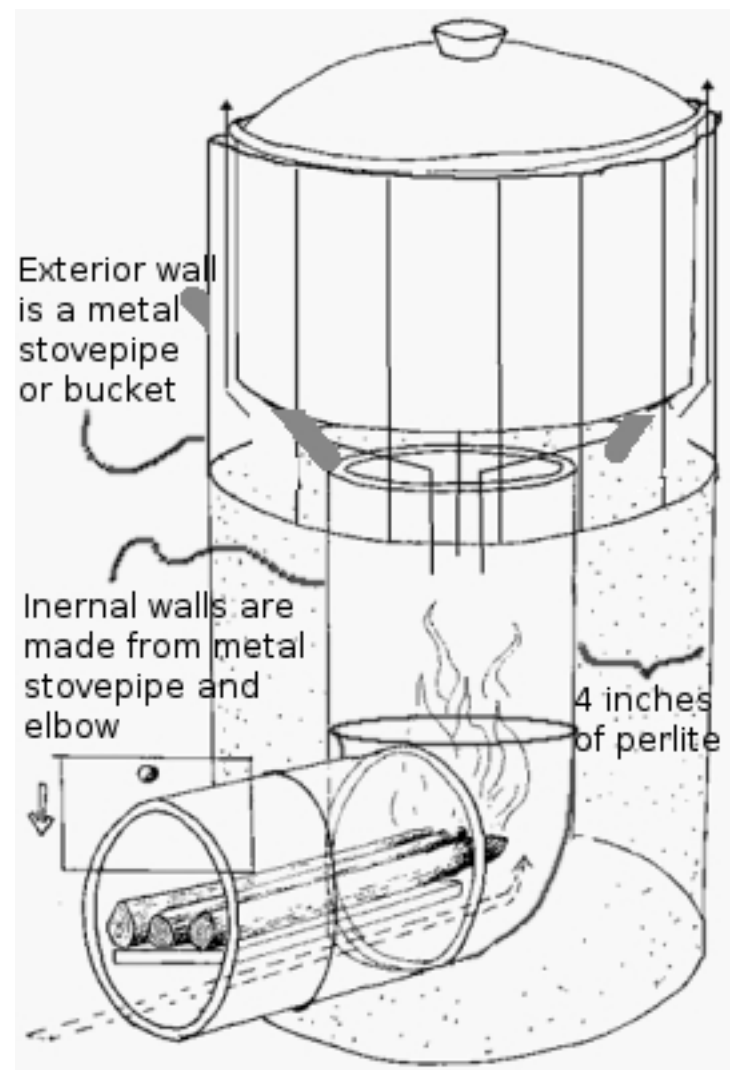
# EverythingNice Stove Components!





# EverythingNice Stove Components!









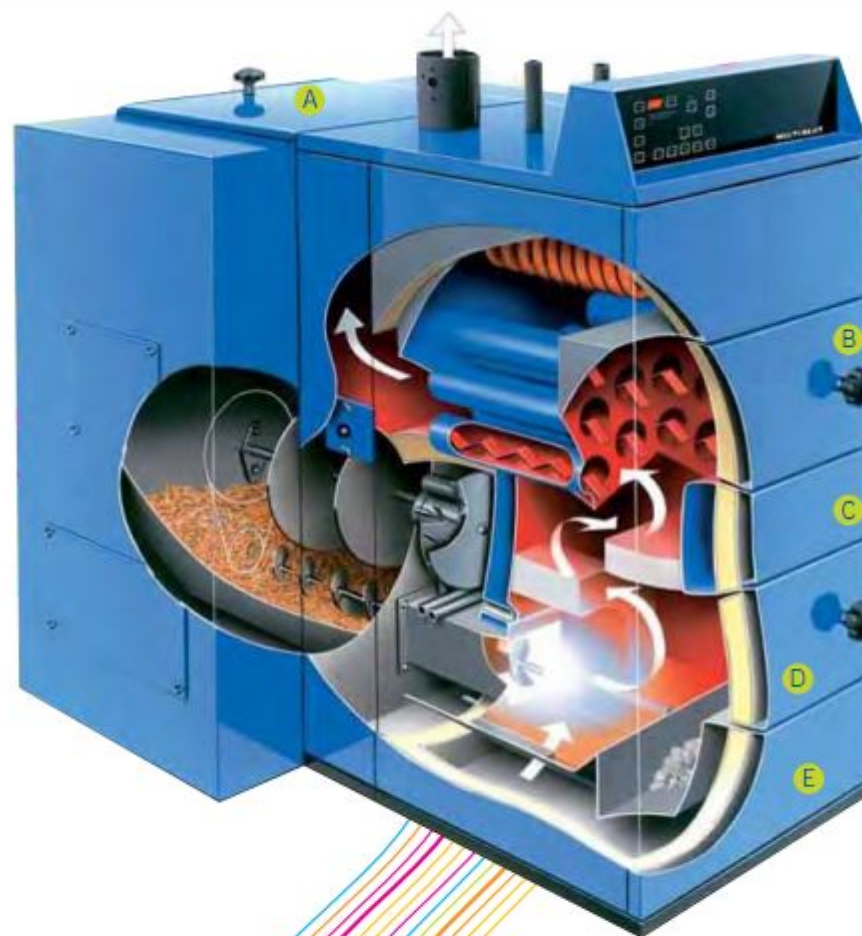




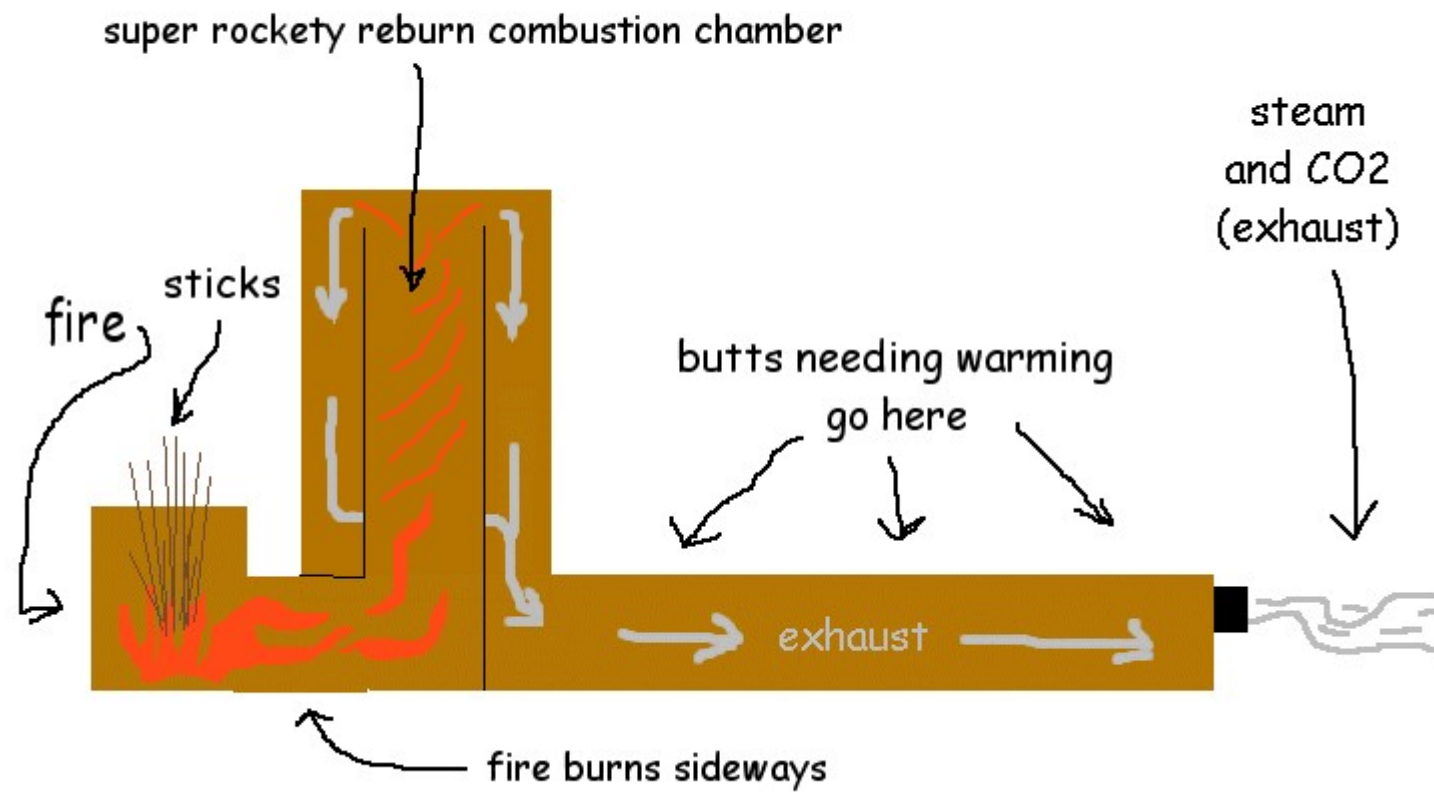




*Kachelofen,*



pellet loading door  
pellet storage compartment  
intelligent feed system  
combustion chamber  
automated ash compartment



- ① Fuel Magazine
- ② Burn Chamber
- ③ Heat Riser
- ④ Thermal Mass Bench with flue duct

[www.woodstovewizard.com](http://www.woodstovewizard.com)

