

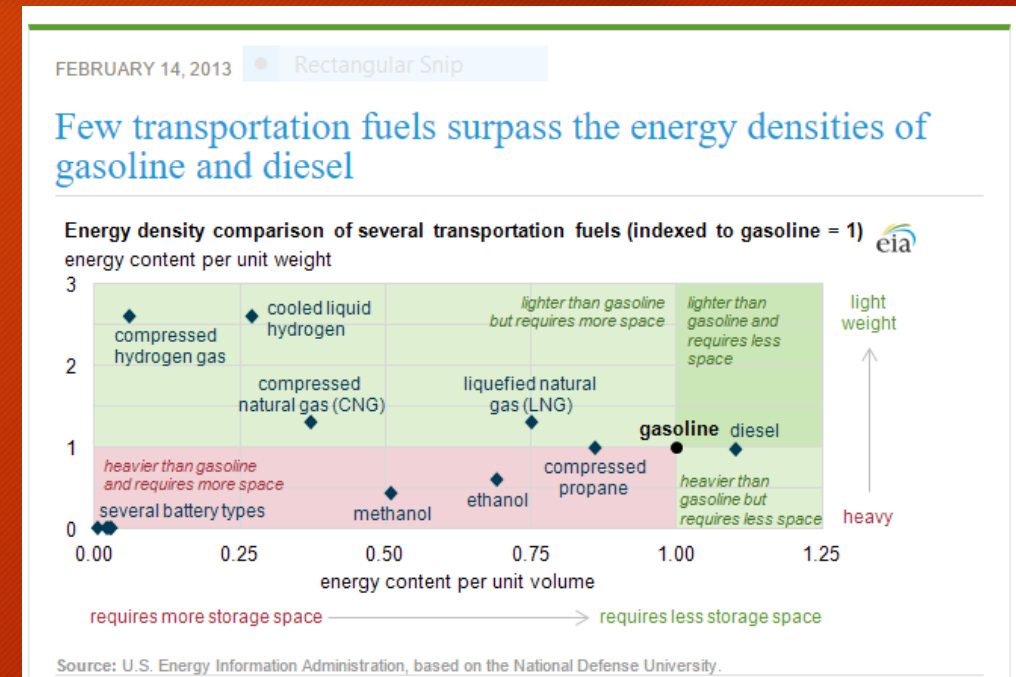
Raps as Icelandic Marine Fuel

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Marine Energy - Fossil based

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- Fossil (oil, gas, coal)
 - refined - transportation fuels (oil)
 - can be converted to electricity
- Solar
 - wind, hydro, and direct; converted to electricity
 - Bio - transportation fuels (oil)
 - Electricity
 - converted to energy carriers (Hydrogen, Methanol....)
 - or batteries



- Progress is being made for alternative to oil, however oil based transportation will be around for another „perhaps 50“ years

Round numbers - annual per capita

Energy unit = toe (ton of oil equivalent)=42GJ=11,6 MWh

Iceland, annual ktoe

Transport on land	260
Aviation	220
Marine	210
<u>Other</u>	<u>110</u>
Fossil combined	800

Non Fossil:

Hydro/geotherm(e)	1500
Geothermal heating	650

Approx per capita 9 toe

Energy (toe per capita)

	Total	Fossil
Iceland	9	2,5
Nordic (Swe?)	5	1,7
USA	7	6
Europe	4	3
China	2,2	2
World	1,8	1,5

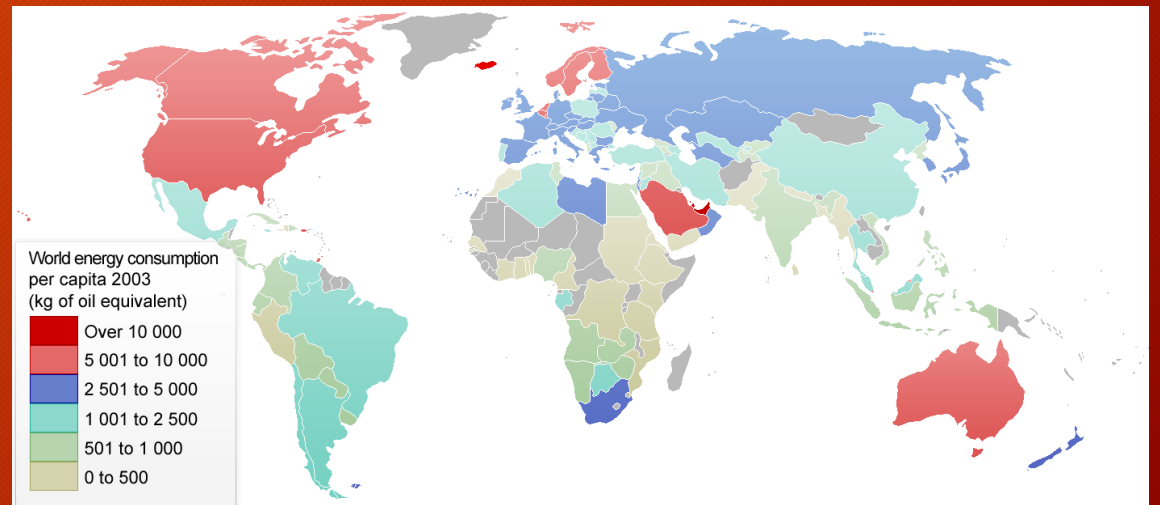
Iceland per capita ? Others

On land	1 toe	=
Aviation	0,7 toe	x5
Marine	0,8 toe	x10
Aluminum	4 toe	x1000
Elec, other	1 toe	
Heating	2 toe	Geoth?

Biofuel (kg oe per capita)

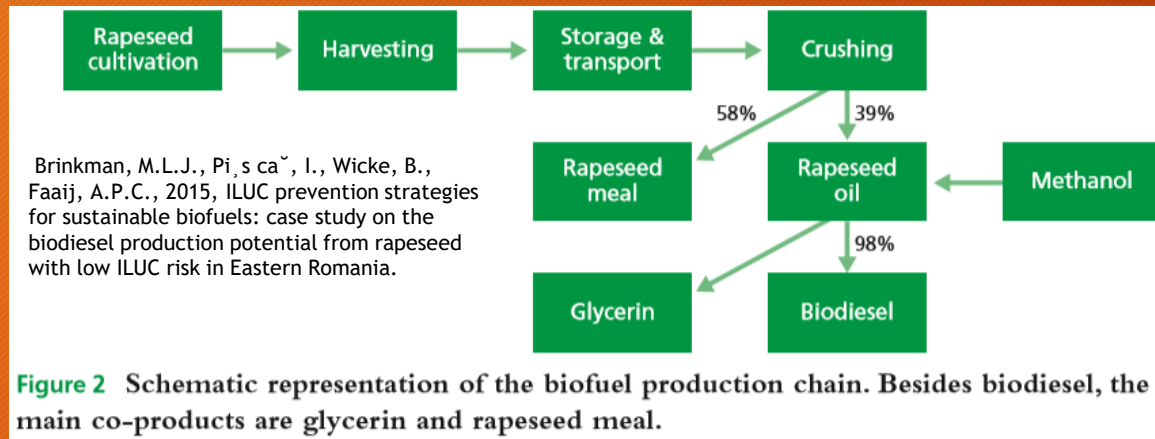
Iceland	10
Nordic (Swe?)	70
USA	94
Europe	18
China	2
World	10

Iceland - special case!



Sustainable biodiesel (rapeseed) in Iceland WW - well known and tested technology

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WW constraints: not enough land available for Bioenergy production to replace Fossil fuel (preference for producing food, and conserve carbon stock forest).

- European RED (renewable energy directive including LUC and iLUC)



Iceland has been producing rapeseed past decade; 50-100 ha per year.

Cost similar to Europe?

Encouraged by Icelandic Transport Authorities (Jón Bernódusson)

Icelandic constraints:

600 k ha available (unused) for cultivation

400 kton oil used

100 kton meal used (growing)

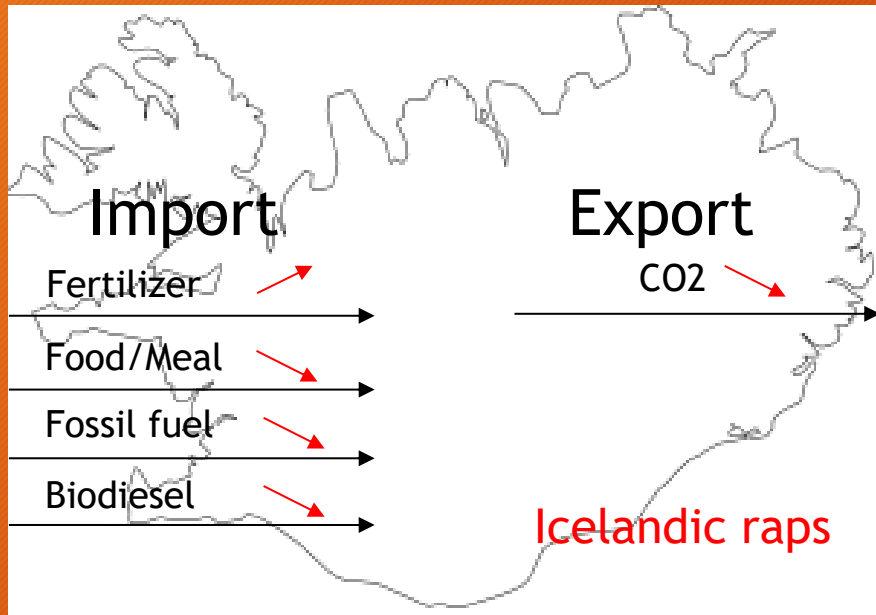
1ha=1ton biodiesel+2 ton rapeseed meal

Iceland has „green“ methanol and energy for processing

Sustainable biodiesel - Iceland

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LCA - Lifecycle Analysis



Fulfills RED, including iLUC

Iceland is importing biodiesel from rapeseed

Iceland can produce 50000 ton biodiesel (150 kg/capita, Sweden is 40 kg). Could reduce GHG marine emission by 20%.

Icelandic biodiesel does not delay other technology advancements

Need to establish a bioenergy economy in Iceland for now, also to be ready for 2nd generation, and aviation biofuel

May need (government) intervention to get going (Iceland is a special case!)

Thank you!

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