Mot ett energi- och vattensmart samhälle

Världsvattenveckans budskap 2014

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SIWI

Important WWW messages

- Among the Sustainability Development Goals: ***specific water goals***
- Relation between ***water use and climate change***
- ***Integration*** of water and energy political decisions

Political actions

Swedish climate goals 2020

- 40% reduction of GHG emissions (relative to 1990)
- At least 50% renewables
- 20% more efficient energy use
- At least 10% renewables in the transport

How far are we? 80% remains!
How do we measure?
How do we report?

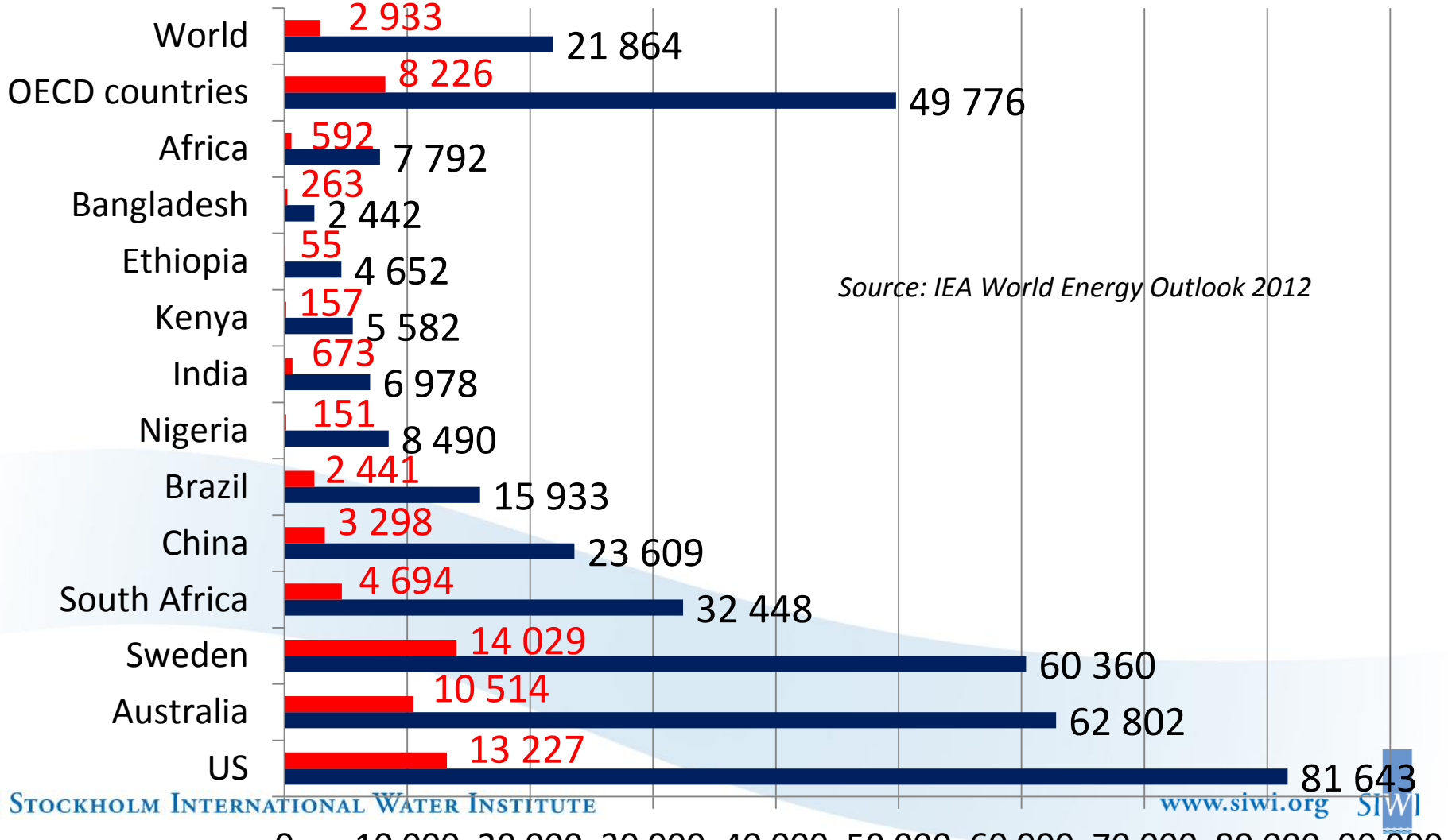
Political driving forces

- Carbon tax
- Implementing EU decisions
  - Allocation of emission rights - emission trading systems (ETS)
  - Carbon capture and storage (CCS)
- Investment in climate actions in developing countries

Carbon capture and storage (CCS)

- Capturing CO_2 from large point sources
- Transport the gas, inject it into a deep geological formation
- CCS takes energy – el. output decrease 20-30%
- Increased water consumption 40-120%
- Current cost for a typical 500 MW thermal plant: +80%
- ”The technology has not been developed in a water-constrained environment”

Electrical energy consumption and total primary energy supply



Source: IEA World Energy Outlook 2012

Swedish action plans

- Renewable energy
- Fossil fuel independent transportation sector
- Increased efficiency

Renewables

Renewables

- How are renewables defined?
  - Hydro
  - Biofuels
  - Wind
  - Solar PV
- Wind and solar are intermittent. Can we balance them?

Renewables

- New renewables
  - Wind and solar PV

Financial support globally (2012):

Renewable energy US$101 billion

Fossil fuel US$544 billion

Hydropower

- Advantages
- Environmental consequences
  - Evaporation (not a problem for Sweden)
  - Flood control and flood risks
  - Water storage
  - Sediment transport
  - Consequences for biodiversity and fishing
  - Displacement of people
  - Human health

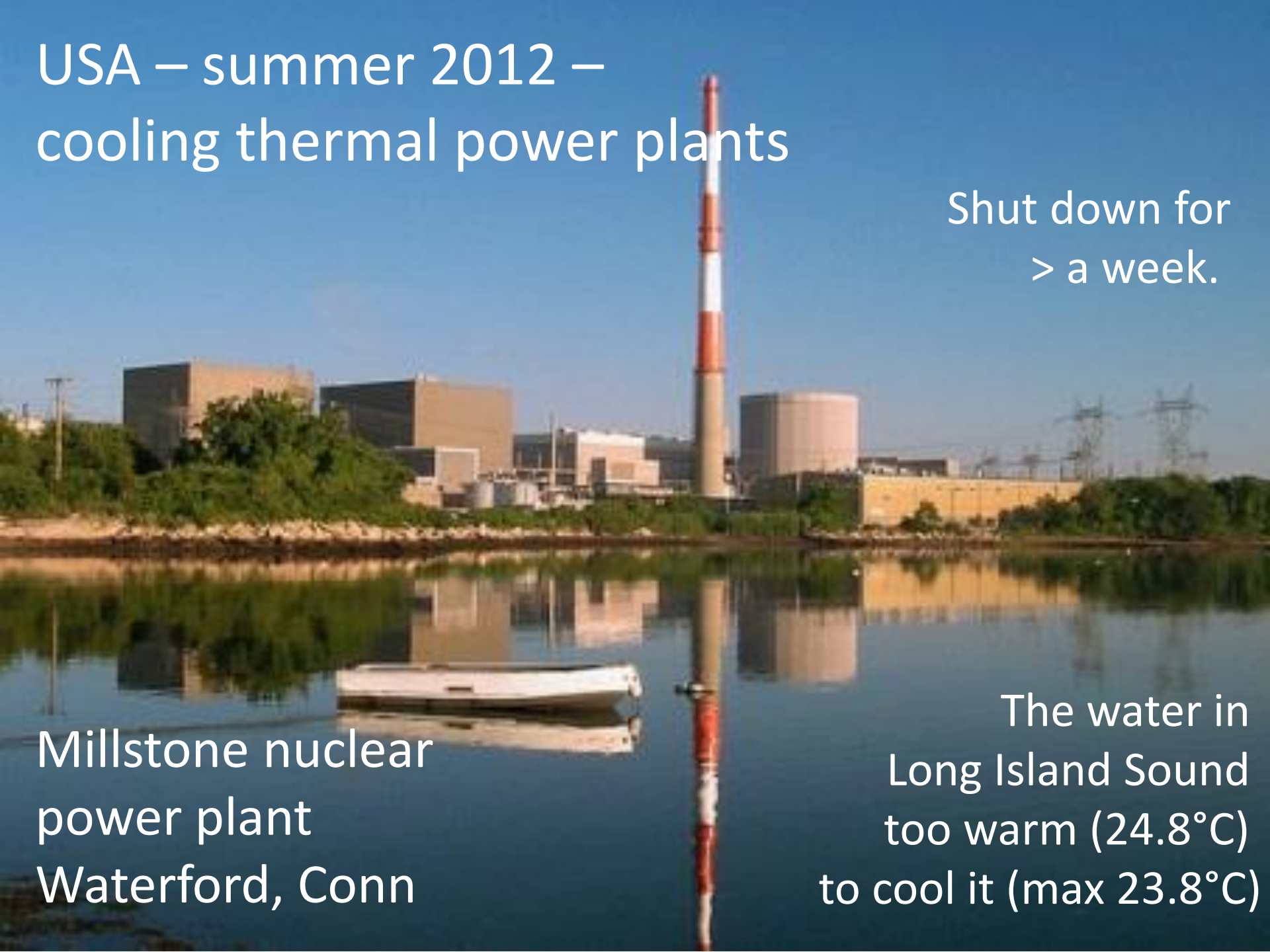
Energy and environment

- We need a checklist – based on *scientific* methods
- The decision is ***always*** subjective and political
  - How to weight the various positive and negative consequences of energy generation

Biofuels

Biofuel

- First generation biofuel
  - Should be rainfed and not irrigated
  - Huge water need
  - Competition with food
  - The EU goal
- Second generation biofuel
  - Cellulosic material
  - No competition with food


USA – summer 2012 –
cooling thermal power plants
Shut down for
> a week.
Millstone nuclear
power plant
Waterford, Conn
The water in
Long Island Sound
too warm (24.8°C)
to cool it (max 23.8°C)

Summer 2012 in the USA

- Worst drought since the 1950s - 80% of agricultural land was affected
- Price of corn soared
- **Corn for ethanol or for food?**
- **USA - corn for ethanol production:**
  - **2000: 7% of supply**
  - **2014: 40% of supply**

Biofuels in EU

Goal: 10% of transport from biofuel

Biodiesel

- 5.8 million m^3 in 2006
- 24 million m^3 in 2013
- Biodiesel mostly from vegetable oil
- Palm oil from Malaysia – rainforest vs. drivers

Ethanol

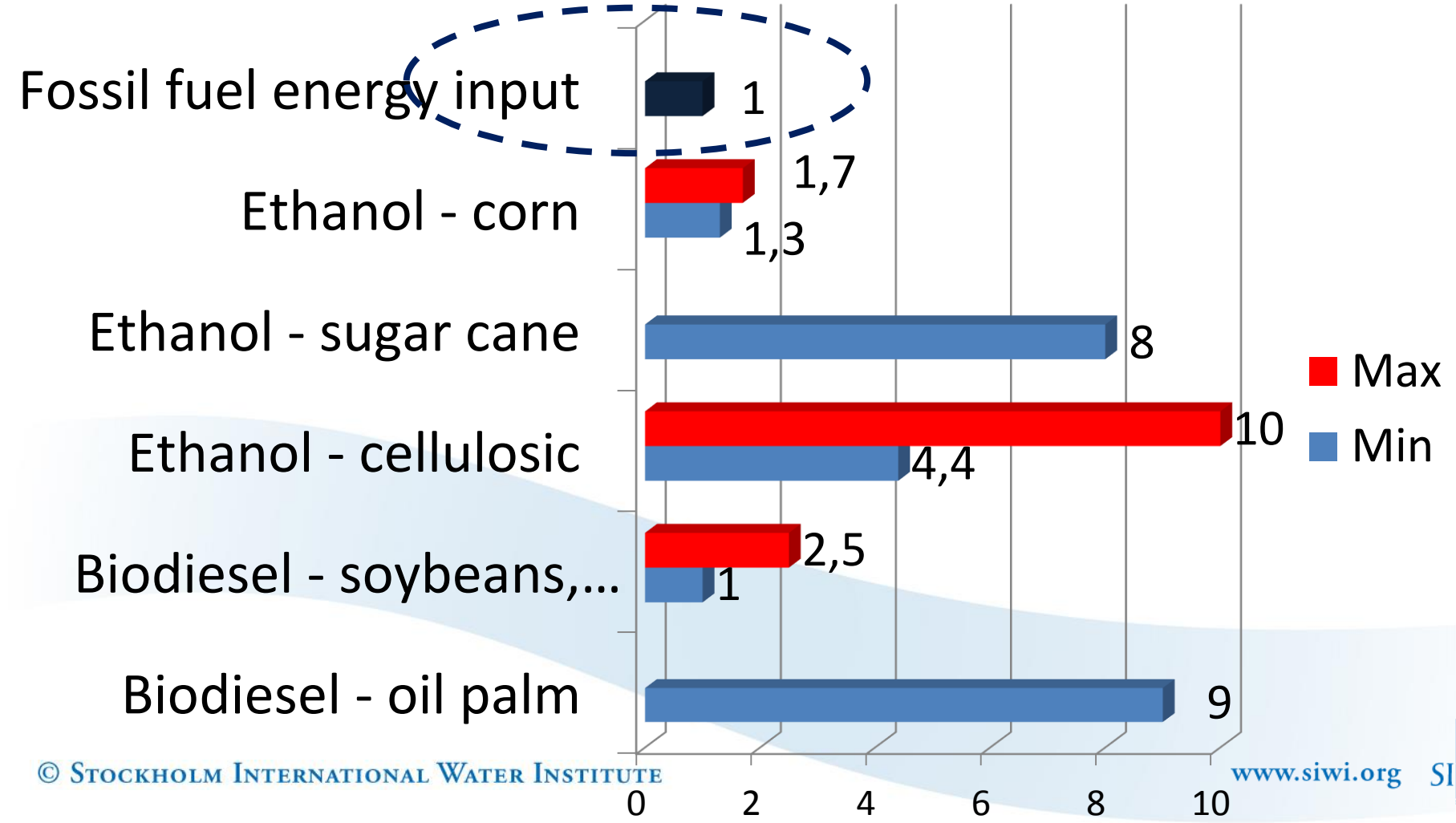
- 8.4 million m^3 in 2013
- Distilled from grain (France, Germany, Spain)

EU Biofuel subsidies 2011

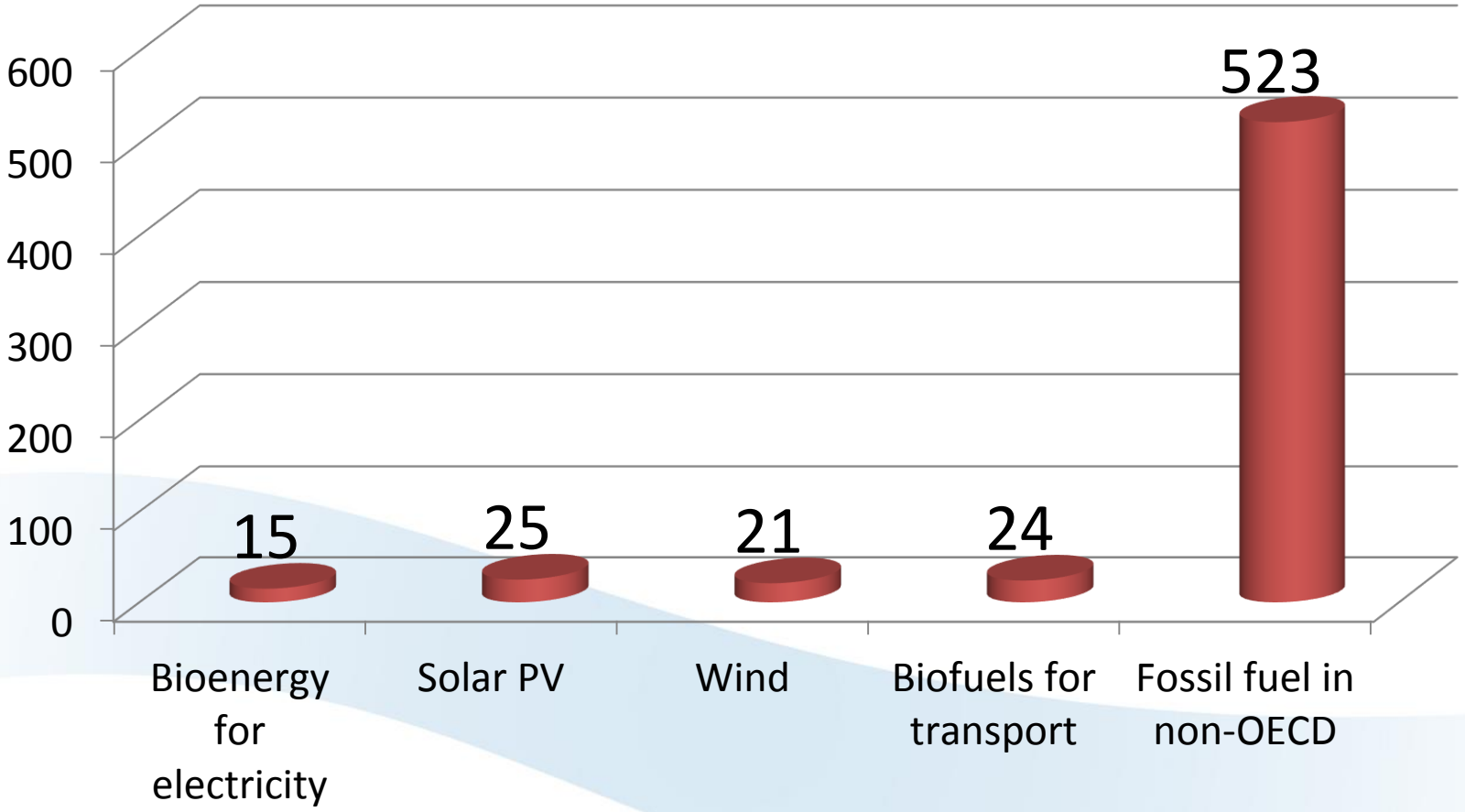
€ 8.4 billion

46% of the global subsidies to biofuels

Energy balance for biofuels



Subsidies renewables / fossil billion US$ 2011



Source: IEA World Energy Outlook 2012

Biofuels in EU

Int. Institute for Sustainable Development (2013):

- The CO_2 and climate benefits from replacing petroleum fuels with biofuels like ethanol are ***basically zero***
- Much more effective, much less costly, to significantly ***reduce vehicle emissions*** through more stringent standards.
- ***20-100 times cheaper*** than the average CO_2 abatement cost for biofuels

Biogas

- The zero energy wastewater treatment
- In Sweden: only 50% of the capacity is used
- With more advanced operation and control – a lot more capacity
- Incentives for more digestion?
- Legal and tax obstacles
- Lack of integration: incineration vs. thermal power of wastewater effluent vs. biogas

Wind and solar

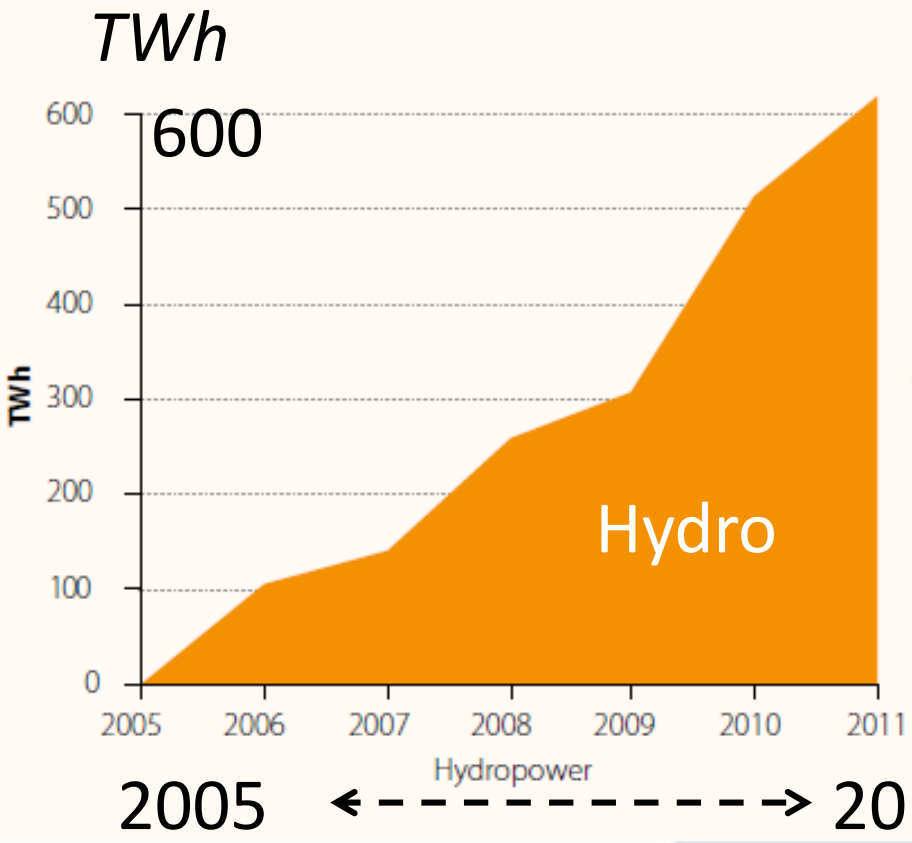
Wind power

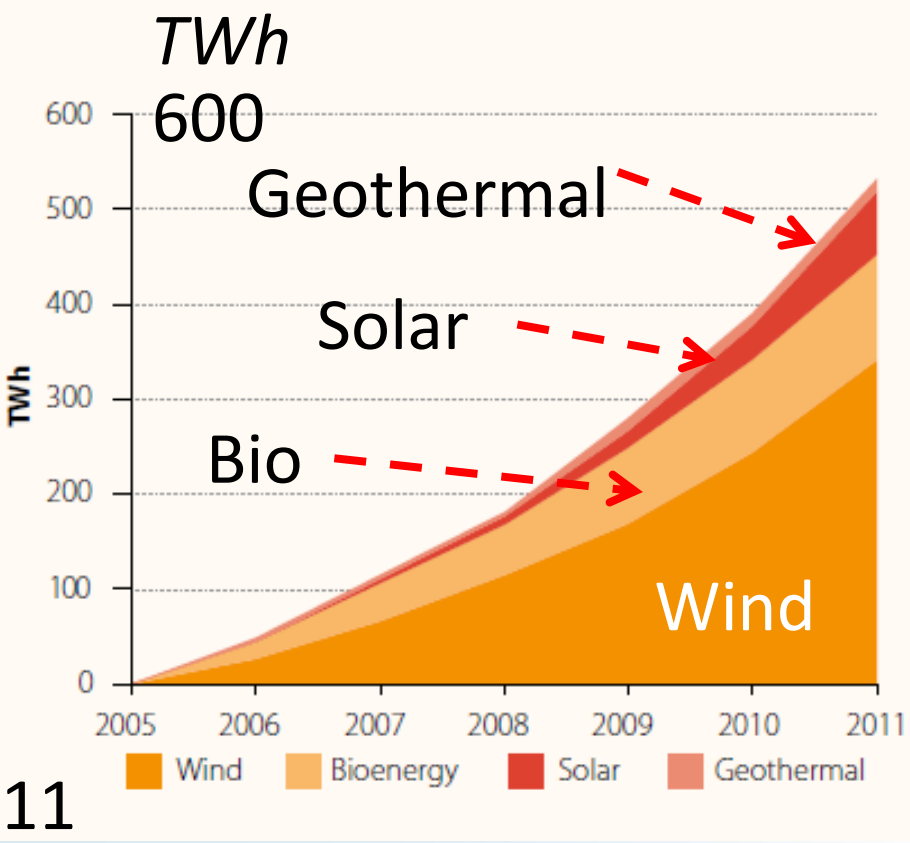
- Denmark:
  - 41% of electrical energy from wind during first half year 2014
  - At times – 100% electrical power from wind
- Sweden:
  - 150 TWh total electric energy 2014
  - 11 TWh total wind energy 2014 (= 7.3%)

Solar PV

- Example from ***Kenya***: 1 MW at a tea factory
- ***Germany*** June 2013: During 1 hour, 100% el. capacity from solar PV (24 GW)
- Is solar ***competitive***?
- ***Tax*** rules?
- Surface area requirements

Electricity generation - recent additions to hydropower and other renewables





Source: IEA (2012)

Land use and water consumption

Hydropower

0.08 – 17 MW/km^2
1 – 3000 l /kWh

Biofuel

Corn ethanol ~ 1 MW/km^2
0.5 - 90 l /kWh

Palm oil biodiesel
0.08 – 0.5 l/kWh

Wind

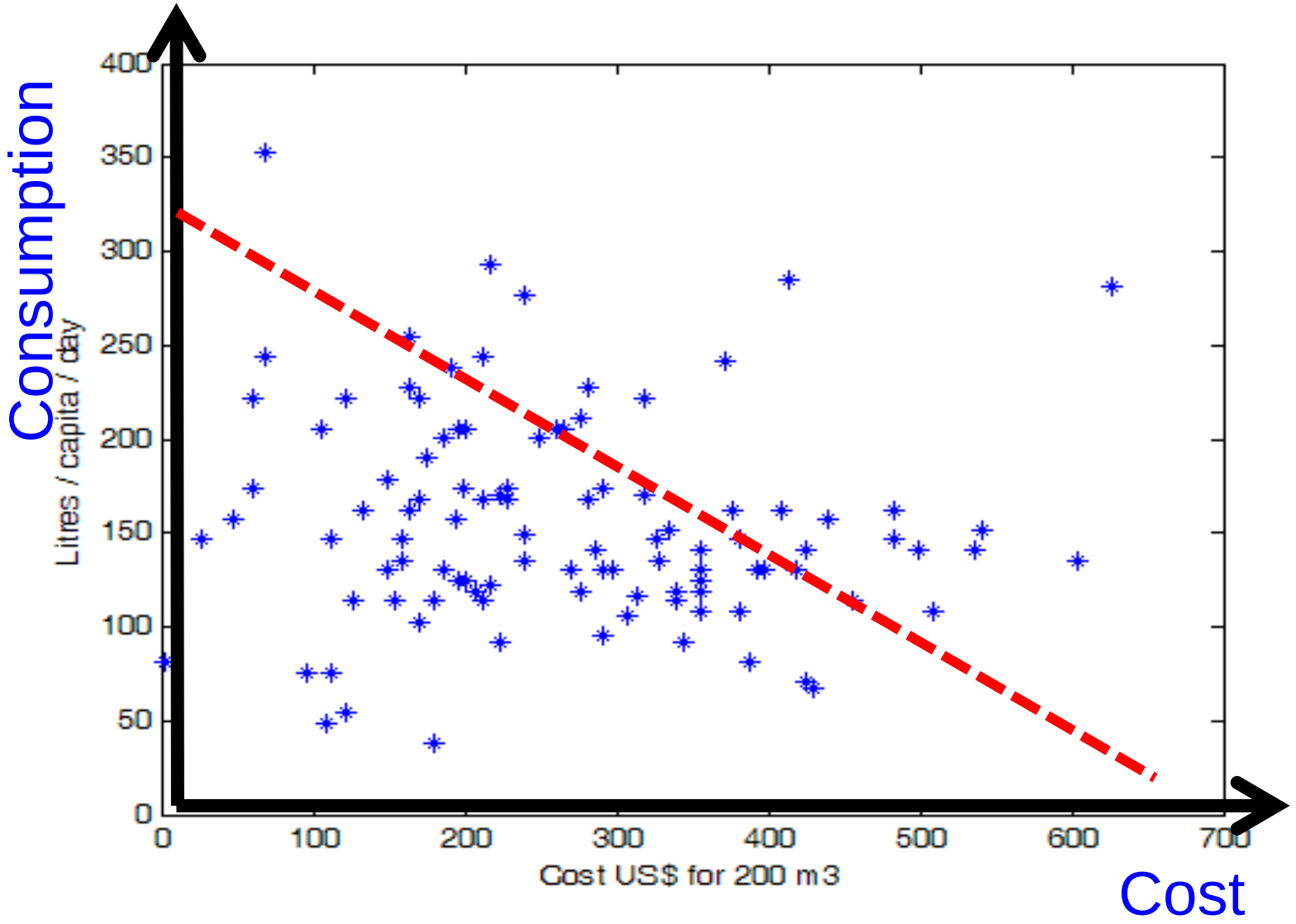
On-Shore: 3 MW/km^2
Off-Shore: 8 MW/km^2

Solar PV

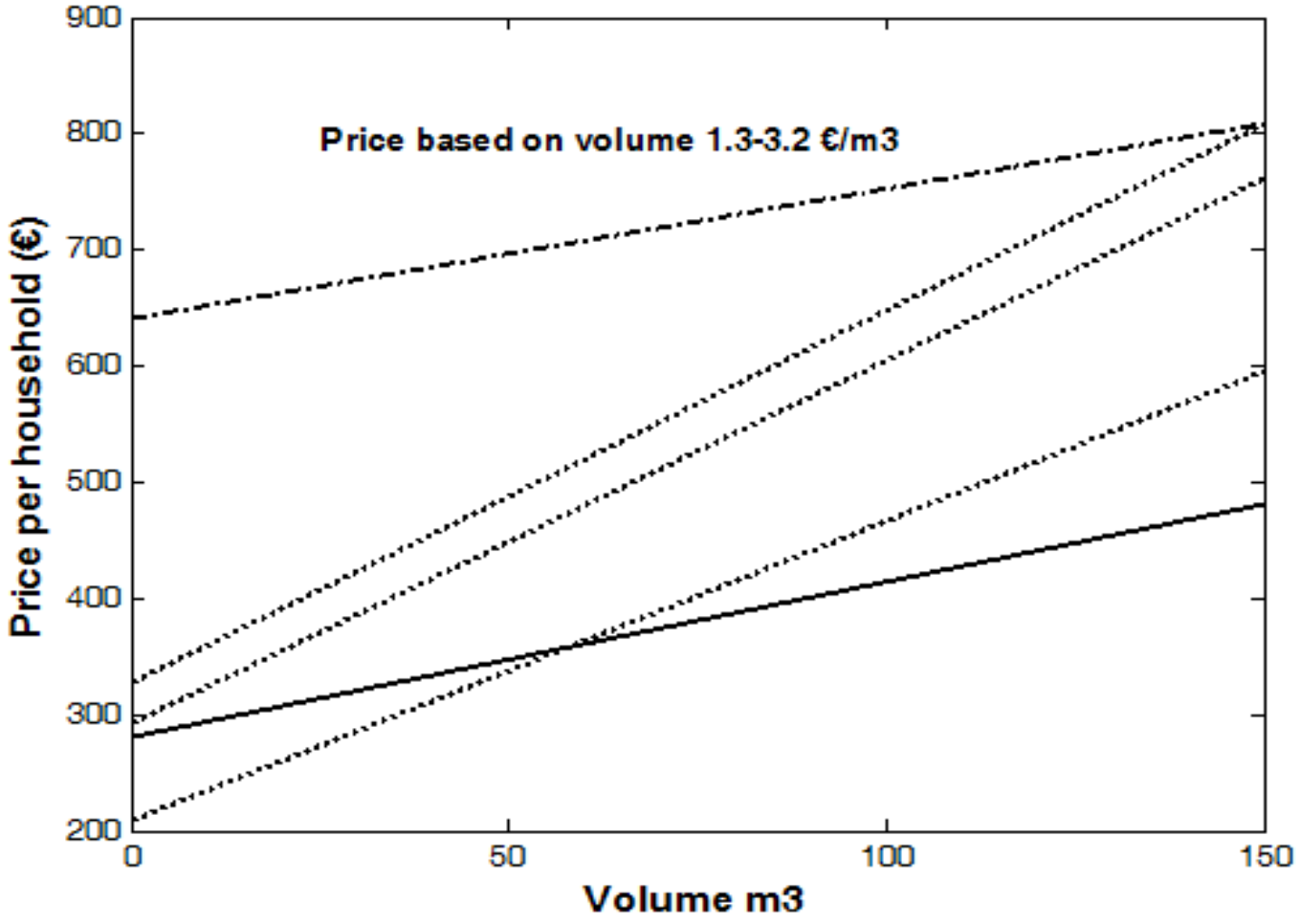
Up to: 100 MW/km^2

Water economy

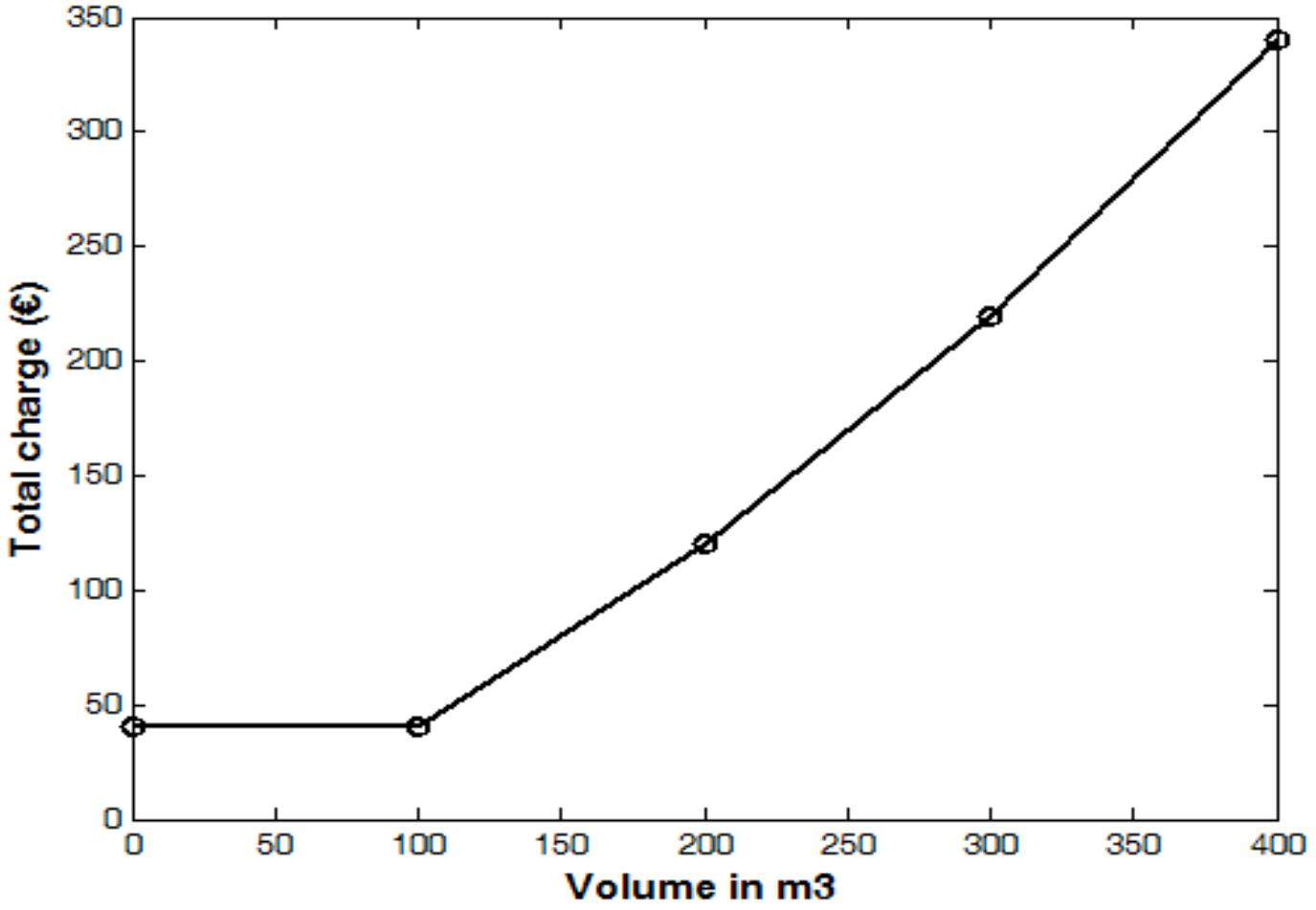
Water consumption vs. cost for 200 m^3 (104 cities)



Water tariffs in 5 municipalities in West Sweden



Progressive water tariff



Swedish climate achievements

Does Sweden satisfy the climate goals?

- According to the Government: yes
- Hydropower and nuclear power save us
- Transportation: are biofuels OK?
- *How much have we actually done in the last 5 years to mitigate the climate change?*
- Is the Swedish population aware?
  Or – are we complacent?

Is Sweden a role model?

- What has Sweden done during the last 5 years?

Concluding reflections

- The ***political will*** is the key to establish a successful strategy for the water-energy nexus
- How do we ***measure and report*** progress in climate actions in Sweden?