



# Hydropower and Climate Change

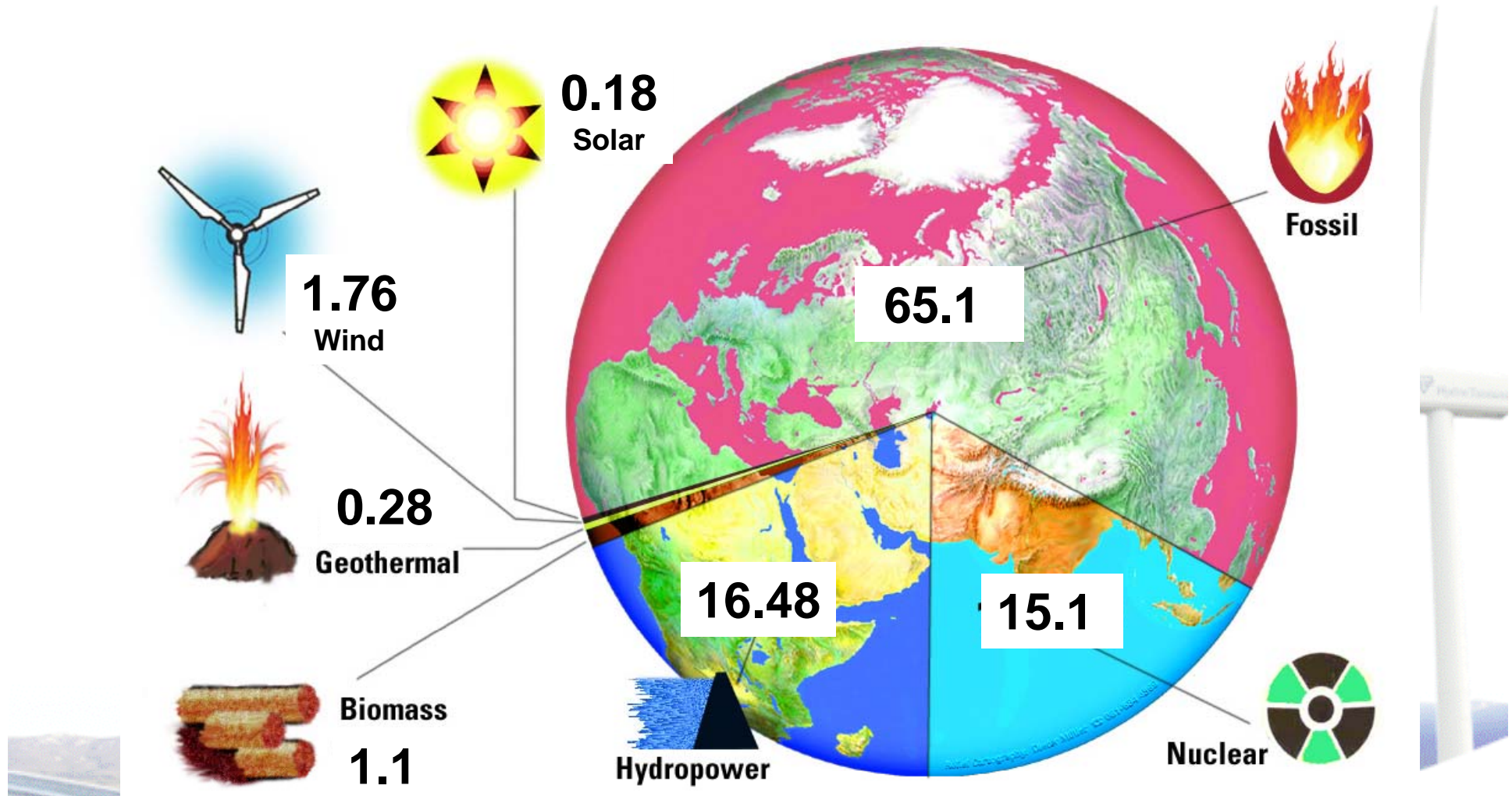
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International Hydropower Association



# Power Generation by Type (17,530 TWh in 2005)

(Tripled since 1970 – OECD Growth = <3% - Non-OECD Growth = ~5%)



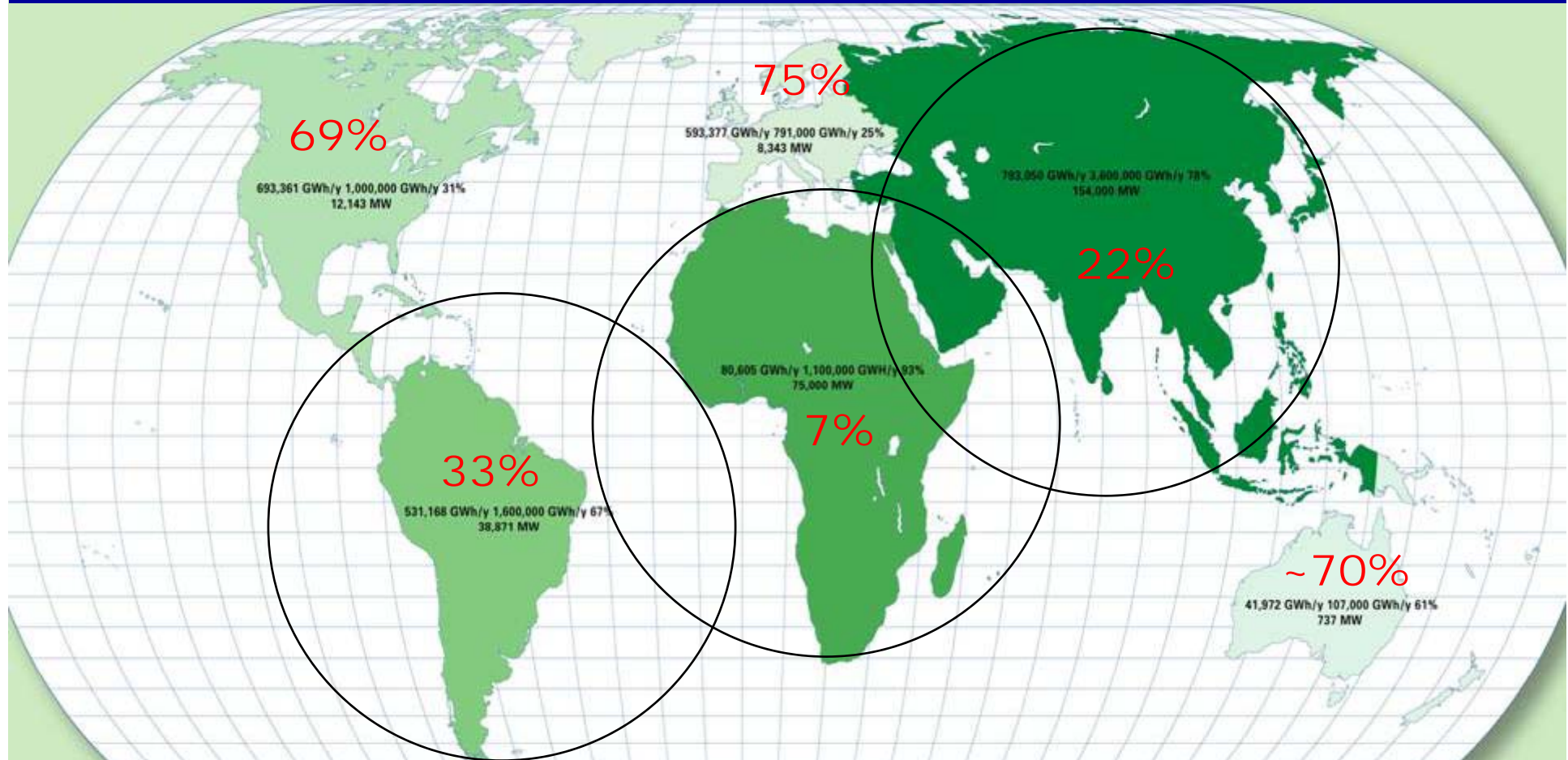
Values are percentages.

Sources: IHA/IEA,2006/REN21,2006

**World's realistic potential developed: ~ 1/3**

**Current hydro production: 2889 TWh/y**

**Realistic potential production: ~ 8600 TWh/y**



**“For non-OECD countries, hydroelectric plants produced 1546 TWh or 21.1% of total gross production reported in 2004.**

**This represents a 9.8% increase over the previous year.**

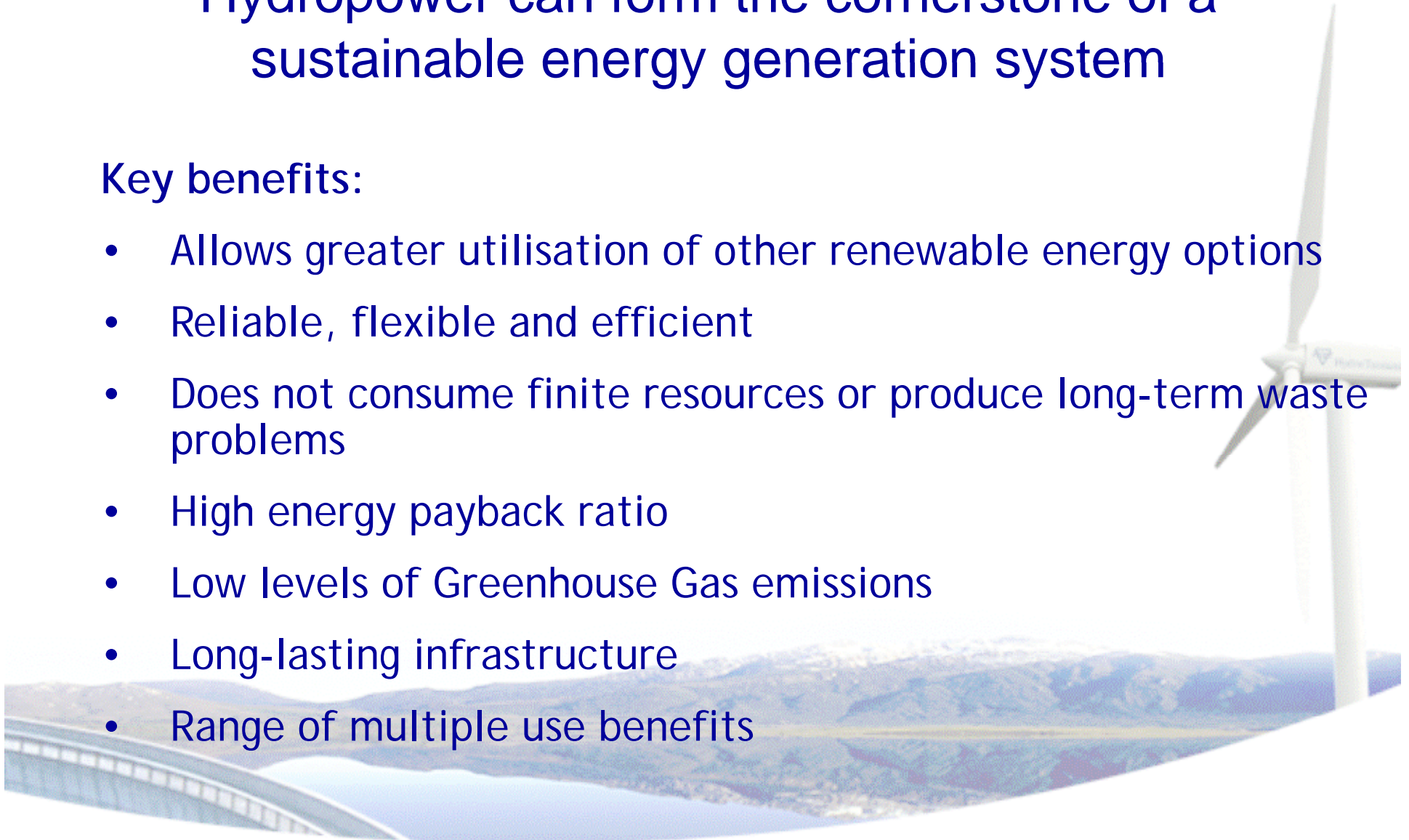
**Hydro production reported by non-OECD countries has increased at an annual average rate of 4.7% since 1973.” – IEA Electricity Information, 2006**

# Advantages of Hydropower

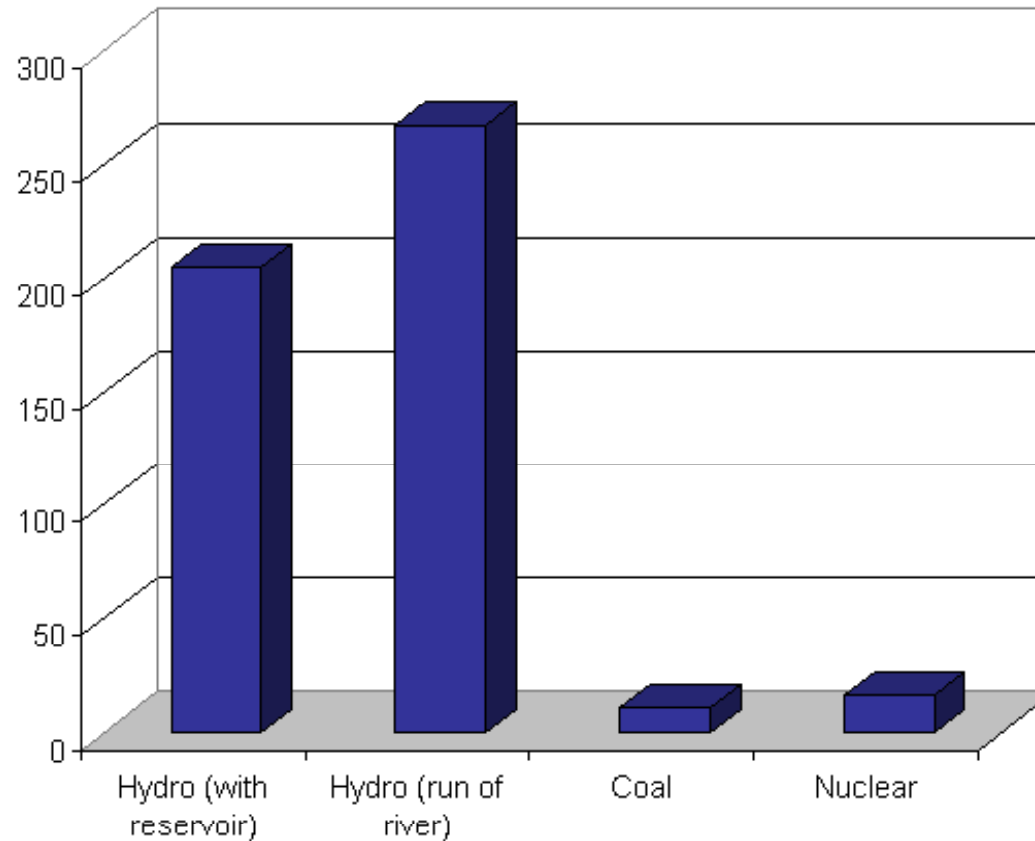
Hydropower can form the cornerstone of a sustainable energy generation system

## Key benefits:

- Allows greater utilisation of other renewable energy options
- Reliable, flexible and efficient
- Does not consume finite resources or produce long-term waste problems
- High energy payback ratio
- Low levels of Greenhouse Gas emissions
- Long-lasting infrastructure
- Range of multiple use benefits

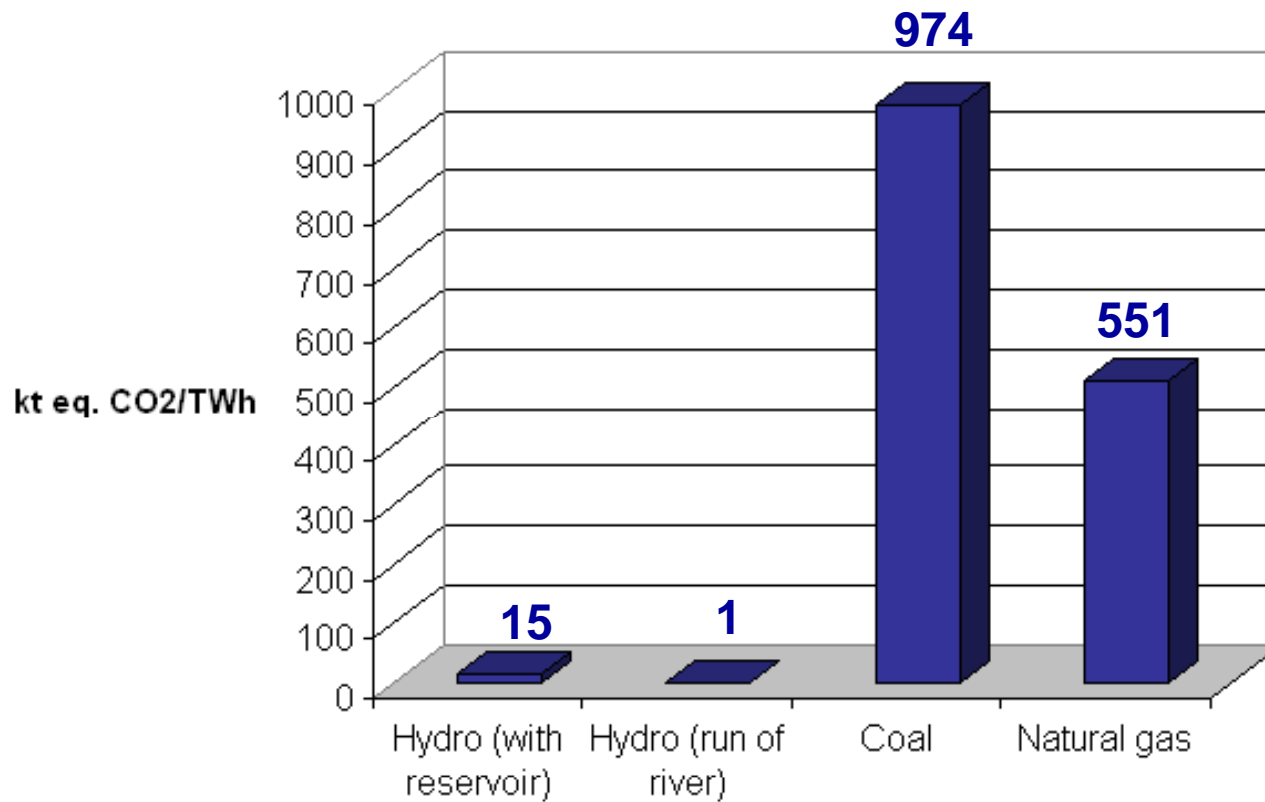


# Energy Payback Ratios



Energy payback ratios are calculated from the energy produced during the normal lifespan of a powerplant divided by the energy required to build, maintain and fuel the generating equipment.

# Greenhouse Gas Emissions



Hydropower's direct and indirect emissions make it one of the lowest greenhouse gas producing technologies

# Greenhouse Gas Emissions



# UNESCO Workshop

In December 2006 a UNESCO Workshop was held on greenhouse gas emissions from freshwater reservoirs.

The workshop concluded that the main area of uncertainty related to shallow anoxic reservoirs in tropical regions.

The workshop recommended further research in tropical regions including the refinement and validation of a generic predictive model for shallow anoxia.

It was also recommended that reservoir designers and operators be better informed of possible mitigation measures to reduce emissions from shallow anoxic reservoirs.



# Clean Development Mechanism

In April the most popular CDM project type was hydropower (51 new projects, 42 in China).

In the absence of certainty around the greenhouse footprint of hydropower, the CDM rules exclude storage hydro.

Less than 4 watts capacity per m<sup>2</sup> of reservoir is excluded and greater than 10 watts capacity per m<sup>2</sup> of reservoir is included.

The exclusion of storage hydro can lead to poor outcomes. It reduces the flexibility of hydro systems, undermines the optimization of basin development, reduces the value for multipurpose use and reduces the ability to adapt to increasing climate variability.



# IHA Sustainability Assessment Protocol

