ICID 18 Congress and 53 IEC Meeting
Montreal July 21-28, 2002

Web site: www.cancid.org, e-mail: montreal2002@cancid.org
World Food Outlook
Desire to alleviate poverty and hunger especially in rural areas
Food surplus and deficit in 1995

- Major deficit (>50%) (22)
- Minor deficit (<50%) (44)
- Self-sufficient (-5 to 5%) (19)
- Minor surplus (<50%) (9)
- Major surplus (>50%) (4)
- No data (122)
Increase irrigated area, productivity, water use efficiency
World cereal production = consumption = 2000 M metric tons

[2 B tons for 6 B persons]

1 ton of cereals = 3-5 barrels of oil
World Hunger Data
Extreme hunger and starvation in the world today

Location and duration of protracted food emergencies, 2004

Consecutive years including 2004
- 5–8 years
- 9–11 years
- 12–14 years
- > 15 years

Source: FAO
Persisting hunger
Rice = meal
Rice: Grains for half of the World
Food
From Paddy to bowl
Non-Renewable Energy Sources

Coal
Oil
Gas
Thermal power plant

1. Coal conveyor
2. Stoker
3. Pulverizer
4. Boiler
5. Coal Ash
6. Air preheater
7. Electrostatic precipitator
8. Smokestack
9. Turbine
10. Condenser
11. Transformers
12. Cooling towers
13. Generator
14. High-voltage power lines
Thermal Plant

Low Efficiency

Efficient
Order of Magnitude of Energy Resources

"Pick the low-hanging fruit first!"
WEC Survey of Energy Resources 2004
Coal

<table>
<thead>
<tr>
<th>Region</th>
<th>Reserves</th>
<th>Production</th>
<th>Consumption</th>
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</thead>
<tbody>
<tr>
<td>North America</td>
<td>255</td>
<td>20</td>
<td>255</td>
</tr>
<tr>
<td>Europe</td>
<td>247</td>
<td>50</td>
<td>247</td>
</tr>
<tr>
<td>Asia</td>
<td>258</td>
<td>0.4</td>
<td>258</td>
</tr>
<tr>
<td>South America</td>
<td>79</td>
<td>79</td>
<td>79</td>
</tr>
</tbody>
</table>

RESERVES: 909 Gt
PRODUCTION: 4.8 Gt/year
CONSUMPTION: 4.8 Gt/year
WEC Survey of Energy Resources 2004
Oil

North America
South America
Europe
Africa
Middle East
Asia
Oceania

R/P RATIO
41.2 years
RESERVES
148 Gt
PRODUCTION
3.5 Gt/year
CONSUMPTION
3.5 Gt/year
WEC Survey of Energy Resources 2004
Natural Gas

North America
- RESERVES: 9 tcm
- PRODUCTION: 70 tcm/year
- CONSUMPTION: 56 tcm/year
- R/P RATIO: 9 years

South America
- RESERVES: 57 tcm
- PRODUCTION: >100 tcm/year
- CONSUMPTION: 56 tcm/year
- R/P RATIO: >100 years

Europe
- RESERVES: 70 tcm
- PRODUCTION: >100 tcm/year
- CONSUMPTION: 56 tcm/year
- R/P RATIO: 57 years

Middle East
- RESERVES: >100 tcm
- PRODUCTION: >100 tcm/year
- CONSUMPTION: 40 tcm/year
- R/P RATIO: >100 years

Asia
- RESERVES: >100 tcm
- PRODUCTION: >100 tcm/year
- CONSUMPTION: 29 tcm/year
- R/P RATIO: >100 years

Oceania
- RESERVES: 29 tcm
- PRODUCTION: 29 tcm/year
- CONSUMPTION: 29 tcm/year
- R/P RATIO: 29 years

RESERVES: 171 tcm
PRODUCTION: 2.6 tcm/year
CONSUMPTION: 2.6 tcm/year
R/P RATIO: 59.8 years
Figure 1.1: Proved coal reserves at end-1999 - regional distribution
Figure 1.3: Coal production and consumption, 1999 - regional distribution

- **Asia**: High production and consumption.
- **Europe**: Moderate production and consumption.
- **North America**: Moderate production and consumption.
- **South America**: Low production and consumption.
- **Africa**: Low production and consumption.
- **Middle East**: Low production and consumption.
- **Oceania**: Low production and consumption.

**Note**: The chart shows the comparison between production and consumption for different regions.
Figure 7.2: Hydropower - technically exploitable capability and 1999 generation (all schemes) - regional distribution

[Bar chart showing regional distribution of hydropower capability and generation.]
Figure 7.1: Installed hydropower capacity (all schemes) at end-1999 - regional distribution

- North America: 23.1%
- South America: 15.4%
- Africa: 2.9%
- Oceania: 1.9%
- Middle East: 0.6%
- Europe: 31.0%
- Asia: 25.1%
More than two thirds of the world water reservoirs are used for irrigation and food production to feed billions of the world poor and stamped out the starvation prevailed in 1950’s.

Figure 3.3 Modification of annual flow regimes due to a hydropower dam, Colorado River at Lee’s Ferry, United States

Water Stress: needs and availability

Water Stress Indicator: Withdrawal-to-Availability Ratio [CR]

No Stress | Low Stress | Mid Stress | High Stress | Very High Stress
---|---|---|---|---
0 | 0.1 | 0.2 | 0.4 | 0.8

WaterGAP 2.0 - December 1999
Trends of pressure on water resources
Water scarcity ranking under business as usual scenario in 2025

- **Absolute water scarce**: 13 countries
- **Economic water scarce**: 40 countries
- **No water scarcity**: 25 countries
- **Water not scarce, high imports**: 18 countries
- **No data**: 124 countries
Projected Water Scarcity in 2025

Note: Indicates countries that will import more than 10% of their cereal consumption in 2025.
Limited investments in new water infrastructure reduce irrigation expansion and prevent water scarcity— but food scarcity is the result.
What is the question now?
What is a Dam?

There are a number of technical and legal definitions of a dam, but generally, it is any structure that impounds or diverts water.
Characteristics of dams:

<table>
<thead>
<tr>
<th>PURPOSES</th>
<th>SUM</th>
<th>467</th>
<th>365</th>
<th>521</th>
<th>475</th>
<th>0</th>
<th>0</th>
<th>46</th>
<th>1</th>
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<tbody>
<tr>
<td>BUTS</td>
<td>multiple purpose</td>
<td>214</td>
<td>314</td>
<td>422</td>
<td>230</td>
<td>0</td>
<td>0</td>
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<td>99</td>
<td>245</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>SUM Area/Sur 10³ m²</th>
<th>913 097</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. Capacity 10³ m³</td>
<td>21 563 131</td>
</tr>
<tr>
<td>RETENUES</td>
<td>1 121</td>
</tr>
<tr>
<td>RESERVOIRS</td>
<td></td>
</tr>
</tbody>
</table>

Second dams/barrages secondaires: 1 International 0

<table>
<thead>
<tr>
<th>OUTPUTS / CONSEQUENCES</th>
<th>SUM P (MW)</th>
<th>MAX P (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUM E (GWh/year)</td>
<td>MAX E (GWh/year)</td>
<td></td>
</tr>
<tr>
<td>SUM Irrigation (km²)</td>
<td>MAX Irrigation (km²)</td>
<td></td>
</tr>
<tr>
<td>SUM Floodstock (hm³)</td>
<td>MAX Floodstock (hm³)</td>
<td></td>
</tr>
<tr>
<td>SUM Resettlement</td>
<td>MAX Resettlement</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATISTICAL TABLE</th>
<th>TABLE STATISTIQUE</th>
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</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Japon</td>
</tr>
</tbody>
</table>
Large Dams Predominance

Figure 1.8: Distribution of existing large dams by region and purpose

Source: Adapted from ICOLD, 1998 (See Annex V).
Asia picked up speed about a decade later. Needs resumption.

Figure 1.7: Dams constructed over time by region (1900-2000)

Statistics from the WRD 98 on the role of dams

7 000 km³ of storage - including dead storage - built mainly during the last century
World Commission on DAMS (1997-2000)

• A special Commission created to deal with the issues related to large dams and environmental controversies related to the safety, construction, operation and decommissioning of dams.
President of ICID statement to the WCD

Dams and Water Resources

“Irrigation, drainage and flood control of agricultural lands are no longer options. They are a necessity for feeding billions of people, providing employment for billions of the rural poor and for protecting the environment. Large dams provide large storage capacity to meet the needs during the dry period especially in the arid and semi-arid zones thus allowing for reliable delivery of water to the crops when most needed...

The determination of the size, location and type of structure depends on the economic, technical, social and environmental factors being considered by the promoter of the scheme...

The knowledge in this respect is rapidly advancing and is likely to go further in the future.”

Aly Shady, President of the International Commission on Irrigation and Drainage
The « DIVIDE »
FAMOUS DAMS OF THE WORLD

Grand Coulee

ASWAN

TARBELA

Three Gorges
INTERNATIONAL COMMISSION ON LARGE DAMS

ASWAN
a success!

Data from ICOLD CO
Environment

- Floods
- Sediment
- Drainage
- Shoreline navigation
- Resettlement 50 000
- Fauna
- Health
- Heritage …