PRESENTATION 2ND WORLD IRRIGATION AND DRAINAGE PRIZE WINNER

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TWO CRUCIAL TOPICS

- water management for food security
- impacts of man induced changes in land use and climate change on living and working in coastal and deltaic areas

In light of a rapidly changing and urbanising world
WATER MANAGEMENT FOR FOOD SECURITY IN A RAPIDLY CHANGING AND URBANISING WORLD
EXPECTATION ON FOOD PRODUCTION

- duplication in food production in 25 – 30 years
- 80 - 90% from existing cultivated area
  - higher yield per ha, double or triple cropping
  - installation of irrigation and/or drainage systems in areas without a system
  - modernization of existing irrigation and drainage systems
  - installation of drainage in irrigated areas
  - installation of irrigation in rainfed areas with drainage
- 10 - 20% from land reclamation

INCREASE IN FARM SIZE
Food affordable for urban people
WORLD MARKET PRICES OVER THE LAST 30 YEARS

![Graph showing world market prices over the last 30 years for wheat, maize, and rice. The graph illustrates the price trends from 1985 to 2015.]

WATER MANAGEMENT PRACTICES

- no system: 1,100 million ha
- irrigation only: 230 million ha
- drainage only: 135 million ha
- irrigation and drainage: 70 million ha

<table>
<thead>
<tr>
<th>Type of country</th>
<th>No system</th>
<th>Irrigation</th>
<th>Drainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High HDI</td>
<td>67</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>High + Medium HDI</td>
<td>69</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Low HDI</td>
<td>87</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>
ACTORS IN AGRICULTURAL WATER MANAGEMENT

RESPONSIBLE
- Government
- Agencies
- Farmers

CONTRIBUTING
- Consultants
- Contractors, manufacturers
- Universities, schools
- Research institutes
- Banks, donors
- NGO’s, Int. org.
- Farmers associations

SOME REMARKABLE POINTS

- Global food production enough to feed the World
- Challenge: duplication in 25 – 30 years
- Improved and expanded water management is needed to cope with the challenges, especially in the countries with a high, medium and low HDI
- Responsible for water management: governments, irrigation/drainage agencies, farmers
IMPACTS OF MAN INDUCED CHANGES IN LAND USE AND CLIMATE CHANGE ON LIVING AND WORKING IN COASTAL AND DELTAIC AREAS

- World’s population is increasingly living and working in coastal and deltaic areas. No indications that this tendency will change.
- Improvement in agriculture, increase in value of crops, buildings, water management facilities, infrastructure.
- 80 – 90% of urbanisation takes place in flood prone areas. Increase in value of property, buildings and infrastructure. Further increase will take place.
Cities with > 5 million residents

SUBSIDENCE IN COASTAL AND DELTAIC AREAS

<table>
<thead>
<tr>
<th>Location</th>
<th>Subsidence in cm/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semarang, Surabaya</td>
<td>6 - 20</td>
</tr>
<tr>
<td>Jakarta</td>
<td>0.5 - 17</td>
</tr>
<tr>
<td>Bangkok, Ho Chi Minh City,</td>
<td>4 – 5</td>
</tr>
<tr>
<td>San Francisco Bay</td>
<td></td>
</tr>
<tr>
<td>Ganges Brahmaputra Delta,</td>
<td>2 – 4</td>
</tr>
<tr>
<td>Manilla, New Orleans, Shanghai</td>
<td></td>
</tr>
<tr>
<td>Venetia</td>
<td>0.1 – 0.4</td>
</tr>
</tbody>
</table>
**SUBSIDENCE AND SEA LEVEL RISE**

![Graph showing sea level rise and subsidence over time]

- **Sea level rise**
- **Subsidence 50 mm/year**
- **Subsidence 100 mm/year**
- **Subsidence 150 mm/year**

Drainage by gravity needs to be replaced by drainage by pumping.

*Image: World Irrigation Forum*
### STANDARDS FOR FLOOD PROTECTION

<table>
<thead>
<tr>
<th>City/country</th>
<th>Chance per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhaka, Bangladesh</td>
<td>1/50</td>
</tr>
<tr>
<td>United States and United Kingdom (including New Orleans after Katrina)</td>
<td>1/100</td>
</tr>
<tr>
<td>India: urban and industry</td>
<td>1/100</td>
</tr>
<tr>
<td>rural area</td>
<td>1/25</td>
</tr>
<tr>
<td>China: major cities</td>
<td>1/200</td>
</tr>
<tr>
<td>cities</td>
<td>1/100</td>
</tr>
<tr>
<td>rural area</td>
<td>1/20</td>
</tr>
<tr>
<td>Brits Columbia in Canada</td>
<td>1/200</td>
</tr>
<tr>
<td>Coast of the Netherlands</td>
<td>1/10,000</td>
</tr>
</tbody>
</table>

### DEATH AND DISPLACED PERSONS

- **Death**
  - 1985: 20
  - 1990: 10
  - 1995: 15
  - 2000: 25
  - 2005: 50
  - 2010: 100

- **Displaced in million**
  - 1985: 5
  - 1990: 10
  - 1995: 15
  - 2000: 25
  - 2005: 50
  - 2010: 100
DAMAGE IN BILLION US$
CLIMATE CHANGE AND IMPACT OF HUMAN ACTIVITIES

- climate change:
  - rise of the mean sea level
  - change in river regimes and increase in peak discharges of rivers
  - increase in annual rainfall and in peak rainfall
    Impact 10 – 45% per century
- impact of human activities:
  - increase in value of public and private property
  - increase in population
  - increase in value of crops
    Impact 100 – 1,000% per century
CONCLUDING REMARKS – I

Man induced changes in land use – urbanisation and land subsidence – are much faster and have much more impact than the impacts of climate change

Measures in the field of water management and flood protection are generally absolutely insufficient

As long as population growth, increase in standards of living, urbanisation and industrialisation in coastal and deltaic areas goes on, increasingly flood management and flood protection provisions will be required

CONCLUDING REMARKS - II

Flood management and flood protection measures are generally taken after a flooding disaster and not before

Many casualties and substantial damage would have been prevented when the same measures would have been taken before the disaster, but it looks like our societies are not able to take such decisions in time
We are concerned about the calamities that hit us, but many of these calamities are only such disastrous while we started to live on volcanos, at active faults, along subsiding coasts and the flooding rivers

Salomon Kroonenberg, 2006

Thank you for your attention