

# Water in the world

## Some practical teaching suggestions



Source: Corbis Images

Curriculum context: Australian curriculum for Geography, Year 7 Unit 1

Water in the world = half of the Year 7 curriculum

# Water in the World

## Australian Curriculum for Geography focus



Source: Corbis Images

Water is an example of a renewable resource.

# Water in the World—Themes

- Water has multiple uses.
- Water is perceived and valued in different ways.
- Water is a resource in its different forms.
- Water connects places in the environment.
- Water varies over time and space.
- Water is a scarce resource.

Source: ACARA Curriculum for Geography

# Water in the World— Key understandings

- Water is a key component in the environment.
- The water cycle – a conceptual framework for understanding the processes in the water cycle.
- Water is essential for human life and other life, and many of the processes in the environment.
- People perceive and value the environment differently.
- Water is a key component to many environmental hazards.

# Water in the World—Studies

- Australia
- countries of the Asia region
- countries from West Asia and/or North Africa

Source: ACARA Curriculum for Geography

# Teaching Water in the World

- Water is **FUNDAMENTAL** to humans, the environment and the study of Geography.
- Make the topic **FUN** for your students!



Source: Corbis Images

# Water in the World— Year 7 Content Descriptions

There are two interrelated strands:

1. Geographical Knowledge and Understanding
2. Geographical Inquiry and Skills.

# Geographical Knowledge and Understanding

- The classification of environmental resources and the forms that water takes as a resource
- The ways that flows of water connect places as it moves through the environment and the way this affects places
- The quantity and variability of Australia's water resources compared with those in other continents
- The nature of water scarcity and ways of overcoming it, including studies drawn from Australia and West Asia and/or North Africa
- The economic, cultural, spiritual and aesthetic value of water for people, including Aboriginal and Torres Strait Islander Peoples and peoples of the Asia region
- The causes, impacts and responses to an atmospheric or hydrological hazard



# Geographical Inquiry and Skills

- Observing, questioning and planning
- Collecting, recording, evaluating and representing
- Interpreting, analysing and concluding
- Communicating
- Reflecting and responding

# Some practical teaching suggestions

## How to integrate the two interrelated strands

### 1. Classroom teaching

- Choose quality textbook and atlas resources with up-to-date research.
- Use a variety of geographical tools, such as climate graphs, column graphs, maps, graphics.
- Always bring current issues and events connected with water into your teaching at a variety of scales.
- Make the topic relevant and meaningful for your students.

# Some practical teaching suggestions (contd)

## 2. Geographical investigation projects

- Set students individual investigation projects based on their interests, current events and issues on a range of scales.
- Guide students to follow the steps outlined in the Geographical Inquiry and Skills strand of the syllabus.
- This should constitute part of the assessment of the topic.

# Some practical teaching suggestions (contd)

## 3. Group projects

- Set specific projects that integrate the two strands, e.g. investigating and reporting on the threat of CSG to the water table and food security in Australia.
- Guide students to follow the steps outlined in the Geographical Inquiry and Skills strand of the syllabus.
- This should constitute part of the assessment of the topic and include a group and individual component so all students are actively engaged.

# Integrating classroom teaching with the outside world

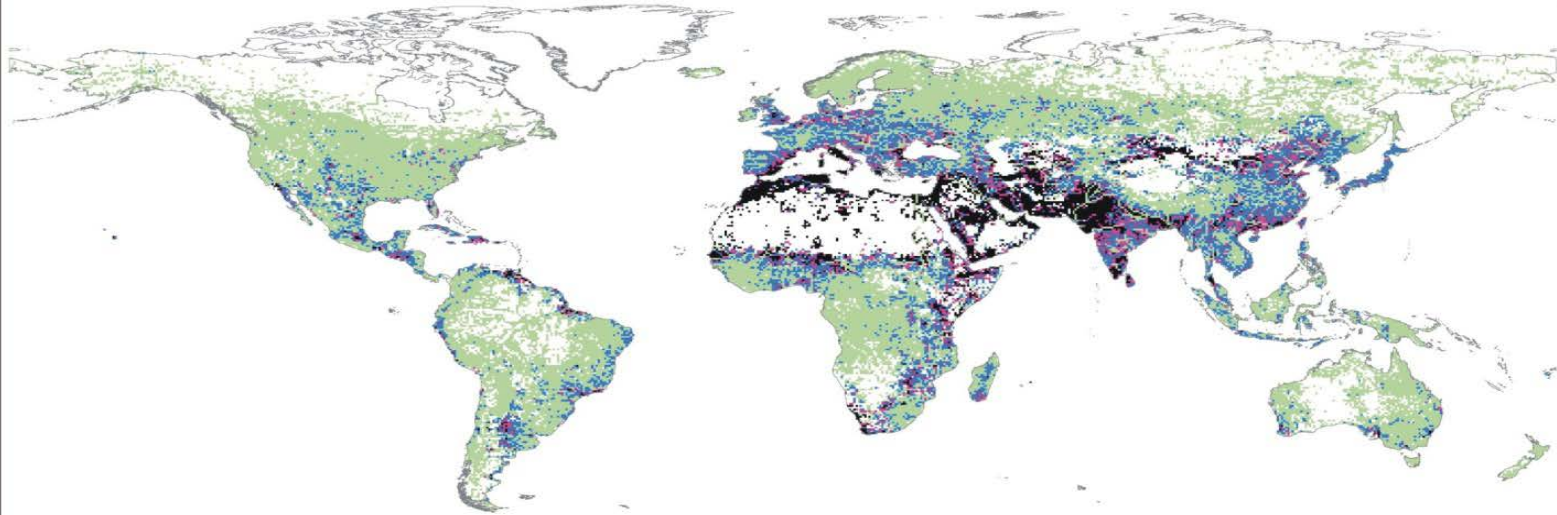
- Make your teaching relevant, practical and meaningful.
- Show how Water in the World relates to real-world current events and issues.
- Actively use the media to make the topic come alive.
- Allocate students to specific Water in the World topics and ask them to be media monitors who report back to the class.

# Some examples of integrating classroom teaching with the outside world

- Water scarcity
- Climate change
- Groundwater resources
- Dams
- Water pollution
- Desalination
- Hydrological hazards
- CSG mining

# Water scarcity

## Water Scarcity Index for Contemporary Conditions



The water scarcity index describes the relationship between water availability and the number of people that can be supported by that water supply. The scarcity index is expressed in terms of the number of people per flow unit where a flow unit of water is equal to 1 million cubic meters per year.

### Water Scarcity Index

- Water Barrier (> 2000 people/flow unit)
- Water Scarcity/Stress (600 - 2000 people/flow unit)
- Populations Vulnerable to Water Stress (100 - 600 people/flow unit)
- Adequate Supply (< 100 people/flow unit)
- Low Density Population

Source: *Assessment of Select Climate Change Impacts on U.S. National Security*, Center for International Earth Science Information Network (CIESIN) Columbia University Working Paper July 1, 2008 (Page 48)

# Climate change



Source: Corbis Images

*Water is at the heart of both the causes and effects of climate change.*  
(Canadian National Research Council)

*the impacts of climate change are global in scope and unprecedented in scale*  
(United Nations Environment Programme (UNEP) *Climate Change Factsheet*)

- Climate change is the greatest environmental issue of our time.
- It includes higher temperatures, changes to precipitation patterns, more frequent weather-related disasters and rising sea levels.
- All of these things will affect the availability and scarcity of fresh water.



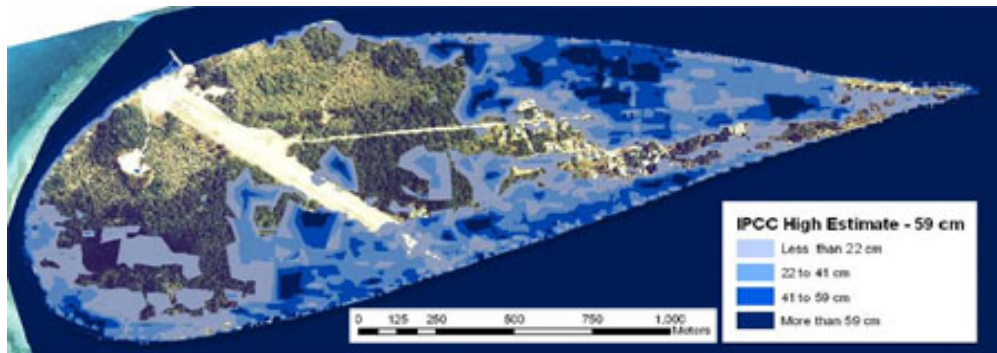
# Environmental refugees

## Case study: Masig Island, Torres Strait

Aerial images of highest tides now and high tide estimates for 2100



Masig Island: highest tides now



Masig Island: IPCC high tide estimate for 2100

Source: K Parnell and S Smithers, *Coastal erosion project: Masig, Warraber, Poruma, Iama*, (Presentation to the board of the Torres Strait Regional Authority, 2008).

# Groundwater resources

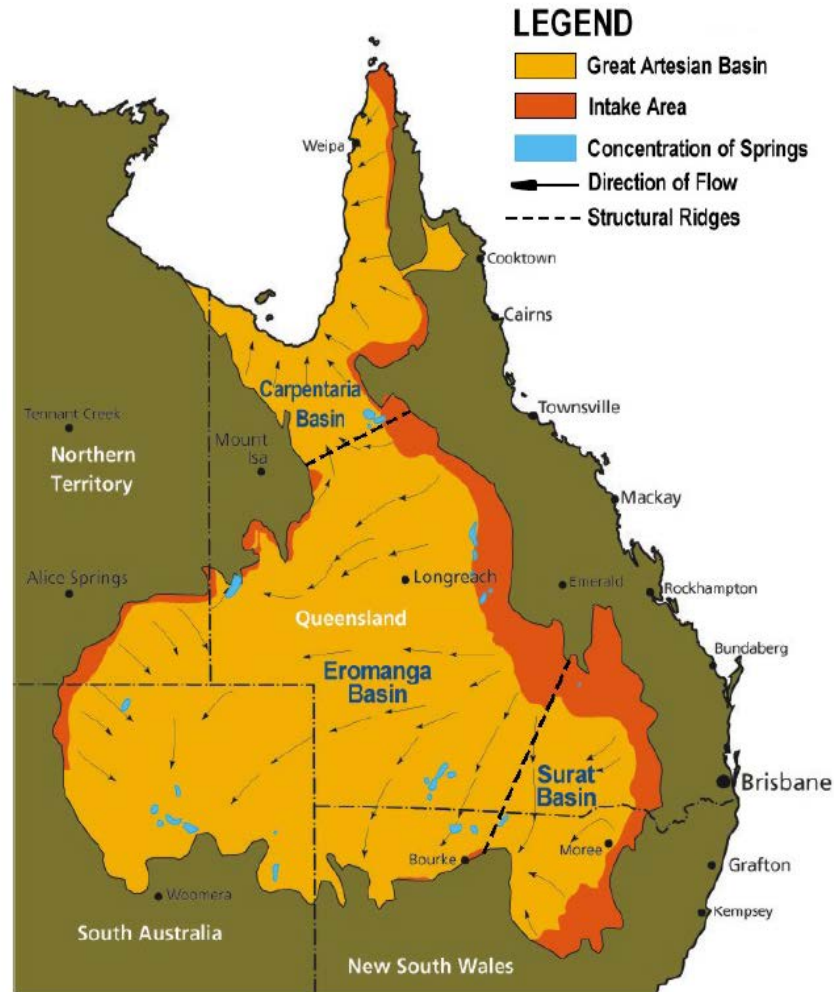


Figure 1—The Great Artesian Basin

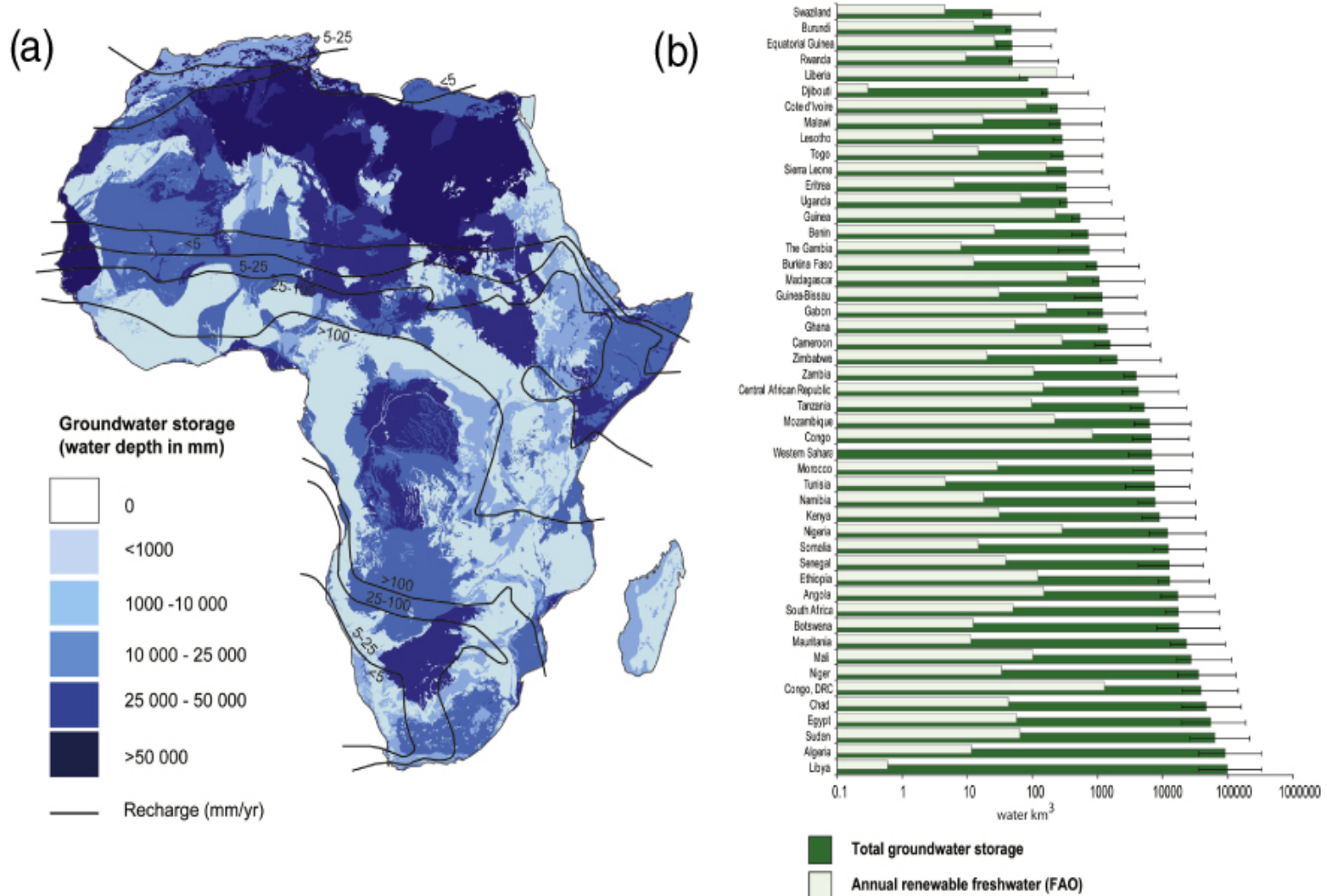
Source: Queensland Department of Environment and Resource Management: *Great Artesian Basin Fact Sheet*

Mound springs in the Great Artesian Basin have great significance to Aboriginal peoples.



Source: Mound springs of the Great Artesian Basin in South Australia: a case study from Olympic Dam by G.M. Mudd, *Environmental Geology* 39 (5) March 2007 © Springer-Verlag. G.M. Mudd, School of the Built Environment, Victoria University of Technology

# African groundwater resources and the issue of fossil water exploitation



Source: IOP Science, Quantitative maps of groundwater resources in Africa, A M MacDonald *et al* *Environmental Research Letters*, Volume 7, Number 2, 19 April 2012 (Figure 2)

# Dams – harnessing water at a cost

## Case study: The mighty Mekong River



# Mekong Basin Facts

- China plans to build 11 major dams on the Upper Mekong to supply hydropower needs for its growing economy.
- More than 80% of people in Laos and Cambodia depend on the Mekong for their protein needs (fish).
- The Lower Mekong Basin in Laos has 43% of the river's hydropower potential.
- The Mekong drains 50% of Thailand's farmland.
- More than 60 million people live in the Lower Mekong Basin. This is more than a third of the population of Thailand, Cambodia, Laos and Vietnam.
- More than 50% of Cambodians benefit from Tonle Sap. The lake is one of the world's largest freshwater fisheries.
- The Mekong delta has more than 17 million people and produces more than 50% of Vietnam's rice crop.
- Reduced river flows in the delta will enable saltwater to invade low-lying agricultural land destroying crops and causing famine and economic hardship in Vietnam.



# Water pollution



Source: Corbis images

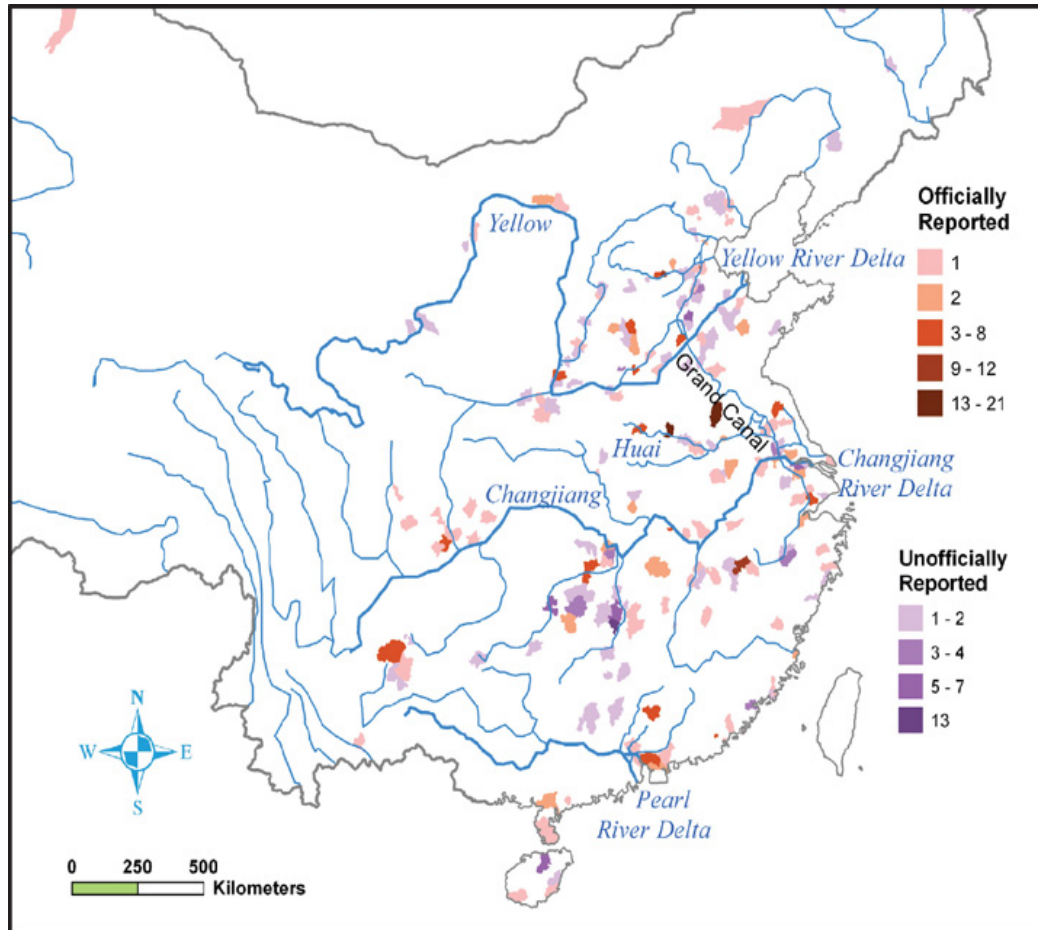
# Case study: Chinese cancer villages (*Aizheng cun*)

- There have been reports of 459 cancer villages across 29 of the 31 provincial units in China.
- Officially, 241 cancer villages have been reported in 117 counties from 22 provinces.
- There are almost as many unofficially reported cancer villages. The unofficial data were obtained from reputable non-government controlled internet sites.





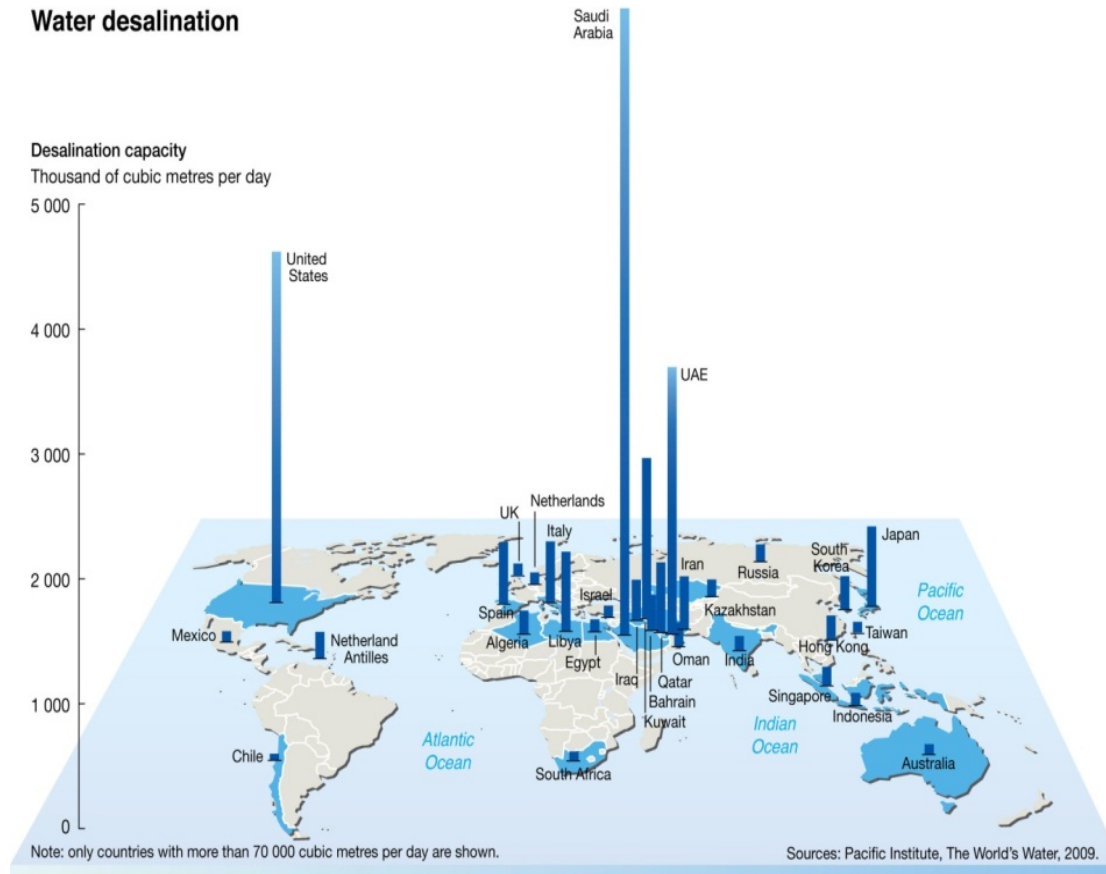
# Major rivers and counties with cancer villages in China, officially reported and unreported



Source: *Environment Magazine*, March/April 2010, Fig 2

# Desalination

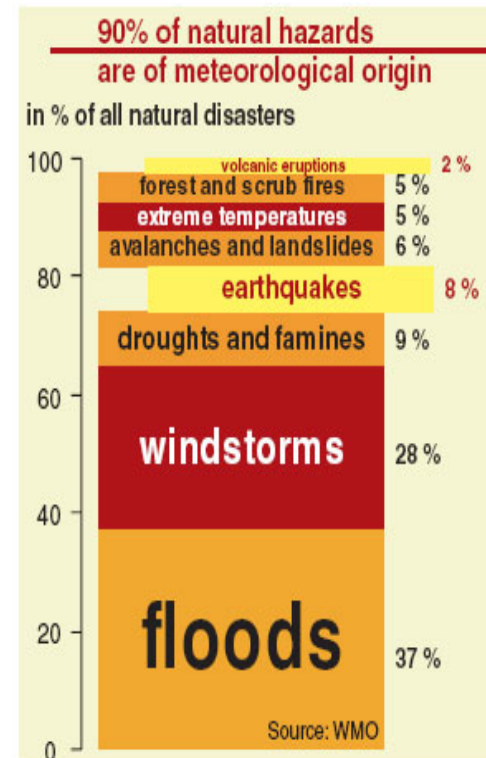
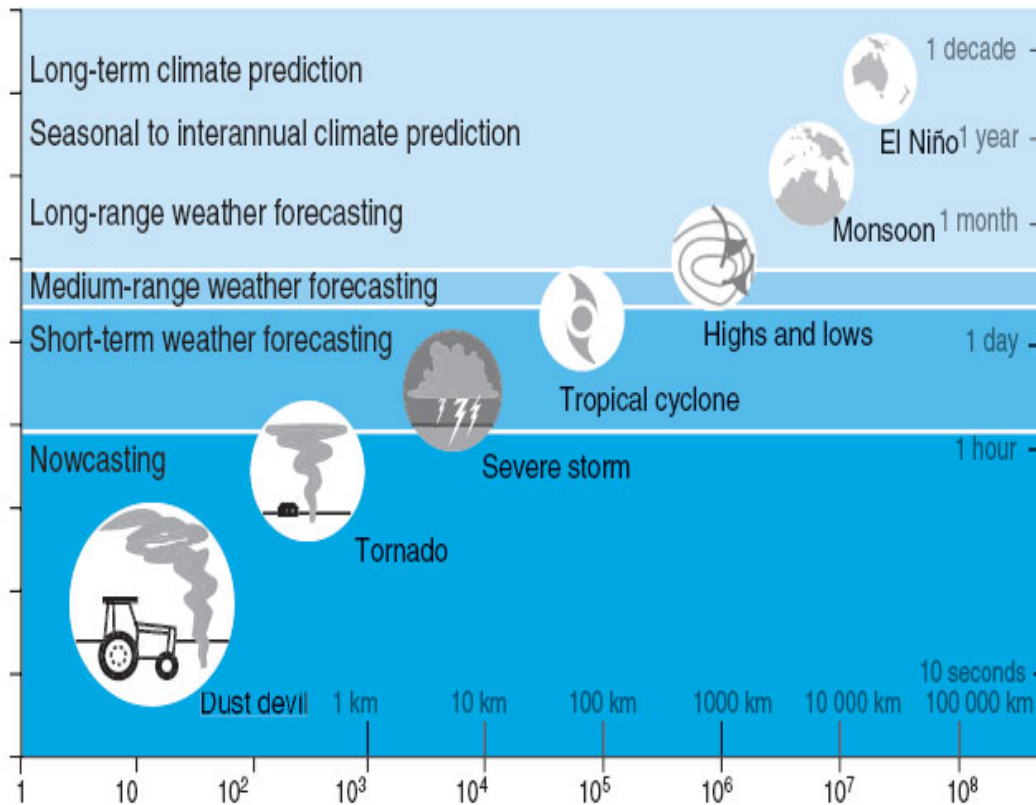
Global desalination capacity (thousands of cubic metres per day)



Source: Pacific Institute, *The World's Water*, 2009

# Hydrological hazards

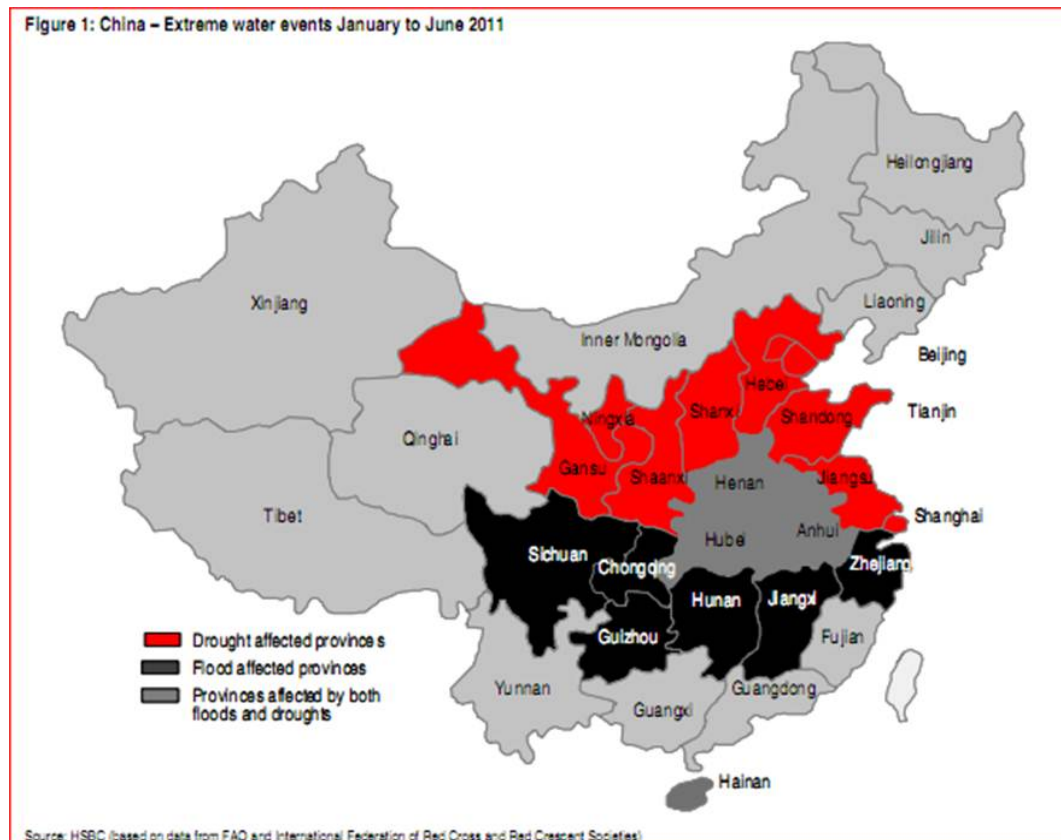
## Temporal and spatial scales of hydrological hazards



Source: UNEP/GRID – Arendal, Large Graphic Display

# Droughts and floods

Extreme drought and flood events from January to June 2011 are typical of the cycle of drought and flood in China (and in Australia).



Source: *China Water Risk – 2011 Year in Review and Five Trends for 2012*, Written by China Water Risk, February 9, 2012



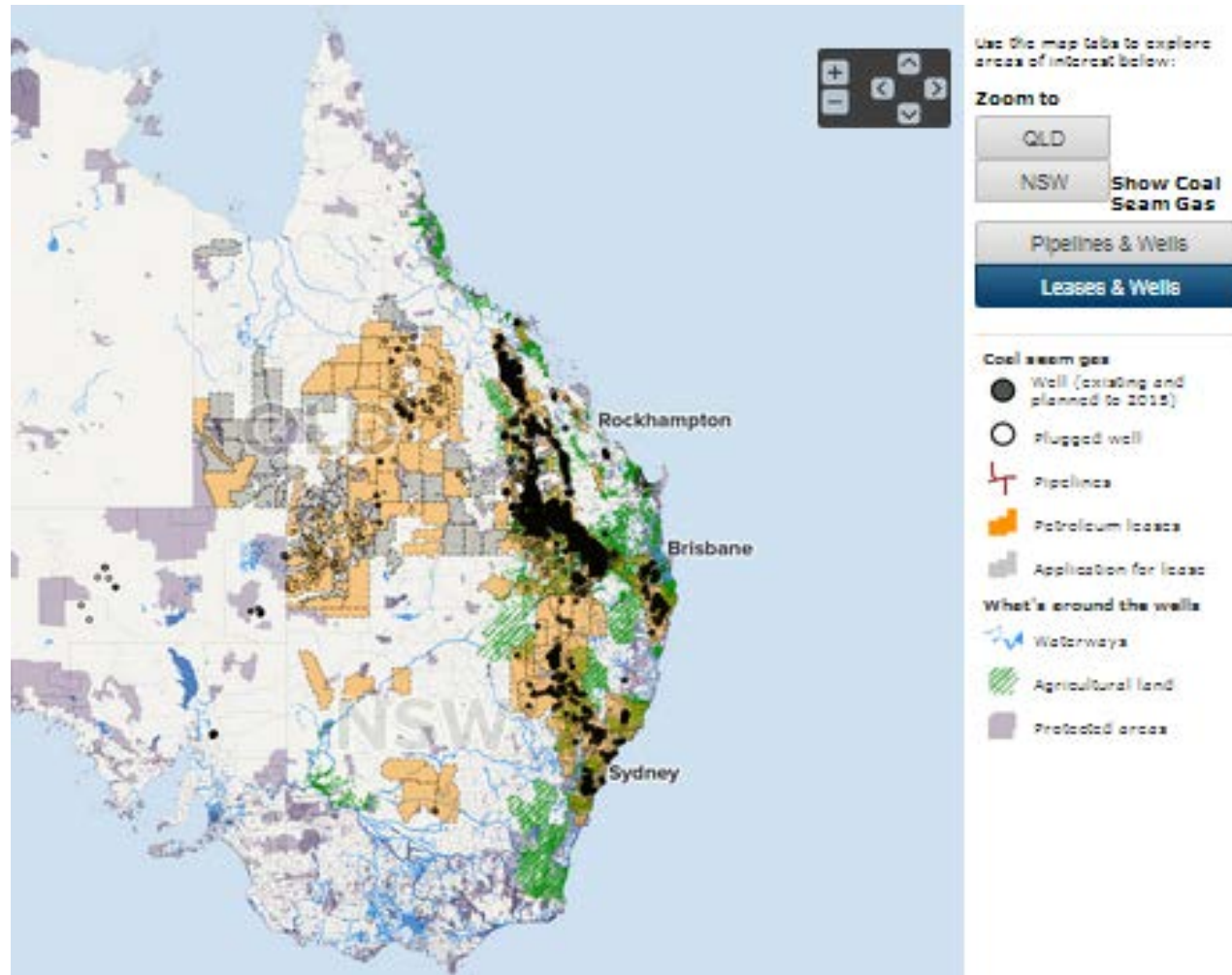
# CSG mining in Australia

Lock the Gate protesters unite against CSG mining



Source: Photo: Phil Hearne, *Sydney Morning Herald*, Fracking fails the poll test, Sean Nicholls, Paddy Manning,  
Date: April 3, 2013

# Extent of CSG exploration in Australia



Source: ABC: Coal seam gas by the numbers <http://www.abc.net.au/news/specials/coal-seam-gas-by-the-numbers/promise/>

CSG mining companies claim that hydraulic fracturing does **not** impact on the water table.



Source: Inkcinct website cartoons 2011-511, 11 Aug 11 Coal seam gas fracturing