

Water Security - Some Challenges and Opportunities

Introduced

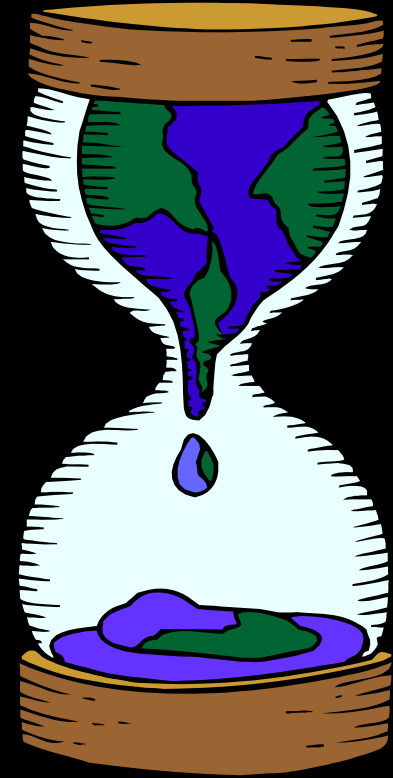
by

**Professor Roger A. Falconer FREng
Halcrow Professor of Water Management**

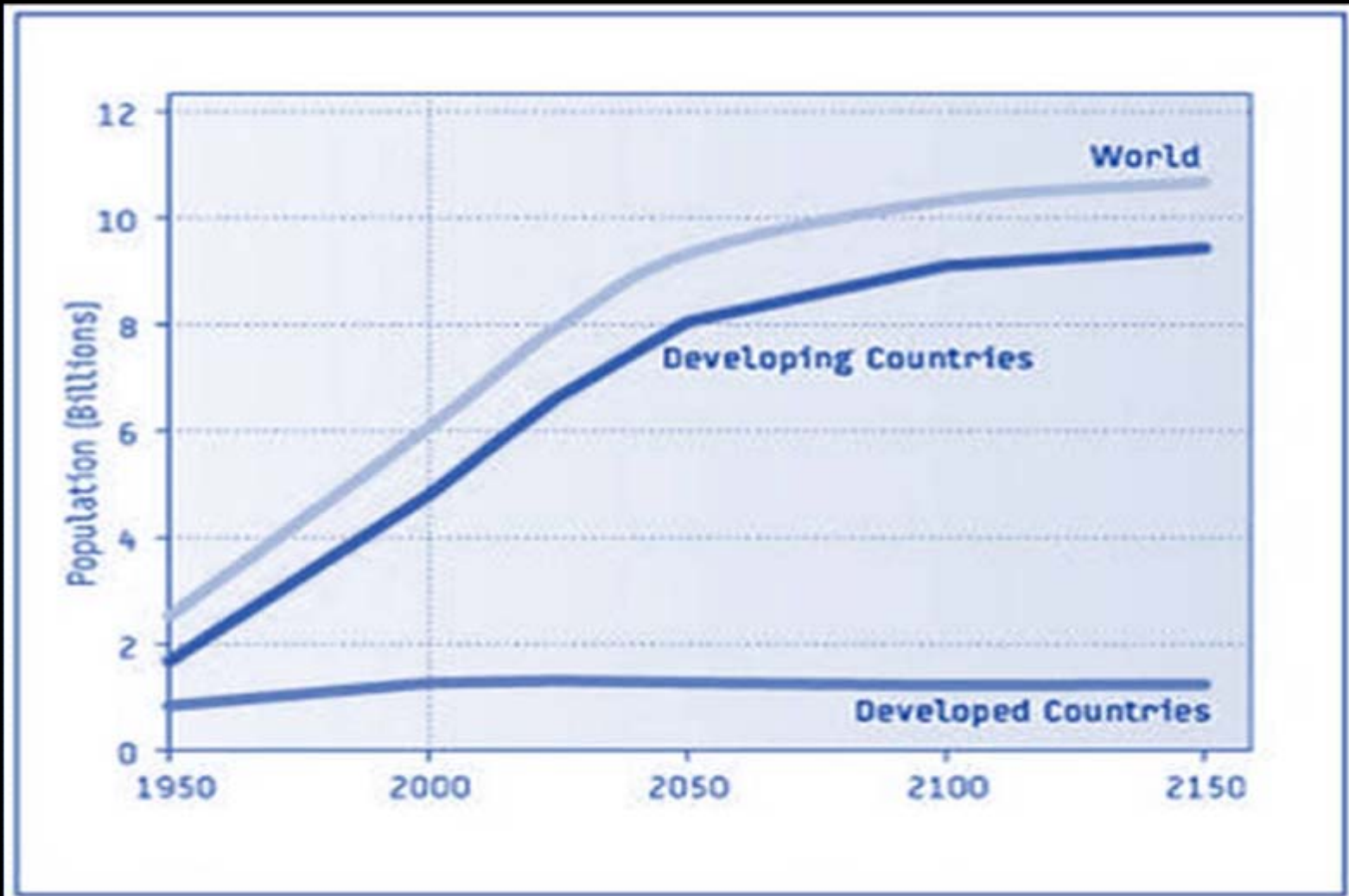
School of Engineering, Cardiff University, UK

Global Water Shortage

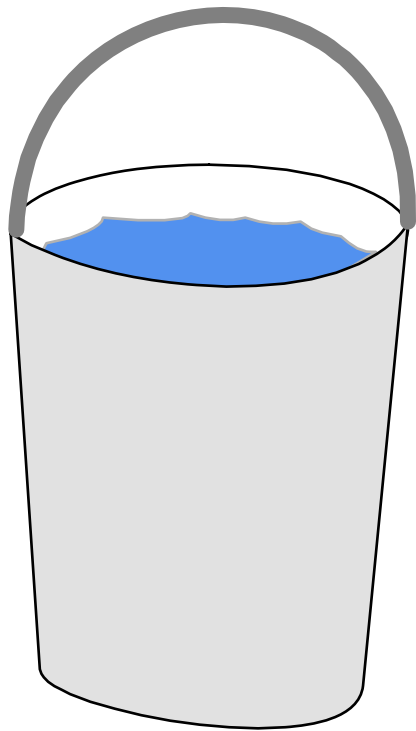
- More than 1 billion people lack access to safe water supplies
- 3 billion people do not have access to adequate sanitation
- 5 to 10 million people die every year from water-related diseases or inadequate sanitation
- 20% of world's irrigated lands are salt-laden, affecting crop production



World Population

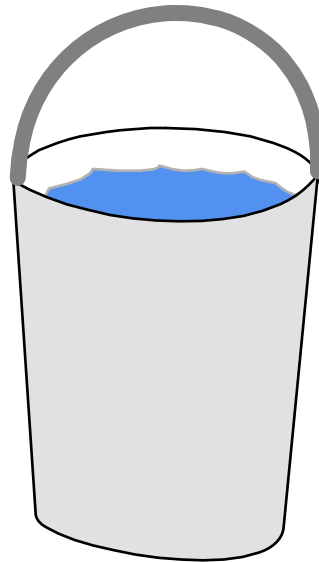


Freshwater Available Per Capita



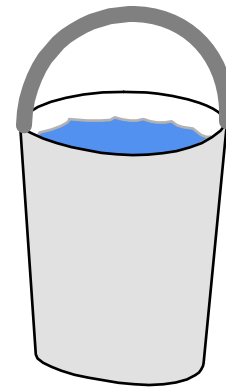
1950

12,050 m³



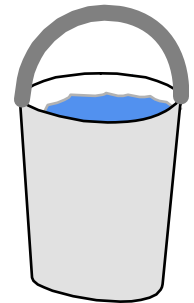
2000

7,310 m³



2025

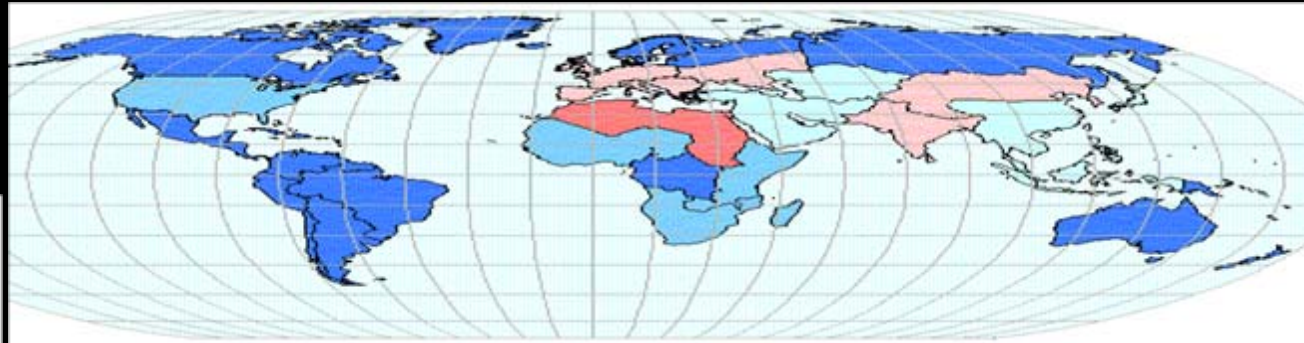
5,120 m³



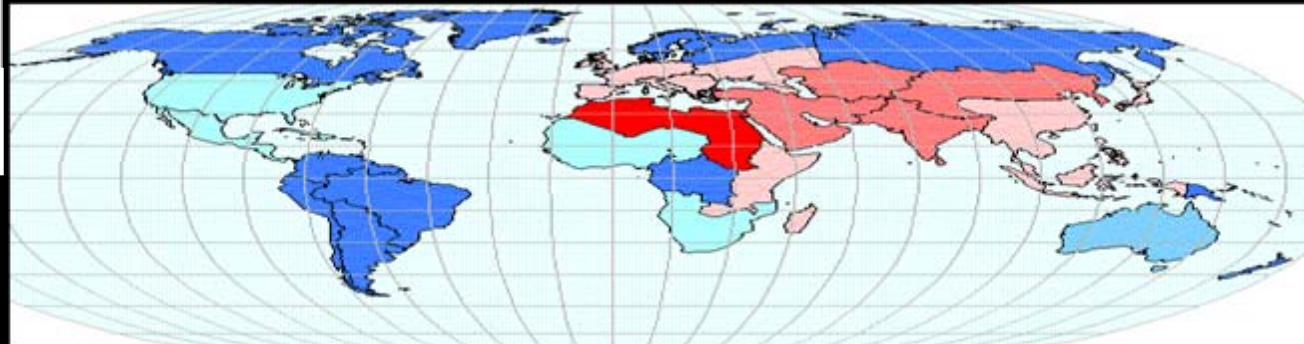
2050

4,580 m³

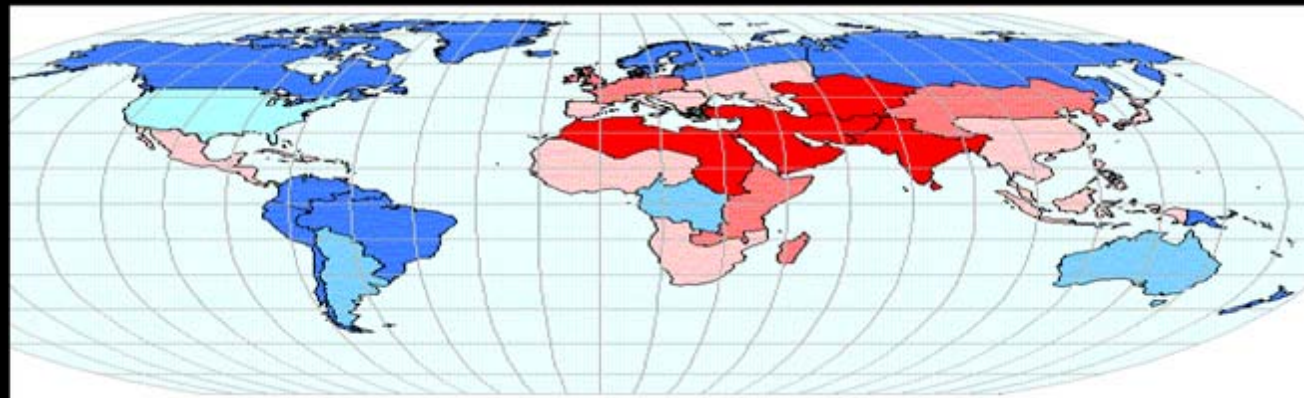
Global Annual Freshwater Resource



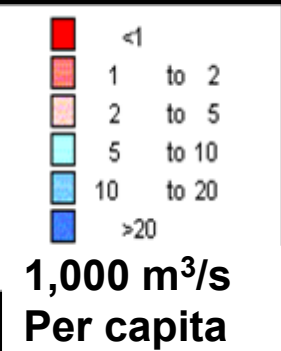
1950



1995



2025



Water Crises in MENA Region

- **MENA region - Middle East and North Africa**
- **Population of MENA region = 5% of world's population**
- **Freshwater availability in MENA region < 1% of global freshwater resource**
- **It is predicted that water availability in MENA region will decrease to 50% of present levels per capita over next 30 years**

Arabian Peninsular - Some Facts

- **Consists of: Kuwait, Saudi Arabia, Bahrain, UAE, Qatar, and Oman; Population of 49m**
- **Arid/semi-arid zone, lacking renewable surface waters, Tigris-Euphrates rivers very polluted**
- **Climate change reducing water resource - but more flash floods ➤ needing more flood dams**
- **60% of world's desalination plants located in region ➤ could be powered by solar power**
- **Groundwater is still main water resource**

Arabian Peninsular – Water Challenges

- Exponential rise in water demand in Gulf since 1980 - demand met by desalination
- Key problems are depletion of groundwater resources, saline intrusion and water quality
- Agriculture consumes over 75% of water ➤ need for effluent reuse BUT strong social / religious bias against use for drip irrigation
- More inter country water sharing needed - but lack of trust between states

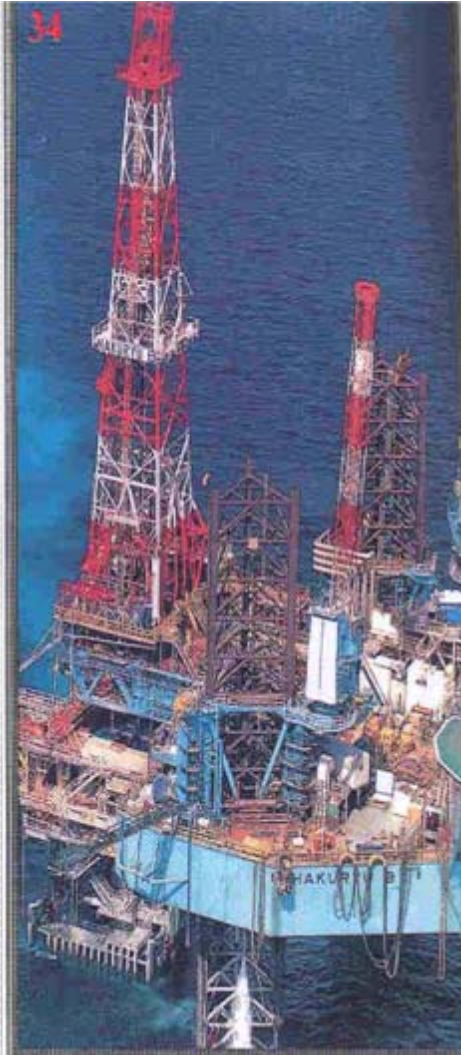
Arabian/Persian Gulf - Challenges

- The Gulf is a semi-enclosed sea of area ≈ 240 km x 1000 km, with mean depth of 30 m
- Has low hydrodynamic energy, shallow depths and minimal water exchange
- Temperature varies from 17°C in winter to over 32°C in summer - with low dissolved oxygen levels of typically only 7-8 mg/l
- Average salinity levels vary from 36 to 45 ppt
- Waters are nutrient rich ➤ eutrophication

Currents and Tides



Coastal Uses and Human Resources



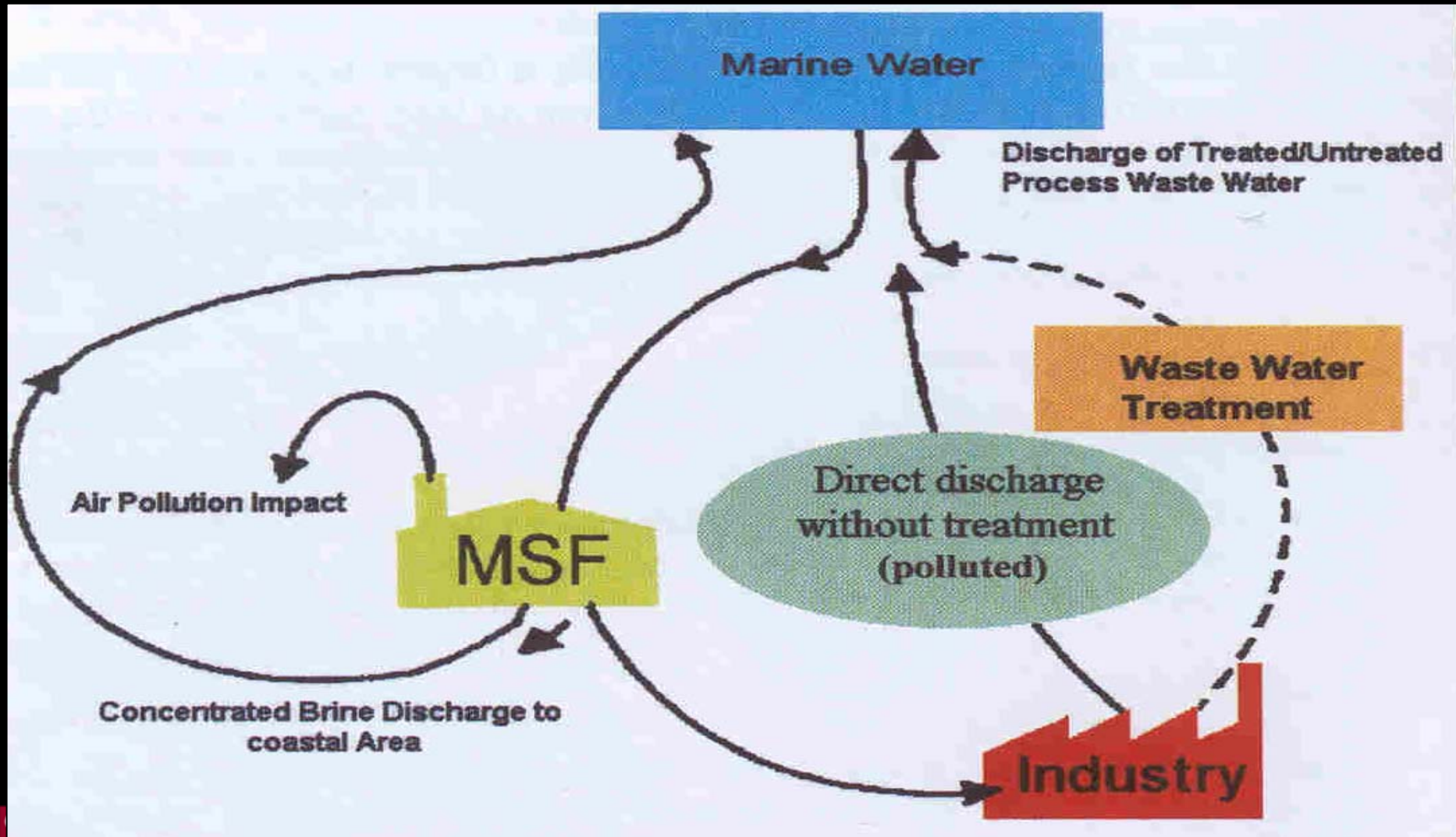
Oil and Ship Pollution



Desalination and Impact of Wars



Land Based Activities



Loss of Fisheries and Ecosystem



Governing Gulf Issues

- **Arabian/Persian Gulf - highly productive but naturally stressed ecosystem with high temperatures and high evaporation rates**
- **Gulf has a complex and dynamic ecosystem where ecological boundaries interact with increasing anthropogenic pressures**
- **Continuing environmental problems due to oil exploration and production, dredging and coastal reclamation and developments**

Recent Articles in Kuwait Times

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LOCAL NEWS

Khaitan pumping station facing water shortages

Published Date: April 04, 2007
By Nancy Oteifa

CUWAIT: Water shortages and low water pressure are already beginning to plague the country. A ready remedy for many is to buy water from tankers off the street. But even tankers now are facing a problem, with low water pressure causing delays and more and more tankers finding themselves struggling to get their fill.

The Kuwait Times went to the Khaitan water pump station and found out that the drivers of the water tankers are suffering and complaining about water shortages in the station. "For the last month, the water supply in the station was very weak especially during the early mornings. This morning there was a water shortage in the Khaitan and Mishref stations and we had to take water from the Salmiya station," said Mohamed, an Egyptian tanker driver.

While his colleague noted "the stations are always under maintenance and when the Ministry of Electricity and Water cuts the water in the stations, people come to us asking for water. We want to help them but we have nothing to offer."

Mfio, another Egyptian worker added: "Sometimes we have to have to fill our tanks four or five times a day to provide people with enough water."

'Iouif Al-Meteri, Khaitan's station supervisor told Kuwait Times: "We are facing a shortage in water since the Iraqi crisis. We mostly serve residential areas, not companies and other sectors, and sometimes we don't have people coming asking for water tankers but some days we have over 40 customers all asking for water tankers due to the shortage of water in their homes"

"People at the Ministry of Electricity and Water are working very hard to help people avoid water shortages. From my side, I try my best to reduce this problem by helping the customers. Drivers must stamp their license cards to pump water into their tankers. When we have customers, I ask drivers to deliver water to these customers in order to get their cards stamped and then they refill their tankers". Al-Meteri noted.

"We don't know how it will be in summer, people are suffering from water shortages and this problem makes them go crazy. We didn't get any announcement from the Ministry and our role here is only to give water to people when they need," he added.

http://www.kuwaitimes.net/read_news.php?newsid=Mzk3NDU3NzAz

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HEADLINE NEWS

MPs call for probe into Mishref pollution crisis

Published Date: August 31, 2009
By B Izzak, Staff Writer

CUWAIT: A number of MPs yesterday called for a probe into what caused the 'Mishref sewage pumping station to break down and cause serious marine pollution which threatens a number of water desalination plants to cease operation. The calls came after an expanded meeting of the environment committee which was attended by a large number of MPs and Minister of Public Works Fadhel Safar.

Safar told reporters after the meeting that he explained to the committee the situation at the pumping station since it was established three years ago and what caused the station to break down. He said that he also explained measures taken after the incident, adding that pollution levels were improving after authorities were forced to dump over 100,000 cubic meters of little treated sewage into the sea.

Safar added that the ministry plans at present calls for diverting the sewage to the Rigga and Ardhiya pumping stations and then try to operate reserve pumps at the Mishref station if situations improve. The minister also supported whatever the MPs decide regarding forming an investigation committee into the incident. Meanwhile MPs who attended the meeting said

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REGIONAL NEWS

Yemen forces kill 100 rebels

SANAA: Yemen security forces said they have killed 100 rebels and injured a further 280 in the country's northern Saada...



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LOCAL NEWS

Drinking water clean

Published Date: August 31, 2009

CUWAIT: Government officials and specialists affirmed yesterday that drinking water was clean and that pollution caused by a malfunction at Mishref Sewage treatment station was not affecting distillation stations.

During an extraordinary Cabinet meeting, the Council of Ministers assigned a committee to investigate the Mishref malfunction and to show who was responsible behind the defect in the station in order to pursue legal action.

'minister of Public Works, Fadhel Safar, Minister of Health, Dr. Hilal Al-Sayer, 'minister of Electricity and Water, Dr. Bader Al-Shuraian, Director of the Environment Public Authority (EPA) Dr. Salah Al-Mudhbi, Public Works Undersecretary, Abdulaziz Al-Kulab, and Director General of Kuwait Institute for Scientific Research (KISR), Dr. Najih Al-Mutairi, all explained to the Cabinet members efforts to address the malfunction at the Mishref station.

'minister of State for Cabinet Affairs, Roudhan Al-Roudhan, in a statement after the meeting, said the officials reiterated the safety of drinking water and the pollution caused by the malfunction did not affect water supply into distillation stations. He said they have also explained that all measures were taken to contain and reduce pollution in sea water. -- KUNA

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LOCAL NEWS

Women hold 'For you my lady' walkathon

KUWAIT: Over 150 women participated in the first walkathon held under the slogan 'For you my lady' at the Avenues...

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Yemen forces kill 100 rebels

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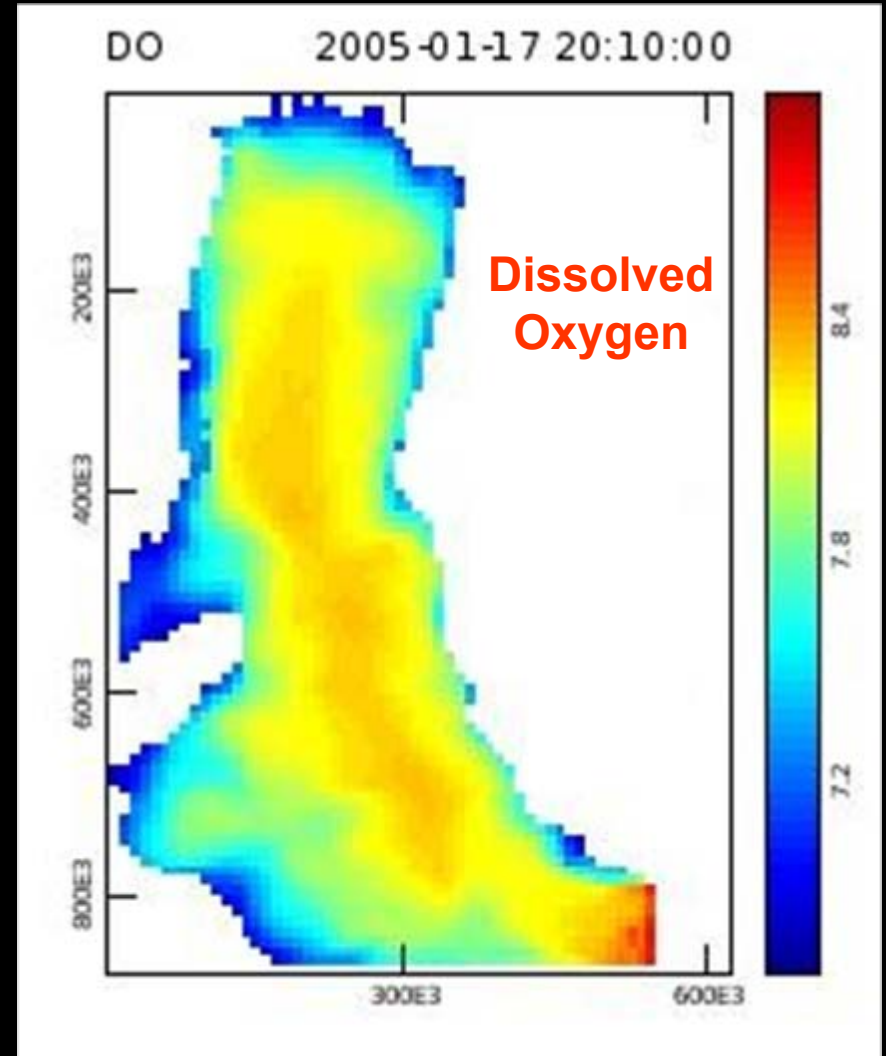
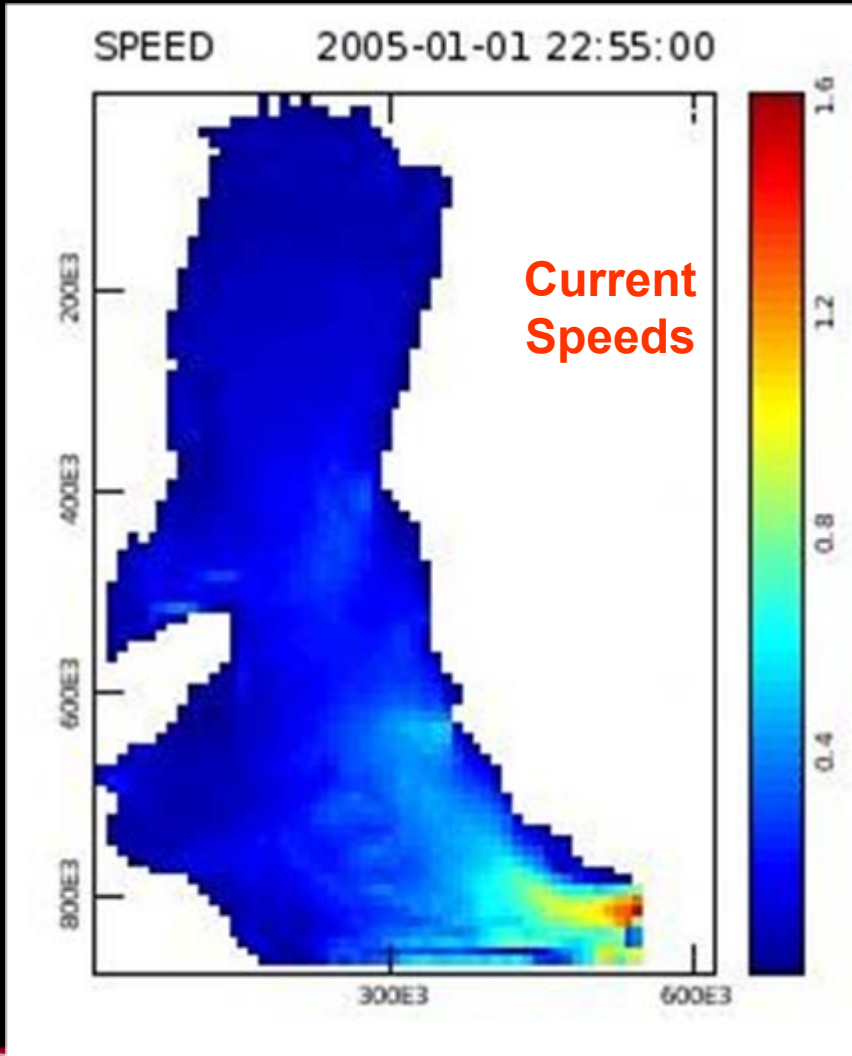
Prise for outcome of Saudi-Syria summit
Dispute over Iraq voting system



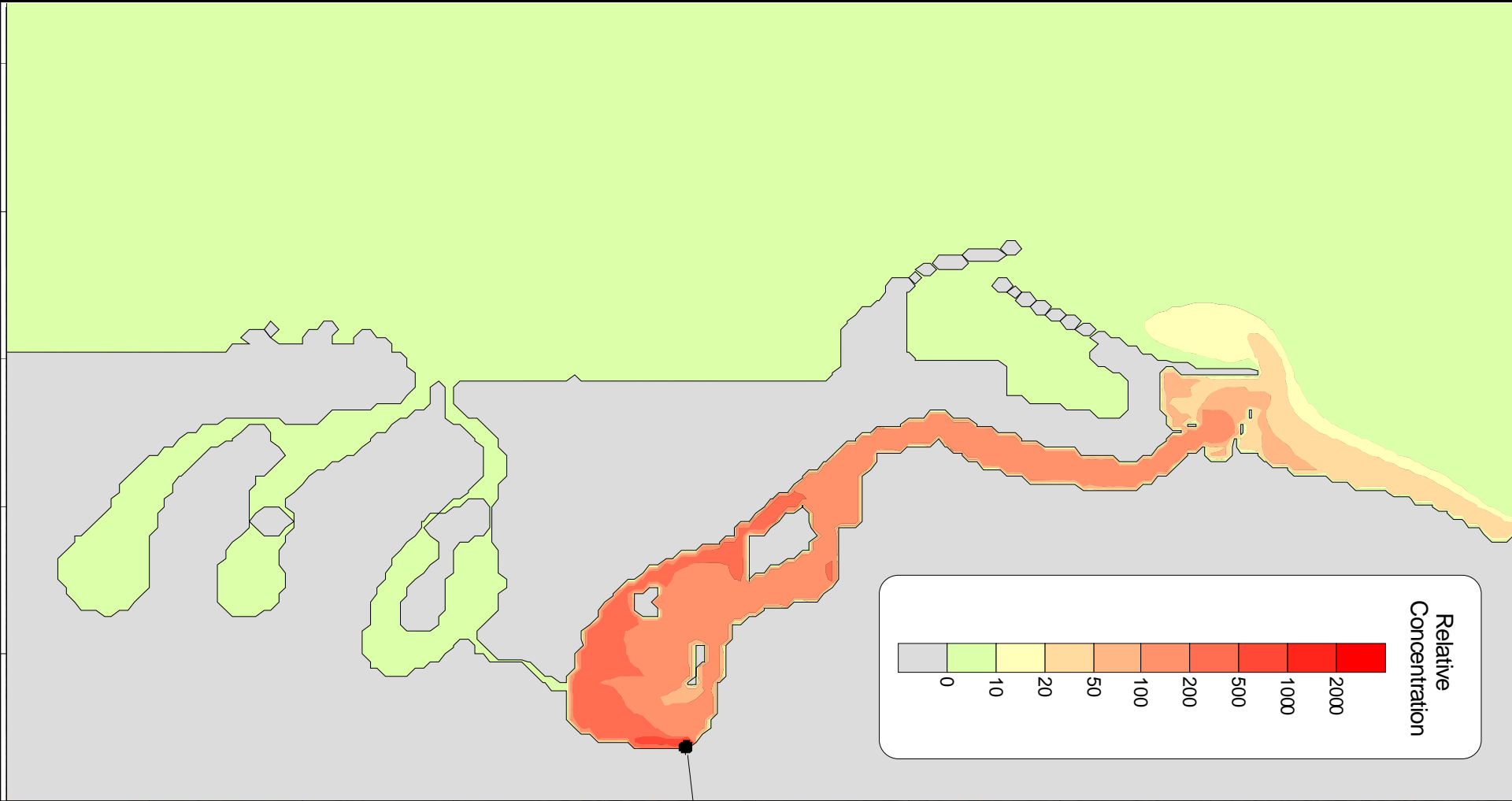
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Cardiff / Western Australia Studies



Halcrow / Cardiff Studies



Sustainable Management of West Bank & Gaza Aquifers (SUSMAQ) - Newcastle

- **Major capacity building for Palestinian water sector undertaken by Newcastle University and other partners (1999-2005): DfID funded (£3.5M)**
- **Overall goal was sustainable management and use of scarce water resources in West Bank and Gaza**
- **Integrates technical and socio-economic components within overall framework for sustainable management planning**
- **Enabled Palestinian Water Authority to estimate sustainable aquifer yields for a range of economic, demographic, land use and climate scenarios**
- **Results informed final status negotiations with Israel**

Water Resources Issues Yemen and Oman - Imperial College

- **Uncertainty in climate change effect on precipitation in region, e.g. Yemen GCM split on rainfall changes**
- **Concerns of intensification of flood risk, e.g. Oman is on edge of Indian monsoon - occasional cyclones**
- **Characteristics of flows are localised convective rainfall, flash floods move down dry wadi channels**
- **Major cultural issues with agriculture and water, e.g. Saudi Arabia concerned whether groundwater should be used for irrigation of cash crops**
- **Politics of water still hot topic, lots of issues - Israel/Palestine, Turkish dams on Tigris & Euphrates etc.**

Fellows and Companies involved in Water in Middle East (known to me)

- **Individual Fellows:**

Academics: Roger Falconer (Cardiff), Enda O'Connell (Newcastle), Howard Wheeler (Imperial College) and Jorg Imberger (UWA)

Independent Consultants: Chris Binnie (Ex-Binnie and Atkins) and Chris Fleming (Ex-Halcrow) and Brian Rofe

- **Companies with Fellows:**

Halcrow Group Ltd, Atkins plc, Buro Happold Ltd, Mott MacDonald Group, HR Wallingford Group Ltd, Jacob UK Ltd

Thoughts on What Academy Could Do?

- **Act as facilitator with Gulf States to create an integrated water management policy for The Gulf ➤ possibly through KISR**
- **Host RAEng workshops on key topics (such as Water) in the Middle East - involving UK companies and academic Fellows**
- **Raise awareness of key challenges of Water Management at highest level in Gulf states**
- **Assist British Council and Foreign Office to Facilitate a framework for capacity building**

Thank You