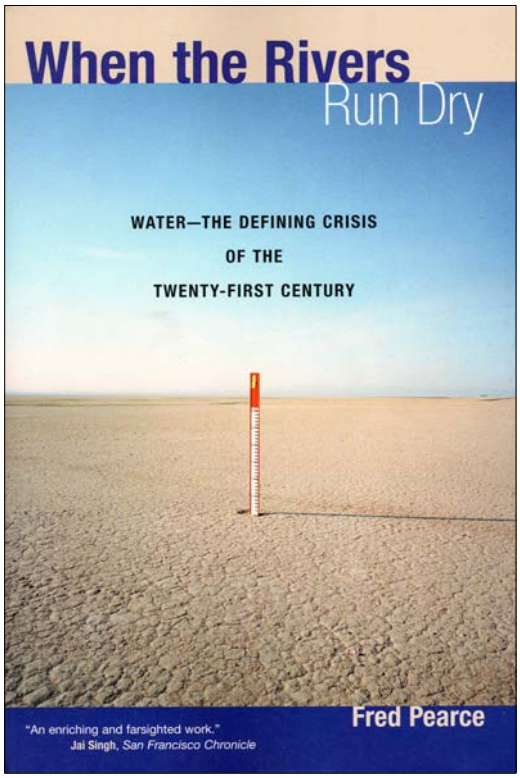
title **When The Rivers Run Dry**
Water: The Defining Crisis of the Twenty-First Century



author **Fred Pearce**
a former news editor at *New Scientist*, is currently that magazine's environment and development consultant; he has written for *Audubon*, *Popular Science*, *Time*, the *Boston Globe*, and *Natural History*; his books include *Keepers of the Spring*, *Turning Up the Heat*, and *Deep Jungle*; he lives in England

category World water issues

publisher Beacon Press
2006 trade paperback edition, 324 pages
ISBN -13: 978-0-8070-8573-8
http://www.beacon.org/

who will be interested in this book?
Anyone interested in the state of world water, this book brings the reader right up to date (2006) on the issues.

why read this book?
A comprehensive and up to date review of world water issues including a look at some current innovative water solutions. Pearce looks at many countries, reviewing historic and current water supply, use, and issues.

review / outline by Lance Brown, vistadelsol@telus.net

Overview
Having been written in 2006, this book is for anyone wanting a review of current water issues around the world.

There is a detailed index.

Chapters & Points of Interest

I. When the rivers run dry …the crops fail

1. The Human Sponge

- the water needs of the food we eat and clothing we wear (some from precipitation and some irrigation)
- imported items contain 'virtual water', est. at 800 mil ac-ft per year (flow of 20 Niles)
- US exports about 1/3 of all water it withdrawals, much in grains (80 mil ac-ft in beef)
- others are Canada (wheat), Aust. (cotton, sugar), Argentina (beef), Thailand (rice)
- major importers are Japan & Euro Union
- cotton is a large virtual water issue – Aral Sea mostly dried due to cotton irrigation

2. N. America: Crossing the Rio Grande

- the forgotten river – dry for over 200 miles – 9 mil people depend on for water
- water used mostly for irrigation at El Paso – Elephant Butte reservoir built in 1915 - evaporation is 6 ft (245,000 ac-ft)
- El Paso buying up ranches for ground water reserve's (water ranching) but aquifer is drying due to lack of precipitation / over pumping
- treaty problems with Northern Mexico water that flows into Rio G.

3. Riding the Water Cycle

- many of biggest aquifers are beneath deserts with little or no recharge (Sahara, Aust. outback, High Plains of US)
- 'slow' water cycle – oceans, ice caps
- 'fast' water cycle – evaporation, water vapour, precipitation
- water distribution doesn't match distribution of people
- 'green revolution' of '60's and '70's produced more food but crops were often less water efficient (less 'crop per drop') – a water ('blue revolution') is needed

4. Pakistan: The Unhappy Valley

- profits and perils of over use of water for irrigation
- between 1890's and 1930's British built largest irrigation are in world and foundation of modern hydraulic engineering
- 1947, when British rule ended, there were 60,000 miles of canals irrigating more land than in all of England
- salt problem: Indus River delivers 24 mil tons of salt, only 12 mil tons are moved to sea
- about ½ ton per irrigated acre stays on fields – about 100,000 ac / yr abandoned

II When the rivers run dry …we mine our children's water

5. India: A Colossal Anarchy

- ground water use – farmers spent about $12 bil on wells and pumps in past 2 decades
- aquifers are being drained (water mining)
- state-subsidized electricity powers pumps – blackouts are limit on pumping
- excessive ground water pumping - 'tragedy of the commons' – everybody chases short-term wealth at the cost of destroying their long-term collective future

6. Halliburton's Job for Qaddafi

- about 50 bil ac-ft of 'fossil water' under Sahara desert radio carbon dated a mil years old
- 1991 Libya's Great Manmade River, 600,000 ac-ft piped 600 mi across desert, $14 bil
- with next phases, 1.6 mil ac-ft, @27 bil

7. The World's Largest Mass Poisoning

- India, ground water pumped with UN-funded wells is high in fluoride affecting health
- Bangladeshi, arsenic in drinking well water 'largest mass poisoning'

8. Mirages

- overuse of ground water in Asia, China, US
- Ogallala aquifer once had 200,000 wells pumping 22 mil ac-ft / year (1/3 US irrigation) producing ¾ of wheat traded on world markets
- made US biggest exporter of virtual water, but as aquifer falls only 10 mil ac-ft now pumped
- Saudi Arabia pumps 'free' ground water to 2.5 mil ac of desert farms

III When the rivers run dry …the wet places die

9. The Common Wealth

- value of wetlands
- fens & fenlands in England; the Sudd of upper Nile; the Pantanal in heart of S. America; the Okavango delta in S. Africa, a desert wetland

10. Lake Chad: Tragedy of the Floodplains

- Hadejia-Nguru wetland in Nigeria; Logone River in Cameroon; - both have dams that, along with reduced precip, have reduced Lake Chad to 200 sq. mi from 10,000

11. Seas of Death

- 1998, 1,500 sq. mi Hamoun wetland between Afghanistan and Iran dried up
- 300 ft high Kajaki Dam, 30 mi long reservoir, built after Second WW
- although water was shared with Iran, Taliban closed sluice gates in 1998 to fill reservoir

12. Mekong: Feel the Pulse

- Tonle Sap River, tributary of Mekong, reverses flow for 5 months at monsoon season as Mekong surges upstream 125 mi
- 60 mil people depend on river – 2 mil tons of fish / yr (over 2% of world catch of wild fish) – only Amazon produces more fish
- least modified major river, no dams built on Mekong
- but China now building 8 huge dams on Mekong – started in 2002, Xiaowan Dam (958 ft high – high as Eiffel Tower) will have 205 mi long reservoir, second in China only to Three Gorges

IV When the rivers run dry …floods may not be far behind

13. China: The Hanging River

- 1972 Yellow River (worlds 5th largest – ½ bil people depend on it) failed to reach ocean
- 1997 failed for 7 months trickling into sand 485 mi inland; hydrological chaos upstream
- every ton of Yellow River contains 90 lbs of silt (2x Colorado R., 70x Mississippi)
- managing silt as important as managing water
- 1950's Sanmenxia Dam filed with silt in 2 years
- dikes have raised Yellow River (hanging river) 65 ft above surrounding land

14. Changing Climate

- higher temps will increase evaporation from oceans and intensify water cycle
- by late this century, up to 8 – 10% more water vapour in atmosphere (800 mil ac-ft)

V When the rivers run dry …engineers pour concrete

15. Wonders of the World

- impact of dams around the world; costs vs benefits; impacts to people, fish, ecology
- one estimate says lost fish due to Grand Coulee Dam more valuable than electricity generated by dam
- most rivers are no longer 'wild', but have dams built on them
- largest wild river is Yukon River, worlds 22nd by volume

16. Sun, Silt, and Stagnant Ponds

- you could fill every faucet in England for a year with the water evaporated from Egypt's Lake Nasser behind High Aswan Dam; 8 – 13 mil ac-ft (1/4 of flow into reservoir)

- is second largest man-made lake at 300 mi long
- in tropics, methane gas from totting vegetation in reservoirs is significant; may warm the planet more than the equivalent fossil-fuel fired power plant
- reservoirs produce up to 1/5 of all man-made methane in atmosphere and 7% of man-made greenhouses effect

17. Dams That Cause Floods

- failing dams or sudden releases causing floods
- 1975 failure of 400 ft high Banqiao Dam in China killed up to 200,000 people in a 7 mi wide, 20 ft high wall of water traveling 30 mph

VI When the rivers run dry …men go to war over water

18. Palestine: Poisoning the Wells of Peace

- conflict around water – 3 large aquifers under West bank Israeli controlled
- desalination a possible solution?

19. The First Modern Water War

- 1964 Israel diverted Jordan River at outlet of Sea of Galilee and pumped up 1200 ft to length of Israel (using 1/8 of Israel's power) – 400,000 ac-ft / year
- 1967 Six Day War gave Israel control of headwaters
- since 1991, no flow out of Sea of Galilee into Jordan Valley – as this went to Dead Sea, it is now 80 ft lower than 50 years ago and falling 3 ft / year
- Israel farms export virtual water that contributes less than 2% of GDP

20. Swords of Damocles

- Pakistan's 150 mil people receive most of their water via Kashmir area ands tributaries of Indus River, an area in conflict with India
- 1960 Indus Water Treaty divided water share, but India controls flow to Pakistan
- many downstream countries are dependent on external water supply, especially in Africa

VII When the rivers run dry …civilizations fall

21. Elisha's Spring and the Mysteries ofAngkor

- water diversions helped establish civilizations 7,500 years age
- hydraulic civilizations organized to manage water
- salt and silt have always caused problems
- Khmer civilization of Southeast Asia

22. Losing the West

- mid 1990's Phoenix was growing by 2 ac every hour, now covers 400 sq miles
- #3.6 bil Central Arizona Project takes 1.6 mil ac-ft from Colorado River into 300 mi long concrete canal to Phoenix and Tucson
- Colorado River used to flow 20 mil ac-ft to Gulf of California, now only 7 mil ac-ft av flow in river (3 mil in 2002), none to the Gulf
- 2004 Lake Powell was 3/5 empty; could take 10 years to refill at av. flows
- water shortages and growth of cities, along with salt problems, irrigation may be reduced
- 10 mil tons of salt enter, none leave – 50ppm salt in headwaters, 700 at Hoover Dam
- $300 mil desalination plant at Yuma to ensure low salt water released to Mexico never used

23. Aral Sea: The End of the World

- UN call the disappearance of the Aral Sea greatest enviro disaster on 20th century
- 1960's Karakum Canal moved water 800 miles across desert, outside of Aral Sea basin
- now many farms use more water before planting to wash out salt than for cotton crop

VIII When the rivers run dry …we go looking for new water

24. Taking the Water to the People

- $60 mil diversion of Yangtze River north 800 mi to replace dried up Yellow River
- to be available to Beijing by 2008 Summer Olympics
- River Interlinking Project to redraw the hydrological map of India
- US interest in moving Canadian water south
- plans to dam Congo River, world's 2nd largest, for power generation and diversion to Lake Chad

25. Sewage on Tap

- recycled water from sewage in Europe, Singapore, Mexico, Israel
- water treatment plants are another loop in the water cycle

26. Closed Basins and Closed Minds

- closed basins are rivers that never reach the sea
- Imperial Valley / Salton Sea; Zayandeh Rud basin in Iran

27. Out of Thin Air

- capturing water from moist air in 'dew ponds'
- atmospheric contains 6x more water then all worlds rivers
- dew-making efforts such as 'seawater greenhouses'; rain-making by seeding clouds
- fog harvesting with sheets of plastic mesh
- desalination about 8 mil ac-ft mostly in Gulf countries like Saudi Arabia
- most by distillation, some reverse osmosis – both require large amounts of energy

IX When the rivers run dry …we try to catch the rain

28. Catch the Rain

- rain water harvesting in India and China
- collecting monsoon rain and recharging ground water

29. On the Grapevine

- rain water harvesting in Middle East; potential in Africa

30. Unfailing Springs

- these are ancient ground water developments in Middle East, Asia, Africa
- modern pumping have dried up many

X When the rivers run dry …we go with the flow

31. Learning to Love the Floods

- 'engineered' rivers with no flood plains have little allowance for flood conditions as they attempt to quickly move water to the sea – such as Rhine and Mississippi

- concrete walls are ‘out’ – wetlands are ‘in’
- rivers need more space or they will take it themselves
- drainage is an issue in many cities – LA is 70% covered with impervious surfaces and receives ½ of need water as rain but doesn’t use it

32. Freeing Saddam’s Captives

- rebuilding Iraq’s wetlands drained by S. Hussein

33. More Crop Per Drop

- due to costs drip irrigation is not used by the mass of small farmers in poor countries who face some of worst water shortages
- low cost Pepsee tubes used in India
- rice paddies in Asia use more than 1/3 of all world water from rivers and aquifers but ½ of worlds rice grown in water stressed areas
- 'blue revolution’ research

34. Water Ethics

- importing virtual water has limits
- problem is not a lack of water but of using what is available

other review **From Publishers Weekly**

Veteran science writer Pearce (*Turning Up the Heat*) makes a strong—and scary—case that a worldwide water shortage is the most fearful looming environmental crisis. With a drumbeat of facts both horrific (thousands of wells in India and Bangladesh are poisoned by fluoride and arsenic) and fascinating (it takes 20 tons of water to make one pound of coffee), the former *New Scientist* news editor documents a "kind of cataclysm" already affecting many of the world's great rivers. The Rio Grande is drying up before it reaches the Gulf of Mexico; the Nile has been dammed to a trickle; reservoirs behind ill-conceived dams sacrifice millions of gallons of water to evaporation, while wetlands and floodplains downriver dry up as water flow dwindles. In India, villagers lacking access to clean water for irrigation and drinking are sinking tube wells hundreds of feet down, plundering underground supplies far faster than rainfall can replace them—the same fate facing the Ogallala aquifer of the American Midwest. The news, recounted with a scientist's relentless accumulation of observable fact, is grim.

other review **Booklist** by Carol Haggas

From the Amazon to the Nile, the Congo to the Colorado, the rivers of the world are running dry. Forget oil: nations have gone to war over water rights and access in the past, and may be forced to do so again as the availability and purity of this vital resource continues to decline. Unlike fossil fuels, water is considered a renewable resource, an erroneous belief that has contributed to its abuse and misuse by superpowers and Third World countries alike. Yet as aquifers are tapped to extinction, rivers dammed to depletion, and wetlands converted to deserts, societies continue to employ the profligate water management techniques that created the current dire situations. Former *New Science* news editor Pearce cogently presents the alarming ways in which this ecological emergency is affecting population centers, human health, food production, wildlife habitats, and species viability. Having crisscrossed the globe to research the economic, scientific, cultural, and political causes and ramifications of this under publicized tragedy, Pearce's powerful imagery, penetrating analyses, and passionate advocacy make this required reading for environmental proponents and civic leaders everywhere.

An Interview with Fred Pearce, California Literary Review, March 14, 2006

Q: Our list of things to worry about – global warming, oil shortages, bird flu, terrorism, etc. – seems to grow every year. Why do you say water is the "defining crisis of the twenty-first century?"

FP: Oh, there are plenty of things to worry about. Most of them arise from Homo sapiens having to work out how to live together in ever greater numbers on the one planet. Right now we seem to be good at finding technical and organizational fixes (none of the above are really insuperable problems), but rather poor at finding ways of making them happen. In truth, I'd put water up there with global warming at top of the agenda. Many climate scientists think that our big problems with global warming will come less from the warming itself and more from the big changes in hydrology that it causes – droughts and floods, dried out soils and ecosystems, empty rivers, and maybe the worst, the sheer unpredictability of where and when we will have water.

But water also defines quite well our problems in moving from a world of apparently plentiful resources – a world in which if we screw up we can move on – to a world of finite resources, where we have to manage carefully to get by. We still often see water as an essentially free and unlimited resource. But it isn't. The public policy response to water shortages is still to build a new dam or sink a new well, with little regard for the thought that there may be no more water in the river to be captured, or underground to be pumped.

Apart from the air we breathe, water is the most basic, most urgent, need that we all have. We can survive for a while without food, but not without water. We can survive forever without oil – but not without water. Water has no substitute. The good news, though, is that it is a constantly renewed resource. The natural water cycle of evaporation and rainfall constantly cleans and recycles it. We will never "run out" of water in the way we might run out of oil. So the trick, as we find local and sometimes regional reserves running out, is to realize that fact, and to manage our use of water in a way that meshes with the natural cycle.

From that perspective, managing water is a model (and, because of its urgency and universality, the defining model) of how we deal with nature. Not as a force to be confronted, but as a force to be nurtured and to be worked with. That notion holds in every sphere from using "soft engineering" in order to manage floods, to harvesting the rains and to preserving wetlands.

The short answer to the question, therefore, is that meeting water needs (and managing our water demand to fit water availability) is both a major challenge in itself for the 21st century and will define more widely our ability to coexist with nature and make good use of the planet's fast diminishing "natural capital." And my belief is that if we can get water right we will be able to get most things right.

Q: Explain to us the value of wetlands, not just for their biological diversity, but for their effect on our water resources.

FP: There are of course many sorts of wetlands: from lakes and ponds through marshes to bogs, flooded forests and floodplains. But all hold water. In general, on river systems, they act as holding tanks for water. They may also help maintain underground water reserves, and hold back water from reaching rivers after heavy rains. They even out rivers flows. When a river is in flood, it will naturally tend to deposit water in wetlands all the way down its course. And heavy rains may be delayed from reaching the rivers themselves by the intervention of wetlands.

These days most of the world's wetlands have been drained, and floodplains barricaded off from rivers, so they can no longer perform this function. That means when the rains come, the water is rushed much faster into the rivers, and then downstream, dramatically raising flood risks. However much engineering we do to try and rush that water to the sea, we are likely at greater risk of flooding – as centuries of intervention on the Mississippi shows.

And just as the destruction of wetlands causes bigger floods, it also causes bigger droughts. If the wetlands are drained, there is less water on the land when the rains fail. The river flows are lower than they would otherwise be. We spend billions of dollars building dams to catch water that nature once caught for us at no cost. Now, of course it is not always possible to recreate all the wetlands and remake natural rivers. But we need to realize the free benefits that were once available to us from wetlands; plug those into cost-benefit calculations before we remove any more; and assess whether sometimes there would be real benefit in recreating the lost wetlands. These things are currently usually done for aesthetic or recreational benefits. Those benefits are real enough. But the benefits from wetlands are in reality much wider. They are hydrological as well as ecological. And so the case for much greater protection and re-creation of wetlands is much greater than commonly supposed.

Q: Dams are a clean source of electric power, a way to control flooding and can provide a water source during droughts. What is the downside to building dams?

FP: For the reasons you state, environmentalists in the old days loved dams. But no more. The reservoir itself is a problem – flooding large areas of land that may be scenic, home to many people and often, being in a silt-covered river valley, good farmland. That is a major loss. Worldwide tens of millions of people have lost their homes, land and livelihoods to large dams.

Dams are built to "manage" river flows, so ensuring there is water to power turbines when it is needed. So, downstream, the flood "regime" – the seasonal rise and fall of water levels and flow speeds -- is dramatically altered. This disrupts natural systems, like fish spawning areas and wetlands, and many human activities, like planting crops on river banks and floodplains after the annual flood. In general, fisheries created in reservoirs behind dams do not compensate for the lost fisheries on the river itself.

It is not just water flow that is disrupted by dams. Most reservoirs accumulate silt from the rivers they barricade. As a result, downstream river flows are less silty. This again disrupts fisheries and wetlands, and farmers that irrigate with river water no longer get the benefit of the nutrients in the silt. Also a silt-free river tends to erode river banks. And, if it fails to regain the silt it once had, it may even have effects on coastlines. In some parts of the world, shorelines are only maintained by the constant supply of new stabilizing sediment that comes from rivers – and when (for instance at the Akosombo dam in Ghana) that source of sediment is lost, rapid coastal erosion occurs.

Dams are often advertised as both generating electricity and protecting against floods. But there is a problem here. To maximize electricity generation, reservoirs need to be kept as full as possible. But to protect against floods, they need to be kept as empty as possible. In practice, most are kept full – so when the big rains come, dams tend to create floods rather than preventing them. Often dam operators are forced to release large volumes of water very fast to protect their structures – with sometimes catastrophic results. The book has a chapter full of examples.

Dams provide power over rivers. The question, often, is who has control of the sluice gates. Usually the cities get the electricity and the rural inhabitants of the river valley bear the damage.

Q: You call the Yellow River in China, the "hanging river." What does that mean and what is the potential for disaster?

FP: For thousands of years, the Chinese have controlled the Yellow River as it crosses its floodplain on its last several hundred miles' journey to the sea, by constraining it within artificial banks, levees. The idea is to prevent floods. But the river is the world's siltiest and through time it deposits this silt on its channel bed, which rises higher and higher above the surrounding floodplain. The Chinese have kept the river on its course by raising the levees ever higher. Hence the term "hanging river". But this is a "double-or-quits" strategy. Chinese history is peppered with disasters when the river breaks its levees and floods across the land.

Yellow River Cuts Through Lanzhou

But the worst disaster happened deliberately, in 1938, during the Sino-Japanese war. To halt advancing Japanese troops Chinese generals dynamited the levees and flooded the land. The Japanese were only held up for a few weeks, but the floods were so great that almost a million Chinese died. It is said to have been the most destructive single act of war ever. And it took engineers ten years to put the river back into its old channel.

Today the risks are if anything higher. A combination of persistent drought and rising demand for water for irrigation leaves the river virtually empty by the time it reaches the "hanging river" zone. That sounds comforting. But the slow, feeble river drops even more of its silt on its channel than before. So the hanging river has been rising ever higher (it is now in places 70 feet above the floodplain) and, despite constant levee raising, the capacity of the channel is diminished. The risk is that one year there will be major upstream floods that dams cannot contain, and the levees on the floodplain will once again be overwhelmed, with dreadful consequences. Chinese engineers have been trying to manage dams on the river so as to create an artificial flood to flush out some of the silt and increase the capacity of the channel. But this has had only limited success, however.

Q: How would you recommend the United States approach the problem of rebuilding New Orleans after the devastation of hurricane Katrina? Or *should* we rebuild New Orleans?

FP: New Orleans, lying below sea level on the delta of the Mississippi, is at constant risk of flooding from both the sea and the river. Its history has been a constant battle of raising levees higher. It is clear that when Katrina struck they were too low. The storm surge burst into the delta and overwhelmed the defenses. But the situation had been made much worse, and the city was super-vulnerable, because the natural wetlands both on the delta and upstream on the river have mostly been "reclaimed" and drained. So when floods come, either from the sea or the river itself, there is nowhere for the water to go. That means water levels round New Orleans are much higher than they would otherwise be.

Arguably, New Orleans is a crazy place to have a city. But if New Orleans is rebuilt – or indeed continues to be occupied at all -- there is an urgent need to recreate these natural flood reservoirs, so that next time the water has somewhere to go other than seeking out the weakest point in the levee system. Louisiana must tear down levees around farmland in order to protect the city.

Q: You mention that water wars are not something off in the future, but have been occurring in the Middle East for some time now. Would you tell us a little about that?

FP: Water conflicts of various sorts are happening all over the arid parts of the world. As more and more water is collected behind dams, and otherwise controlled, it is the powerful who get access to the water and the weak who lose. So there is a serious global issue about water governance. The first modern water war was, arguable at least, the Six Day War in 1967 between Israel and its neighbours. Ostensibly about land and security, Israel's Ariel Sharon (who was a general at the time) has said in memoirs that it was really about water – specifically the River Jordan, which then as now was Israel's biggest source of water. The country feared that Syria was about to annex the headwaters of the river for its own uses. At any rate, when the war ended, Israel was in charge of the river for most of its course, including the headwaters on the Golan Heights and has retained them tenaciously ever since, virtually emptying the river before it flows into the country that bears its name.

Since 1967, Israel has also ruled on the West Bank, where rainwater percolating into an underground aquifer provides it with another source of water. And it has prevented Palestinians living there from sinking new wells or expanding their water sources, with sometimes serious consequences in a fast-growing population. Israel argues (correctly) that the aquifer is fully exploited, but now takes the majority of the water there for its own use. Israelis are divided about whether they can afford to give up part of their "share" of the West Bank water in a peace deal. But any peace settlement will require an agreement on water, as well as land.

Q: What countries do you put at the top of your list for adequate, clean water supplies and an understanding of the proper way to handle such a valuable resource? Which countries are at the bottom and can be expected to suffer a water crisis in the near future?


Orphaned Ship in the Aral Sea

FP: Oh boy, the bottom countries are easy. The two biggest per capita water users on the planet are two near-desert states: Uzbekistan and Turkmenistan. These two former Soviet republics in central Asia are the countries responsible for emptying the Aral Sea, once the world's fourth largest inland sea but now a wasteland of endless and largely unexplored desert, by decanting the waters of the Amu Darya river onto their cotton fields. Their water crisis is major -- and now. Especially in the Uzbek province of Karakalpakstan. They get to drink and irrigate their crops with drainage water from the cotton fields. It is salty and unpleasant. Their entire environment is arid (temperatures have soared since the sea dried up) and full of salt, from both the water and the salt-laden dust storms that blow from the dried up sea bed. The salt is causing epidemics of cancers and anaemia. Life expectancy here has fallen by 10 years. It is ecocide.

Countries that do things well? Pat on the back for the US for introducing low-flush toilets. As a result you now consume less water per head than Canada (and many times less than Turkmenistan). Pick of the bunch is probably the city state of Singapore which has got leakage rates from city water mains down below 5 per cent (25-50 per cent is more typical in most cities worldwide.) Europe probably has the cleanest water, and while southern Europe is emptying rivers and aquifers to irrigate crops, the rest of the continent, where water demand is much less, has succeeded in keeping water crises out of the headlines.

Q: The world has elected you, Fred Pearce, Earth's Emperor of Water. Your first duty is to lay down five laws concerning our access and use of water. All the nations of the world have agreed to abide by your edicts. What are they?

FP: Phew, hard question.

1. Access to clean water is a human right, and should be so enshrined in international law. The world should have a program – paid for by the rich nations, if necessary – to make that right a reality.
2. Most of the world's major rivers cross international boundaries, and yet are not covered by treaties. This is a recipe for conflict and for upstream users to hold downstream users to ransom. There need to be internationally brokered deals sharing such rivers.
3. Underground aquifers, being out of sight, are often out of mind. But these are vital resources that need protecting from rampant over pumping. There may be exceptions, but there should be a universal presumption that aquifers should not be pumped so much that water tables are lowered.
4. Large dams and other river engineering projects are often carried out without regard to the wishes of people who will be damaged by them. This was condemned in the reports of the World Bank initiated World Commission on Dams, and its strictures on consultation and full environmental and social impacts assessments should be enshrined in law. This regime should be extended to give communities proper control over the water on their territory.
5. In a market-dominated world, we need to work towards more realistic water pricing. Only that way will water conservation become the priority that it needs to be, whether in the home or the factory or at the irrigation project or hydroelectric plant.