

Sustainable Urban Water Systems

Dr Sarah Bell

Civil, Environmental and Geomatic Engineering

UCL Environment Institute

s.bell@ucl.ac.uk

Sustainable Urban Water Systems

- Water crisis
- Current models of infrastructure are unsustainable
 - Over consumption in developed economies
 - Not affordable for poorest people
- Alternative models
 - Fit for purpose water
 - Waterless sanitation
 - Multiple scales

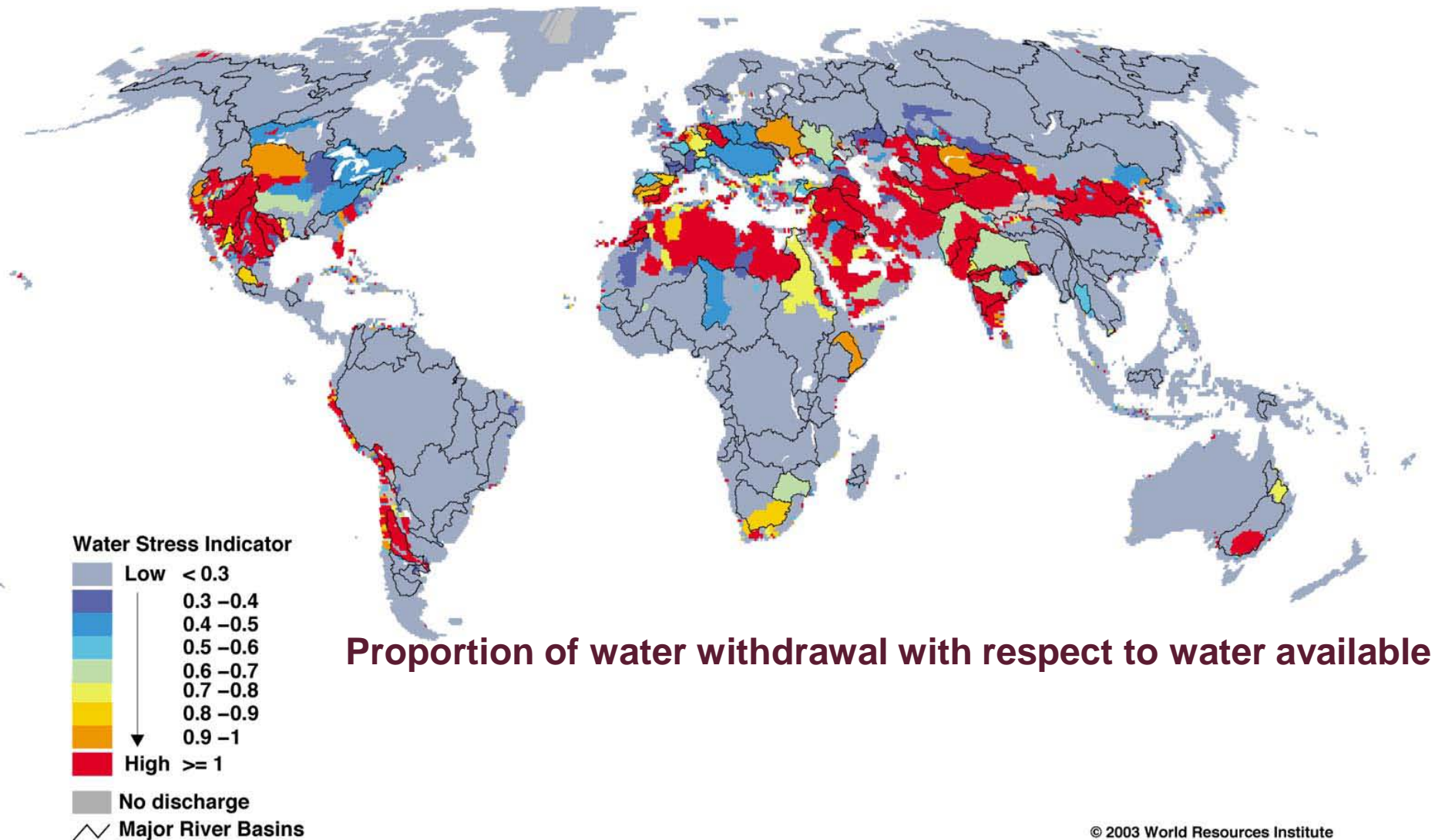
Water Crises

Too much...



Too little...



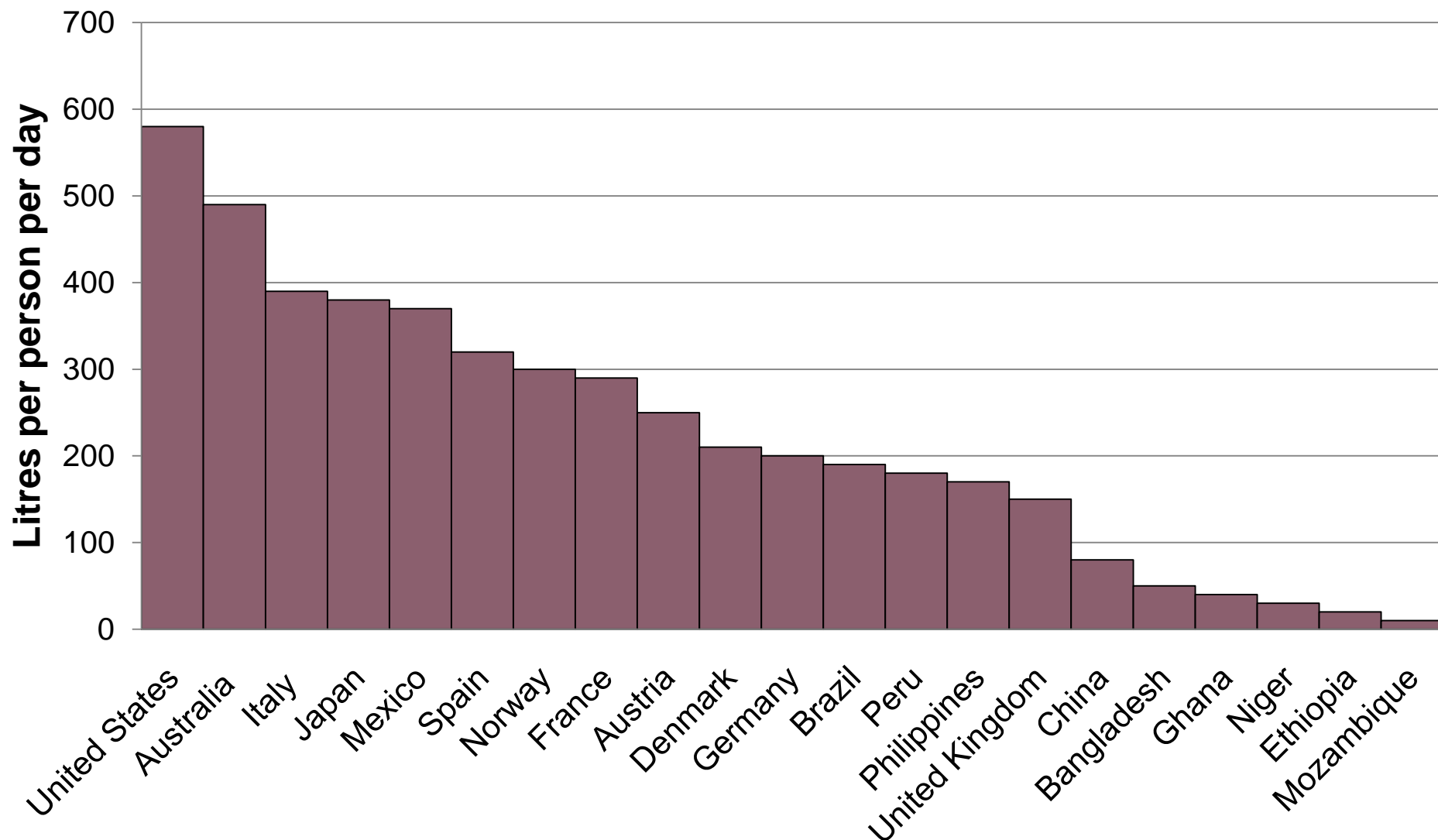


Selected International Water Use

	Agriculture (%)	Industry (%)	Domestic (%)
Global Average	70	19	11
Afghanistan	98	0	2
Australia	75	10	15
Singapore	4	51	45
UK	3	75	22
USA	41	46	13

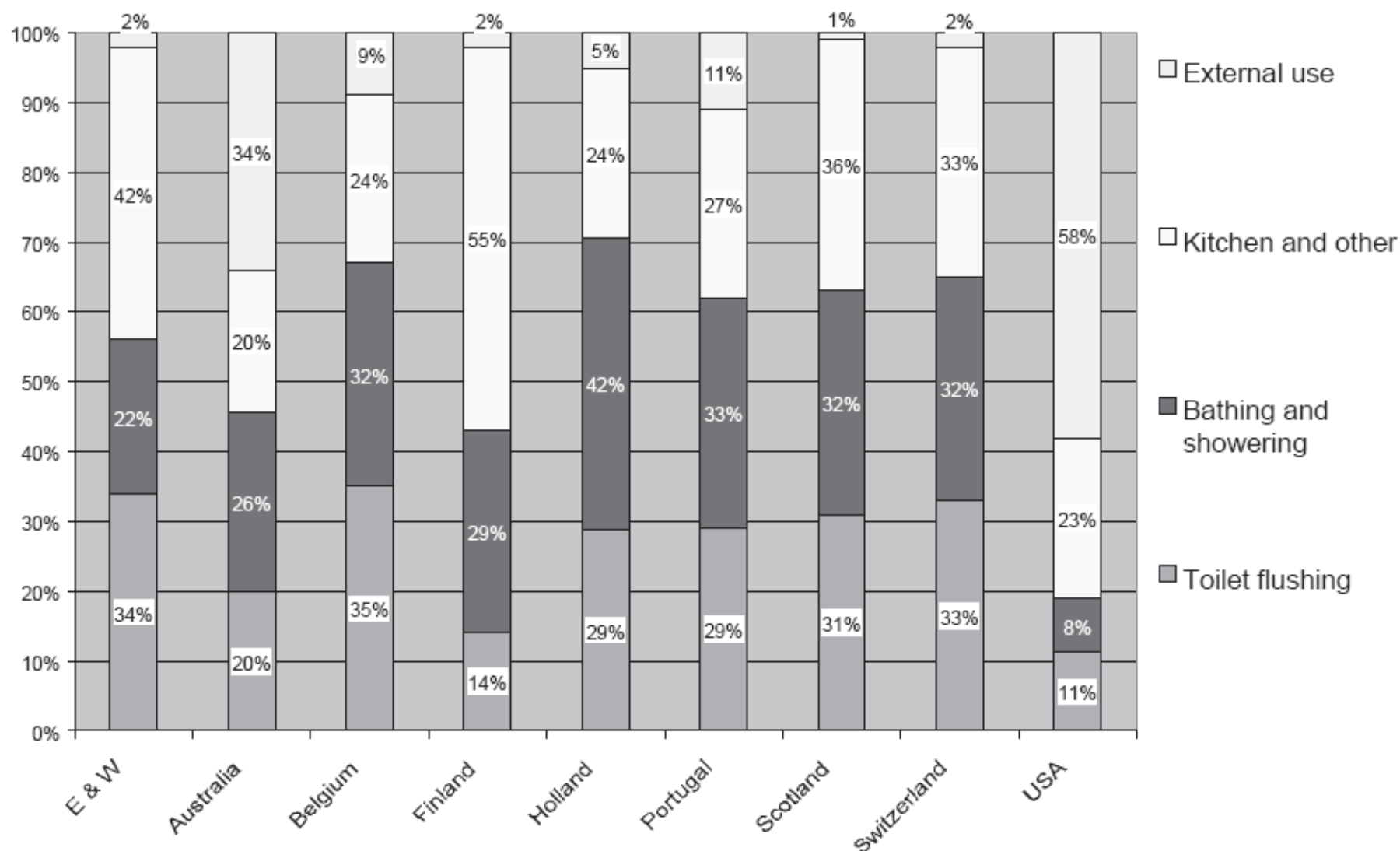
(Gleick 2008, FAO 2010)

Selected International Domestic Water Consumption (1998-2002 average)



Source: UNDP Human Development Report 2006

Figure 8 Estimates of elements of household water use (%)



2009 Millennium Development Goals Update

- **884 million** people lack access to improved water supply
- **2.5 billion** people lack access to improved sanitation

Water Crises

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Too little...

EUROBATH MIX2 > TRIPLE THERMOSTATIC SHOWER VALVE WITH FIXED HEAD AND 36 JETS.



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EUROBATH

Free delivery to mainland U.K.

Description:

Concealed 3/4" thermostatic triple shower valve with 200mm fixed head and 36 jets on two rainbars. Recommended minimum water pressure 3.0 bar.

Price: **£905.68**

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RRP: £1,548 Save: £484.24

Pioneering the fashion of squares in the bathroom, Eurobath Mix2 represents clean flat surfaces with a mirror like effect due to high quality polishing and plating.

All Eurobath Mix 2 bathroom taps and accessories are guaranteed for 5 years.

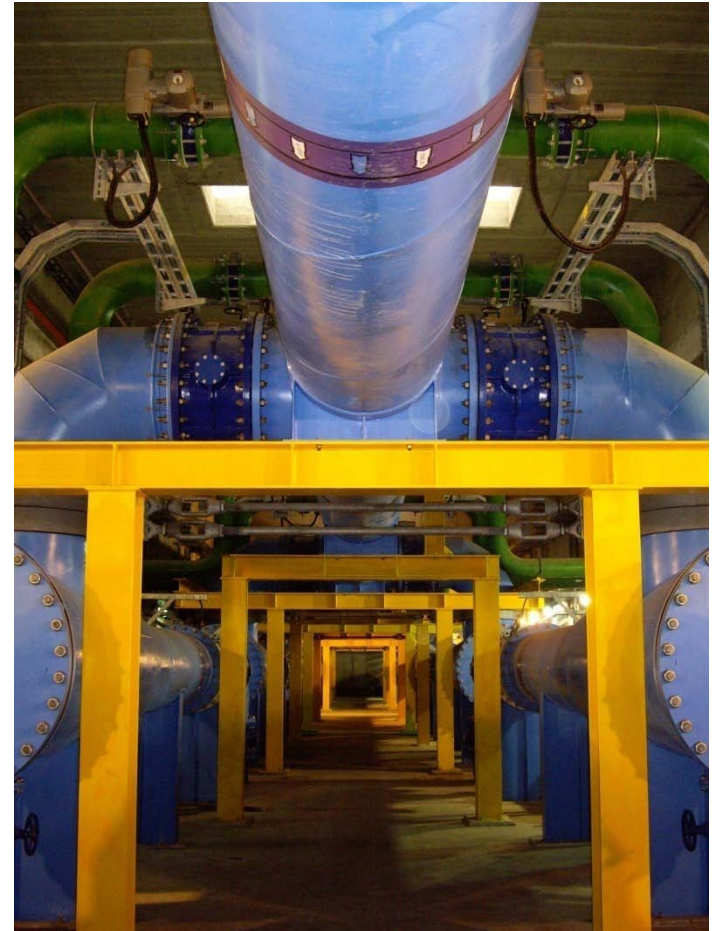
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Product Code: E-MIX169CP



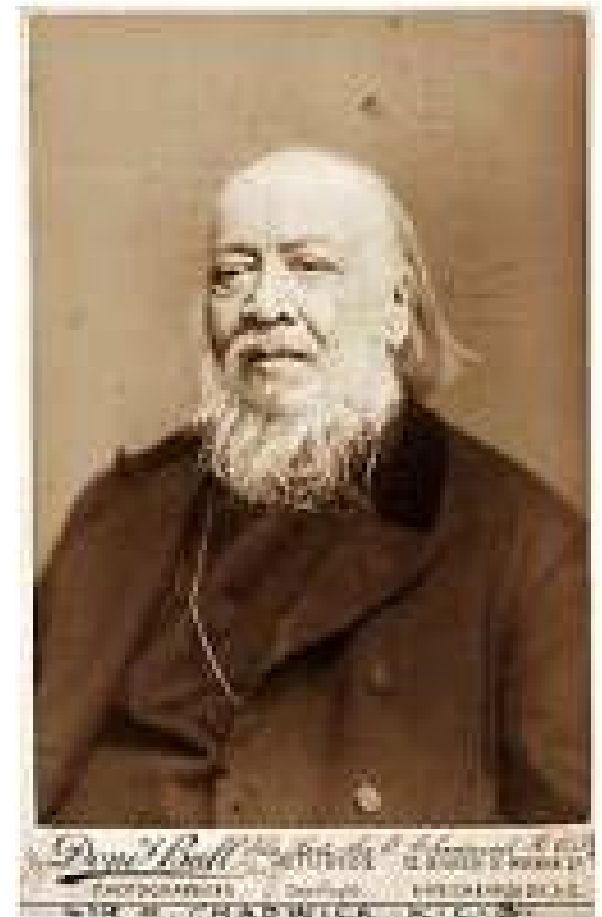
Water infrastructure

- Water resources
- Treatment
- Distribution
- Use
- Drainage
- Wastewater treatment



Water in Modern Cities

- Public health imperative
- Miasma theory of disease
- Continuous, clean water in households
- Water based sanitation
- Ubiquitous, invisible, 'on tap'



Predict and Provide

- Demographic and economic models to predict increase in demand for water
- Engineering systems designed to supply water to meet demand
- Centralised supply and treatment
- Extensive networks of distribution

Challenges to Predict and Provide

- Environmental limits
- Infrastructure maintenance and renewal
- New systems are expensive
- Carbon emissions of storage, treatment and pumping
- Not affordable?



Expanding supply

- Desalination, potable reuse, resource development
- Energy consumption
- Public acceptability
- Land use conflicts
- Cost
- Perpetuate perception that water is limitless

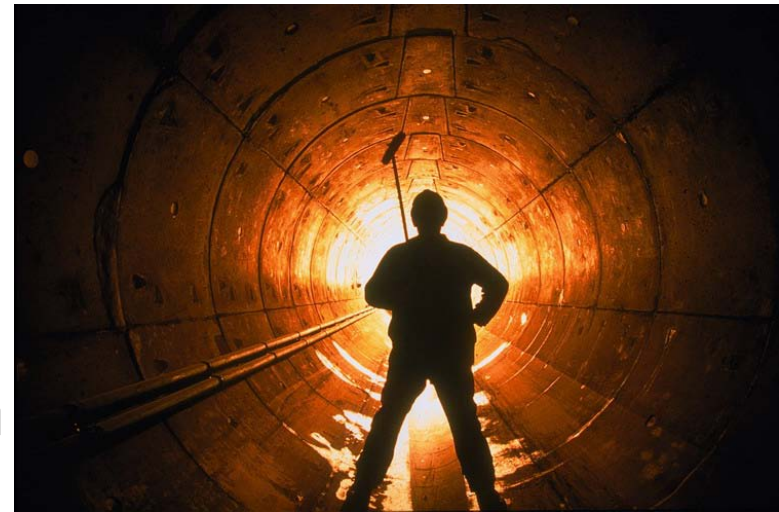
Demand Management



- Water conservation campaigns
- Water efficient appliances
- Water metering
- Water pricing
- Use restrictions
- Building codes

Big Water (Sofoulis 2005)

- Big systems, big dams, big investment
- Contrast with everyday, intimate experience of water
- Messages built into the technical system conflict with conservation messages
- User friendly, saver unfriendly



Comfort, Cleanliness and Convenience (Shove 2003)

- Inconspicuous consumption
- People don't notice water
- Current consumption levels are the result of cultural and technological change
 - Automatic washing machines
 - Daily showering



Challenge of Urban Water Sustainability

- Water scarcity
- Water poverty
- Centralised infrastructure systems
 - High consumption
 - Not affordable to poorest people

Alternative water systems

- Fit for purpose
- Waterless sanitation
- Operate at multiple scales
 - Household
 - Neighbourhood
 - City

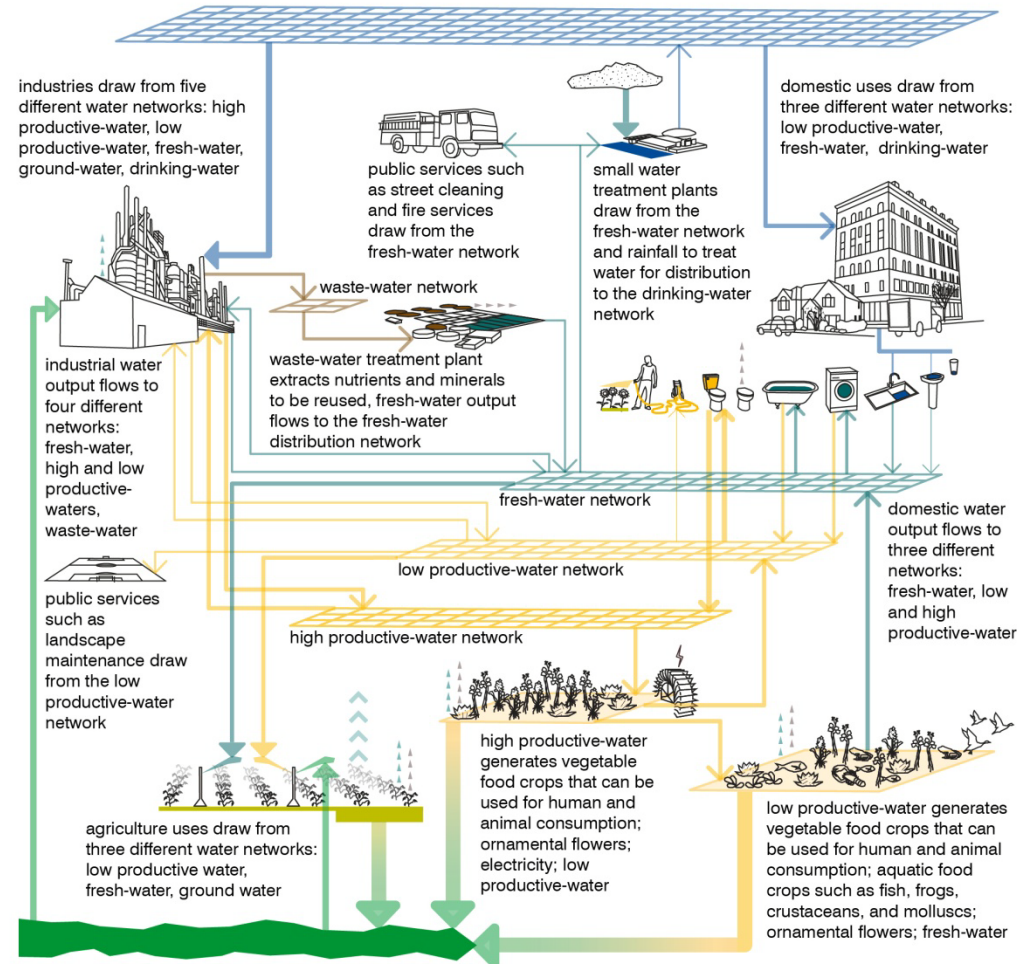


Image from Tse-Hui Teh, UCL

WA Department of Water



<http://www.water.wa.gov.au/>

Rainwater harvesting



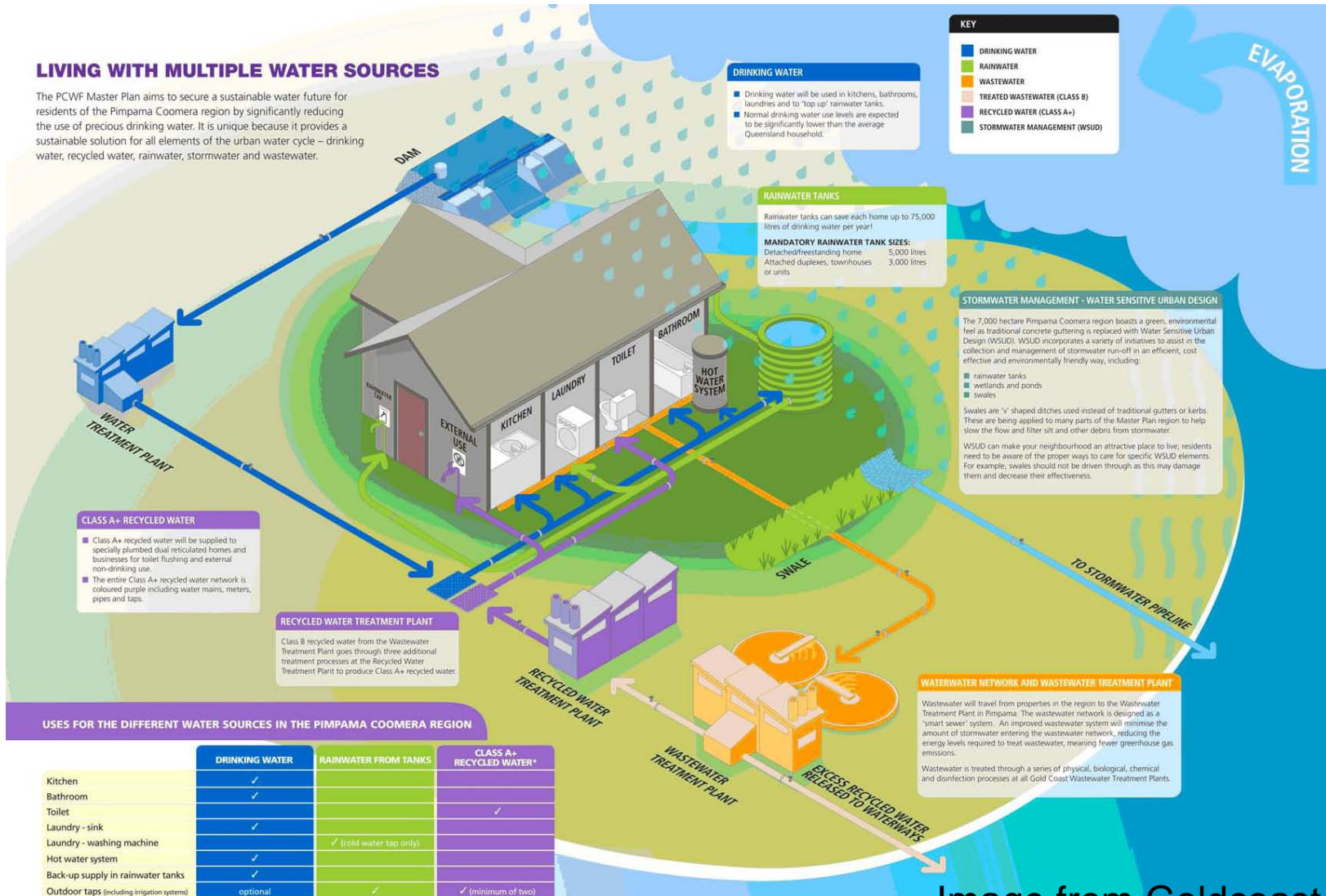
20m³ RWH tank at Hailuu School, Hanoi, Vietnam. Credit: Mooyoung Han

- Household
- Building
- Non-potable use
- Fire protection
- South Korean 'rain cities'
- UK comparison of pumping energy

Pimpama Coomera, Gold Coast

LIVING WITH MULTIPLE WATER SOURCES

The PCWF Master Plan aims to secure a sustainable water future for residents of the Pimpama Coomera region by significantly reducing the use of precious drinking water. It is unique because it provides a sustainable solution for all elements of the urban water cycle – drinking water, recycled water, rainwater, stormwater and wastewater.



Rebound Effect

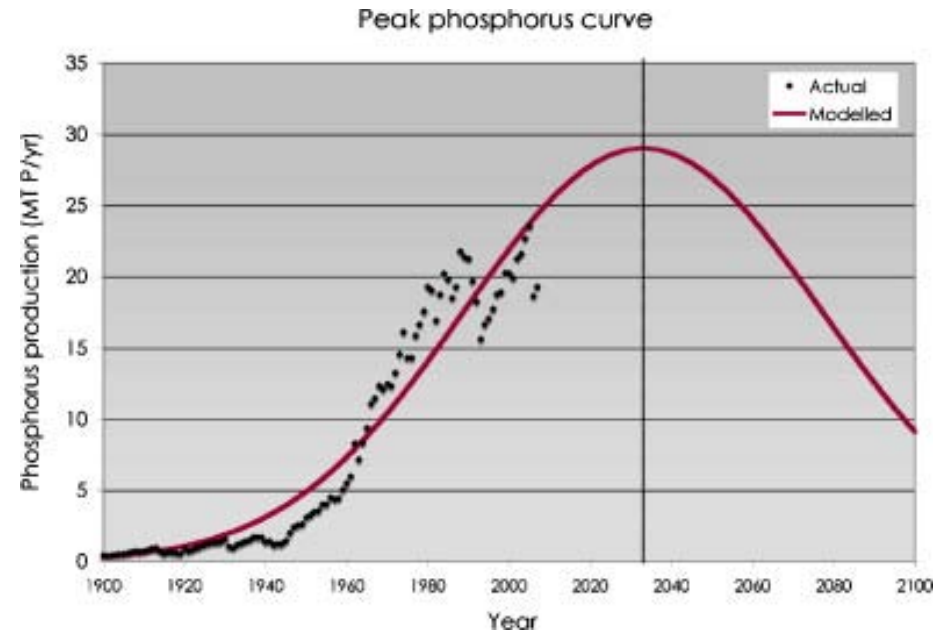
- Increase in non-potable water use
 - Rouse Hill, Sydney
- Reliance on potable backup supplies
 - Pimpama Coomera rainwater subject to municipal restrictions
- Water efficiency and culture change
 - Link supply and consumption practices

Durban, South Africa



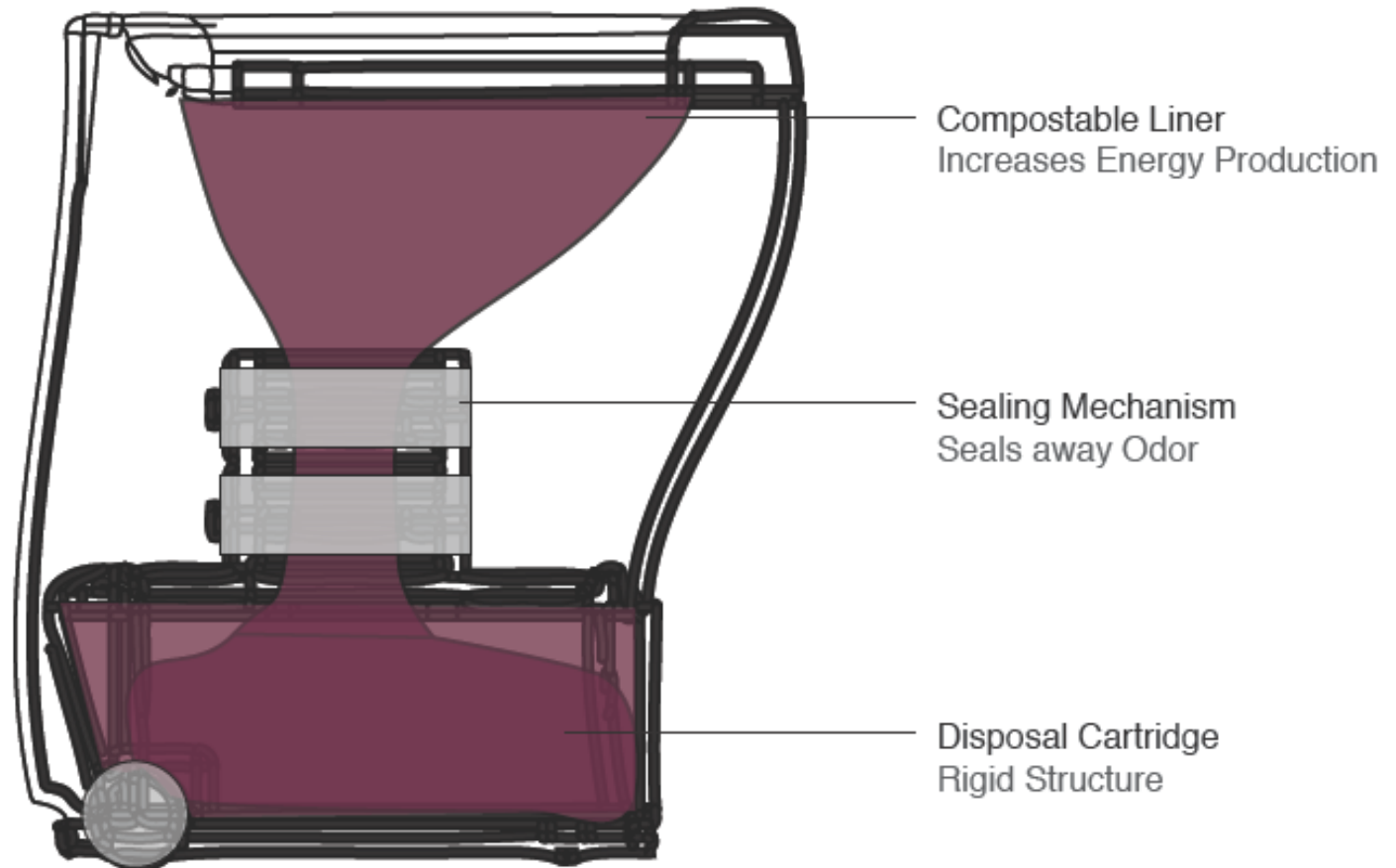
Urine Recovery

- Phosphate fertilisers essential for modern food production
- Phosphate rock is a non-renewable resource
- Urine is rich renewable source of phosphate
- Paid a penny?

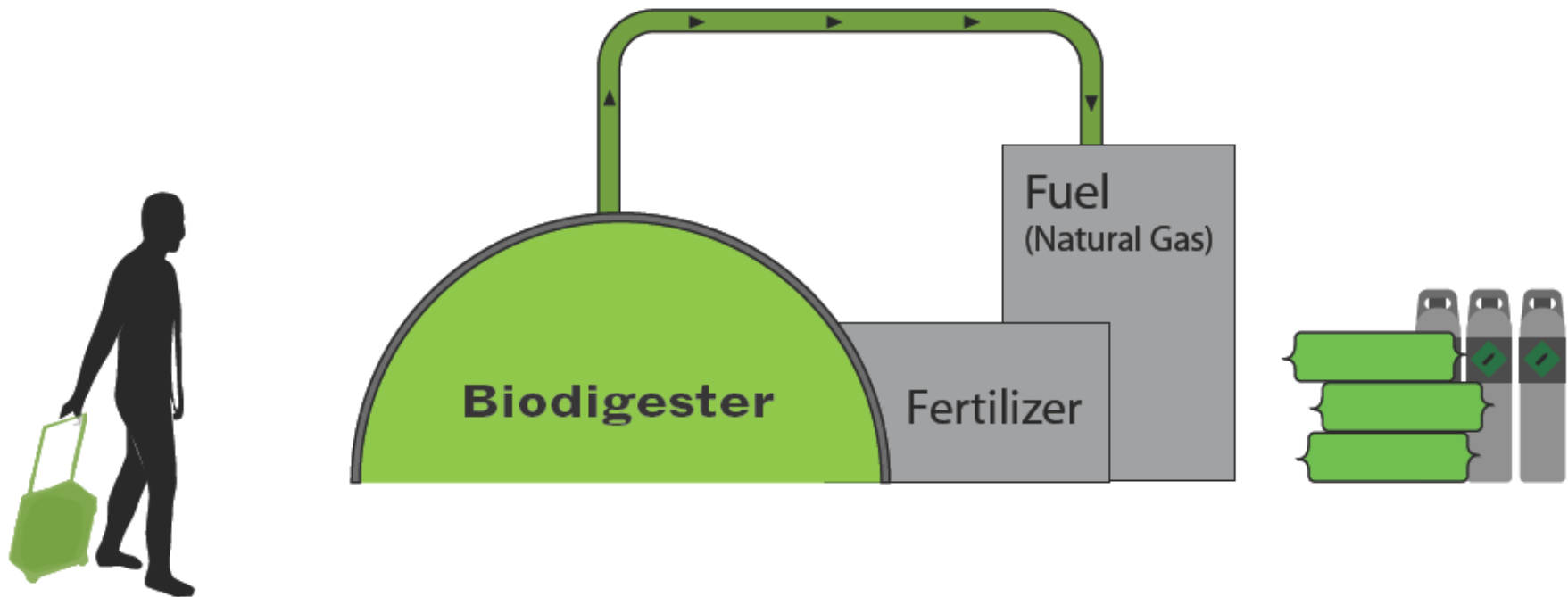


Source: Cordell et al. 2009

Virginia Gardiner, LOOWATT



Virginia Gardiner, LOOWATT



Alternatives to Big Water

- Maintain public health
- Fit for purpose water
- Waterless sanitation
- 'Bake-in' conservation messages
 - Limited resources
 - Saver friendly



Sustainable Systems

- Meet basic human needs
- Reduce wasteful consumption
 - Energy and water
- Recognise interactions between behaviour, infrastructure and technology
- Operate across different scales
- New designs of technology and systems

Water Crises

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Image from Thames Water

Too little...



Image from www.worldwaterday.org

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