Drought risk management safeguarding ecosystems: Towards a strategic approach

Presented by **Paul Sayers**

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Based on an international collaboration…

WWF UK and China

- Paul Sayers (UK) and Catherine Moncrieff (UK) supported by Dave Tickner (UK), Huw Polher (UK), Robert Speed (Australia), Clare Wilkinson (UK), Gang Lei and Wei Yu (China)

Ministry of Water Resources, China GIWP

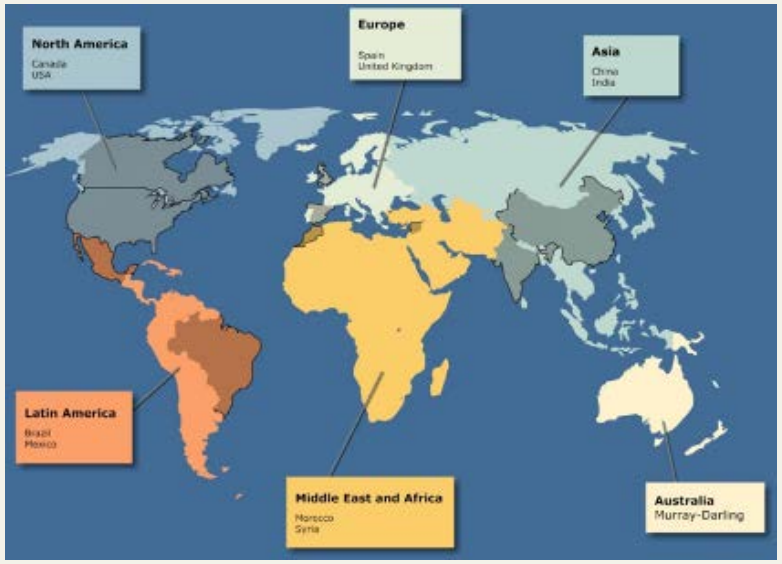
- Professor Li Yuanyuan and Prof. Li Jianqiang supported by Li Aihua, Xu Xiangyu and Yu Lili

International case studies

- Lei Wen (North America), Guy Jobbins (MENA region), Suresh Babu (India), Indira Khurana (India), Mario Mendiondo (Brazil), Jose Tirado (Mexico) and Guy Pegram (South Africa).

Advice and reviews

- Donald Wilhite (Uni. of Nebraska), Eva Hernandez Herrero (WWF-Spain), Guido Schmidt (Ind), Edoardo Borgomeo (Uni. of Oxford)



Case study locations

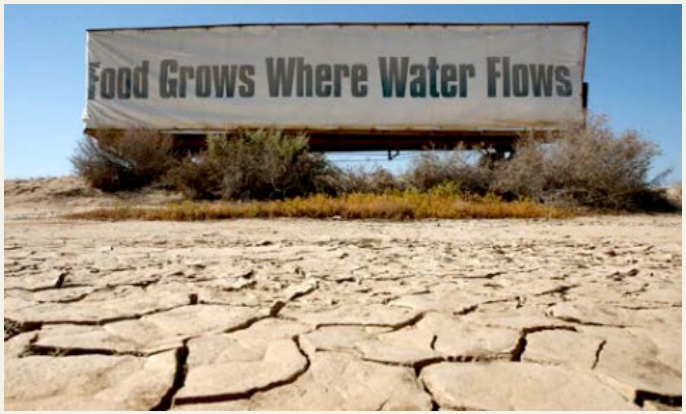
Outline of presentation

- **Motivation**
- **Contemporary challenges** (lessons not yet learnt)
- **A more strategic approach** (including the protection and promotion of ecosystems)
- **Conclusions**
- **Signpost to further information**

Motivation: Why this project?

- Major droughts are an ever-present threat in almost all countries

China (Yunnan Province – 2009-10)



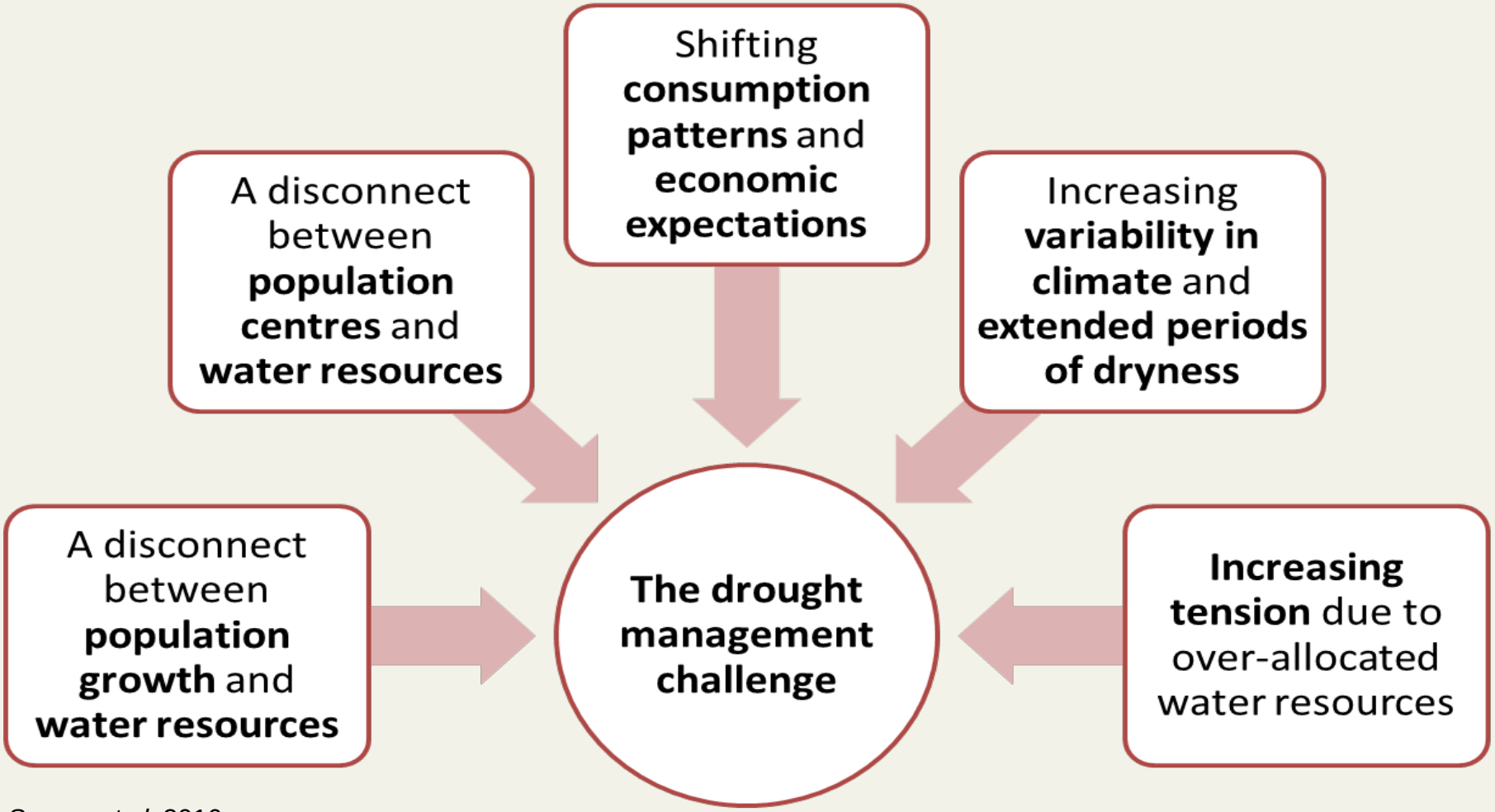
California, 2010

Brazil, Cantareira reservoir, January 28, 2015.

England, 2010-12 (Flought)

Motivation: Why this project?

- And the **drought challenge is set to increase**



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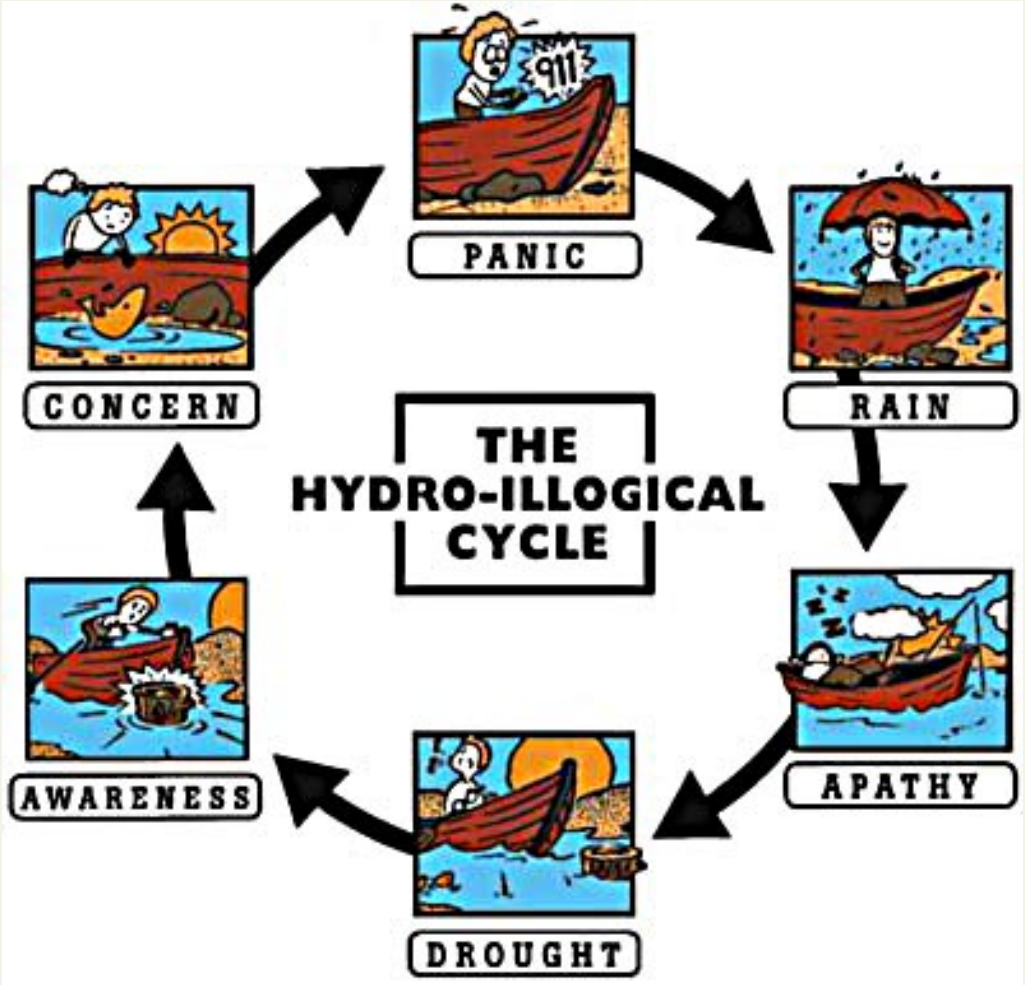
Motivation: Why this project?

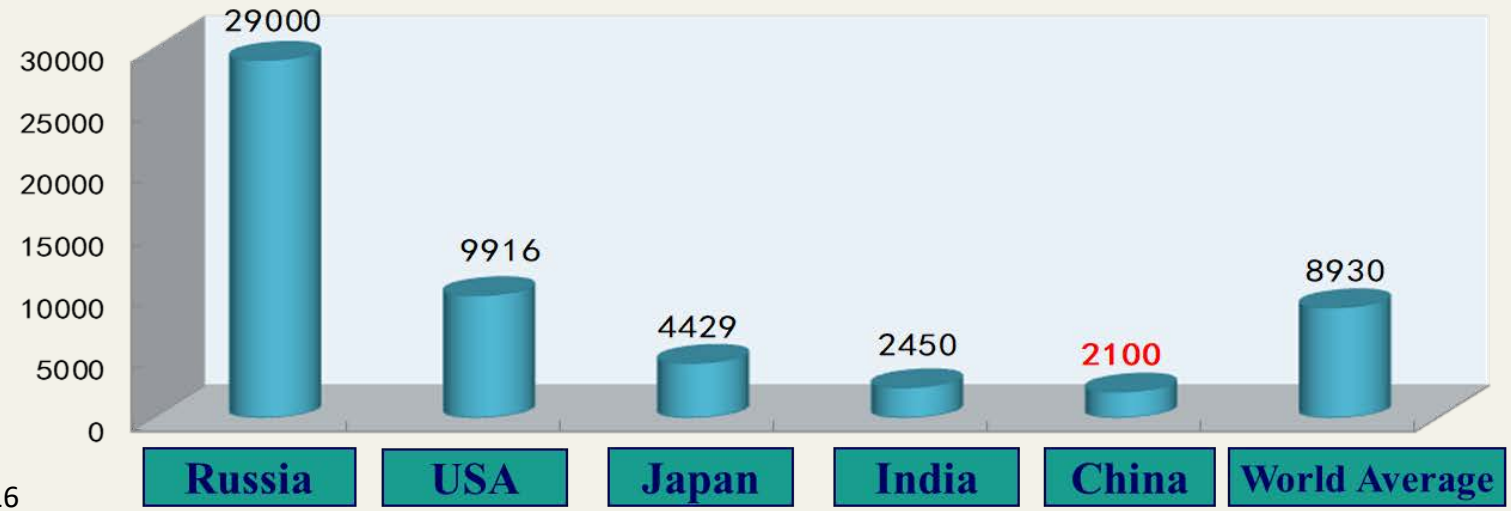
- But most droughts have been responded to *'as they happen'*
- Seen as a crisis
- When rain returns, the impacts of drought are soon forgotten and the opportunity for change lost



Nebraska Drought Monitoring Centre.

Motivation: Why this project with China?

- Water pollution, floods, droughts and water scarcity act as a brake on China's development.
- **Water** has been consistently a **No. 1 Policy** for China in recent years
- **Budget** for water management **doubled in recent years** (>USD 600bn over next ten years)
- **China** is relatively **rich** in terms of **total water volume** (with mean annual average water resources standing at 2.84 trillion m^3).
- **But** is **limited in per capita water** resources (e.g. 2,100 m^3, less than 1/3 of the world average).



Source: GIWP, 2016

Contemporary challenges

- **Failure to recognise the relationship between water scarcity and drought**
- **Reluctance to safeguard critical ecosystem functions and services**
- **Lack of institutional co-operation**
- **Lack of, or perverse, incentives for water conservation**
- **Reliance upon grey infrastructure**
- **Persistence of illegal and unregulated abstractions**
- **Short term imperative**

Ecosystems have evolved to cope with naturally occurring droughts.

Low-flow periods are believed to be important in biodiversity and some freshwater species well adapted to regular periods of dryness - have evolved **resistance** and **resilience** traits ....

BUT

Prolonged drought leads to **tipping points**, resulting in abrupt **shifts in ecosystem functions & structure** and disproportionately severe impacts.

Pressure from other factors such as **pollution**, **over-abstraction** or **invasive species** all **reduce resilience** to drought.

The Millennium Drought in Australia had critical impacts on ecosystems in the heavily abstracted Murray-Darling basin (Speed 2013). It can be tempting to curtail environmental flows during a drought but this can diminished freshwater ecosystem services may take many years to recover and may even suffer long term collapse.

Contemp

- Failure to
- Reluc
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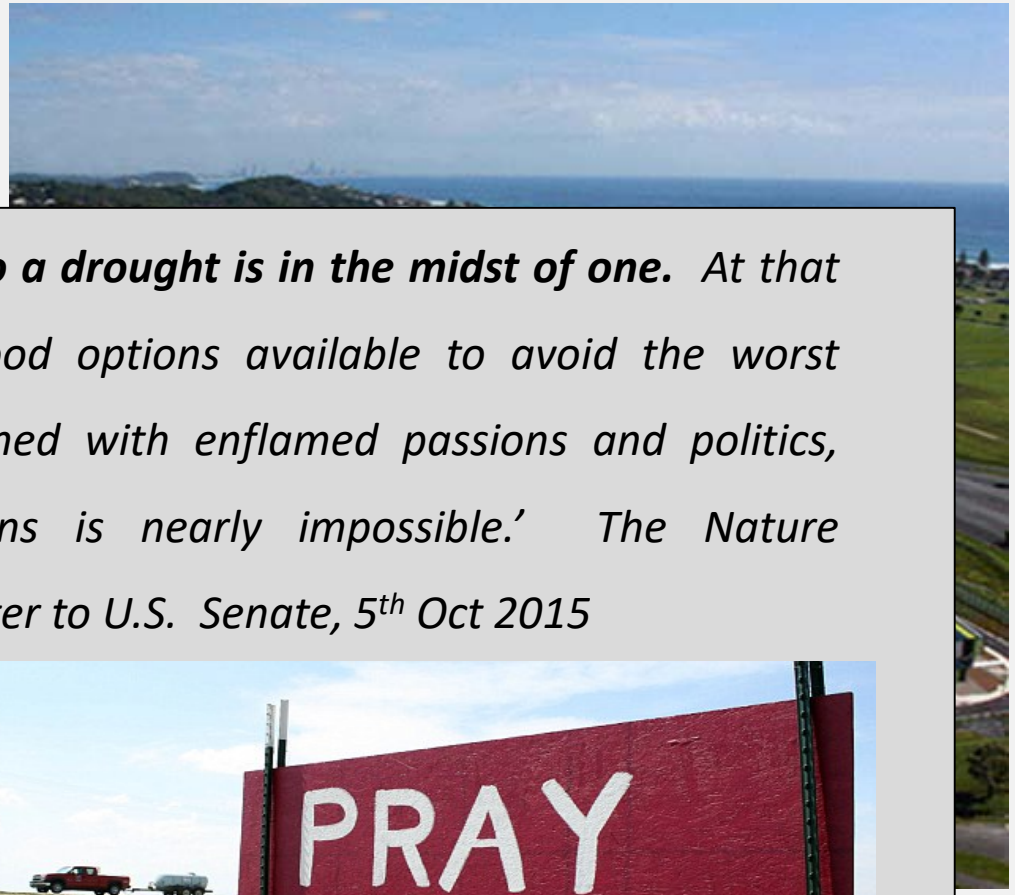
Illegal water abstractions-Kimana catchment Kenya (WWF-USA).
Illegal abstractions make effective allocation planning difficult and recovery slow.
Revoking temporary abstraction agreements, provided during the drought, is difficult as users become accustomed to additional supplies

Contemporary chal



*'…. **the worst time to respond to a drought is in the midst of one.** At that point, there are few, if any, good options available to avoid the worst impacts of drought, and combined with enflamed passions and politics, reaching consensus on solutions is nearly impossible.' The Nature Conservancy and others, open letter to U.S. Senate, 5th Oct 2015*

A short term imperative, a

critical of the process and found that better planning may have avoided such costly action.

A more strategic approach: Basic characteristics

- Is outcome-led (based on a long-term, whole system, view of risks, vulnerabilities and uncertainty)
- Considers drought risk alongside broader water resource and development issues
- Understands the **links between hydro-ecological & socio-economic systems**
- Promotes **a portfolio response that safeguards ecosystems and the promotes natural drought management**
- Adopts a process of on-going learning and adaptation

Drought Risk

is a function of two components:

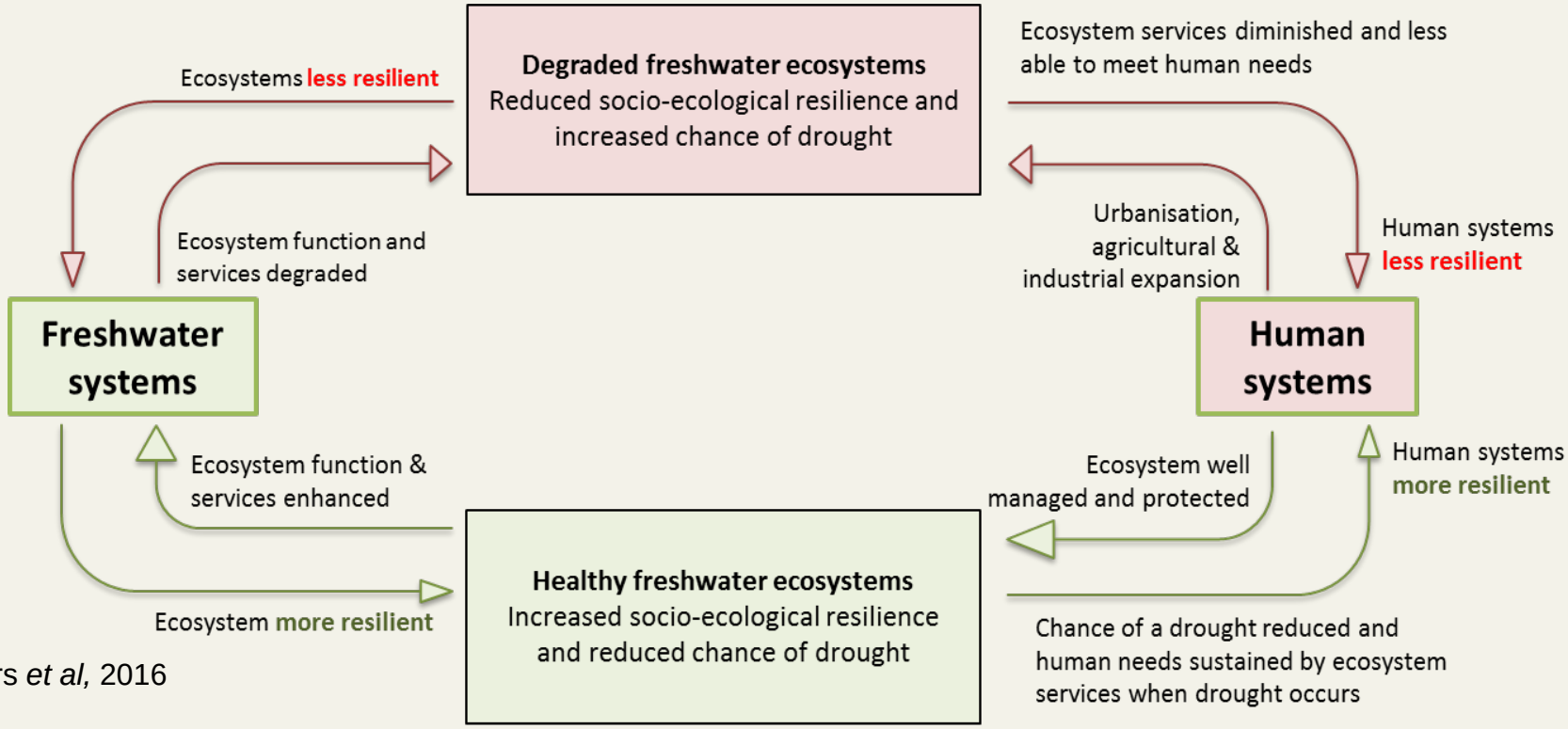
Chance of a hazard occurring
(a given severity of drought)

Associated consequences (reflecting exposure and vulnerability)

SDRM: recognises the interaction between freshwater ecosystems and human systems

In the absence of a strategic plan, some decisions can have perverse outcomes, exacerbating drought impacts and/or the vulnerability of the system:

- halting dam releases to increase water storage for domestic and economic use
- transferring water from other basins as an emergency source of supply – leading to increased water scarcity in the source basin and potential introduce non-native species
- proliferation of small dams– depriving run-off to rivers downstream in dry years.



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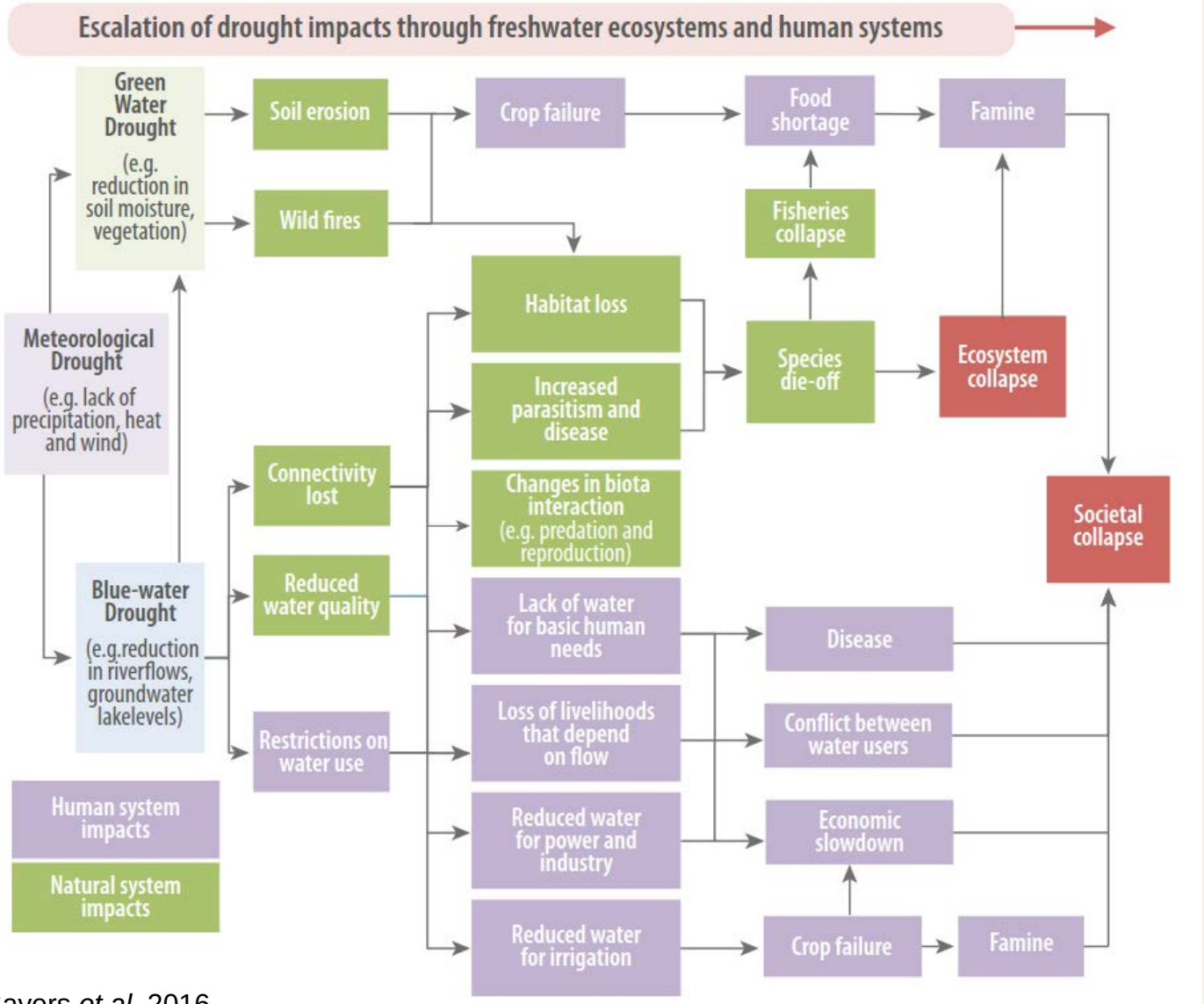
SDRM: recognises the interaction between freshwater ecosystems and human systems



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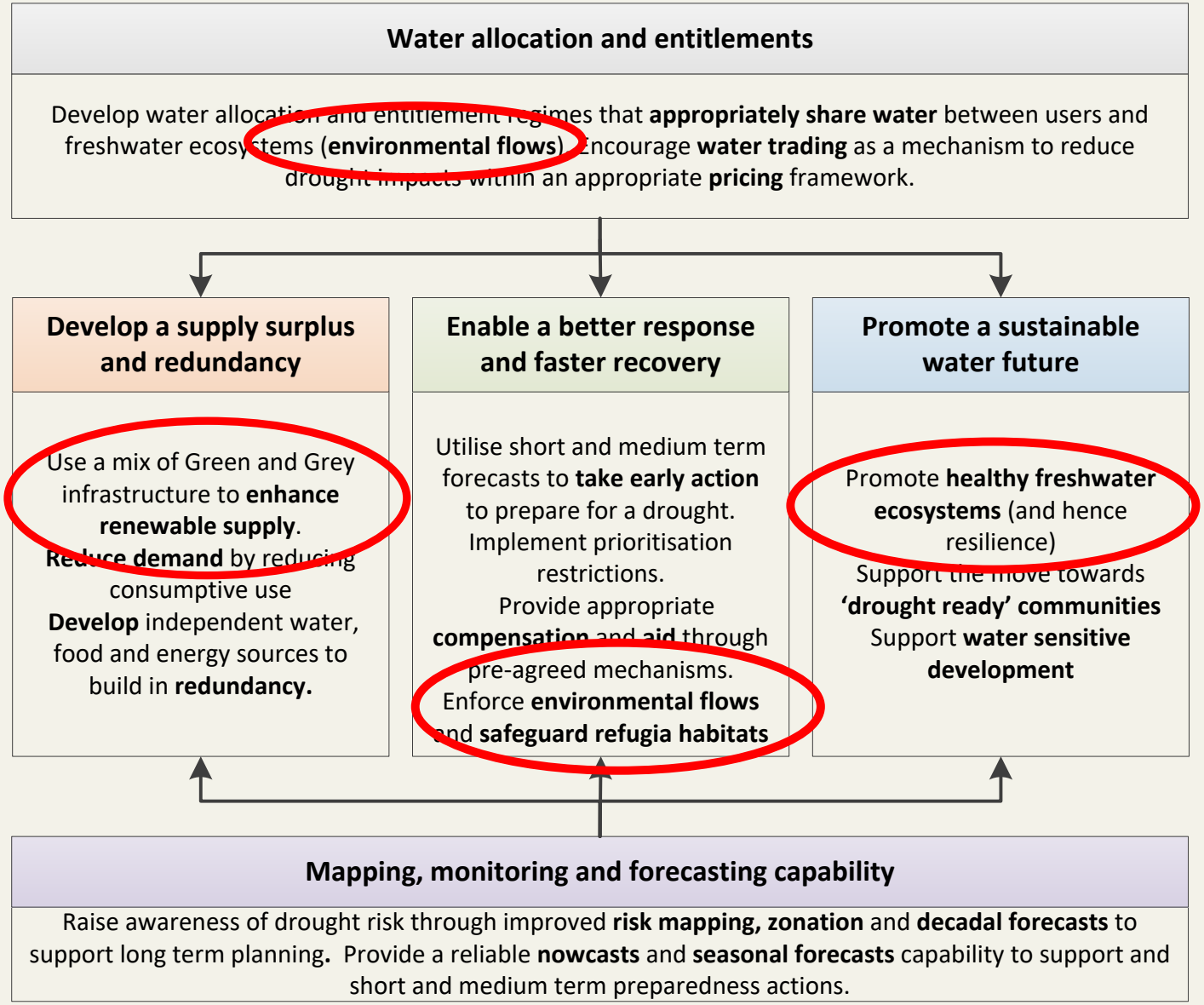
Impacts can cascade and escalate through this coupled system:

1. Loss of livelihoods
2. Economic slow-down
3. Acute food and water shortage
4. Ecosystem collapse or major societal change

SDRM: Implements a portfolio of measures that explicitly recognises the need to protect and promote freshwater ecosystems

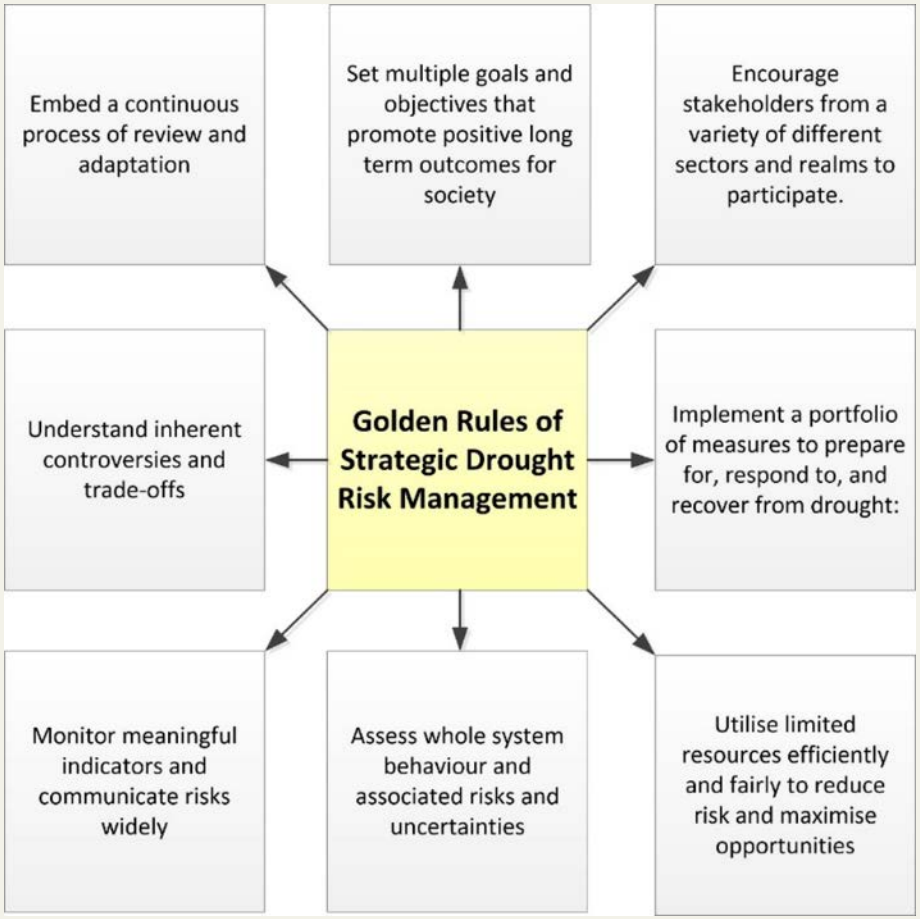


Guiding principles in promoting and protecting freshwater ecosystems as part of SDRM

1. **Clarifying the purpose of ecosystem management within strategic drought risk management** – should maximize the potential contribution of ecosystems to society.
2. **Understanding links between ecosystems, water resources and human systems -** well managed freshwater ecosystems can positively affect human systems
3. **Building socio-ecological resilience** – maintaining and restoring ecosystem function is central to enhancing resilience and ecosystems ability to cope with changing conditions.
4. **Maintaining connectivity and eflows** – underpin freshwater ecosystem resilience and are critical for maintaining downstream ecosystem services and enable species to move
5. **Understand costs and benefits of ecosystem-based SDRM** – can be a cost-effective way to reduce drought risk and can provide benefits beyond reducing drought risk. (Further data/monitoring required of effectiveness and efficiency compared to grey infrastructure).
6. **Engage stakeholders in promoting socio-ecological resilience** – foster confidence in the ability of ecosystems to reduce risk by collectively building & communicating evidence

Conclusions

- Water related tensions are set to increase; a cooperative long term view is the only solution
- It is time to break the hydro-illogical cycle; avoid the grey infrastructure bias and fully recognise the link between human well-being and the health of freshwater ecosystem
- Tackling water scarcity does not necessarily enhance drought resilience
- The eight 'golden rules' of Strategic Drought Risk Management provides a framework to better manage drought risk



Sayers *et al,* 2016

S ater management

Available free to download from UNESCO library (*www.unesco.org/ulis/)*

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