Excellence, collaboration and integration in large river management

Dr Nick Schofield

International RiverFoundaion

CONTENTS

- IRBM success criteria
- Excellence in IRBM
  - restoration
  - protection
  - sustainable development
- Future of IRBM
- Take home messages

Key ingredients to IRBM success

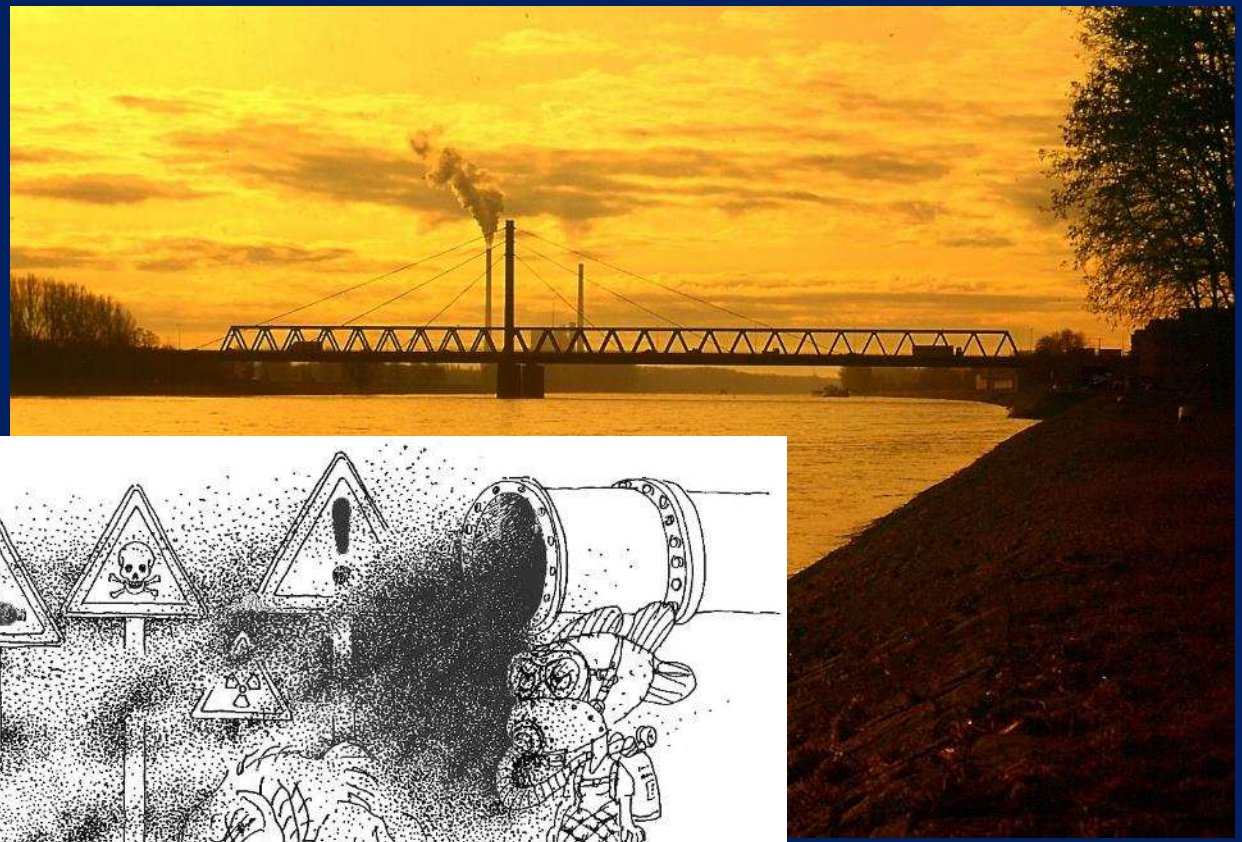
- **Evidence based**, recognizing all forms of knowledge
- Emphasize **people processes**: build trust, co-learning, celebrate
- **Inclusivity** – all sectors, all demographics, all disciplines, all water resources
- **Participation** of all stakeholders in planning, decision-making and actions
- Manage at the **appropriate scale** (local, national, transboundary)
- Integrated **information** and **monitoring** systems based on **adaptive management**
- Master **plan** that defines objectives and has multi-year **priority investments**
- Mobilization of **political will** and **financial resources**
- A clear **legal** framework to support good water **governance**
- **Continuous improvement** through **innovation**, review, reporting and **foresighting**
- **Transfer and exchange** knowledge and best practices

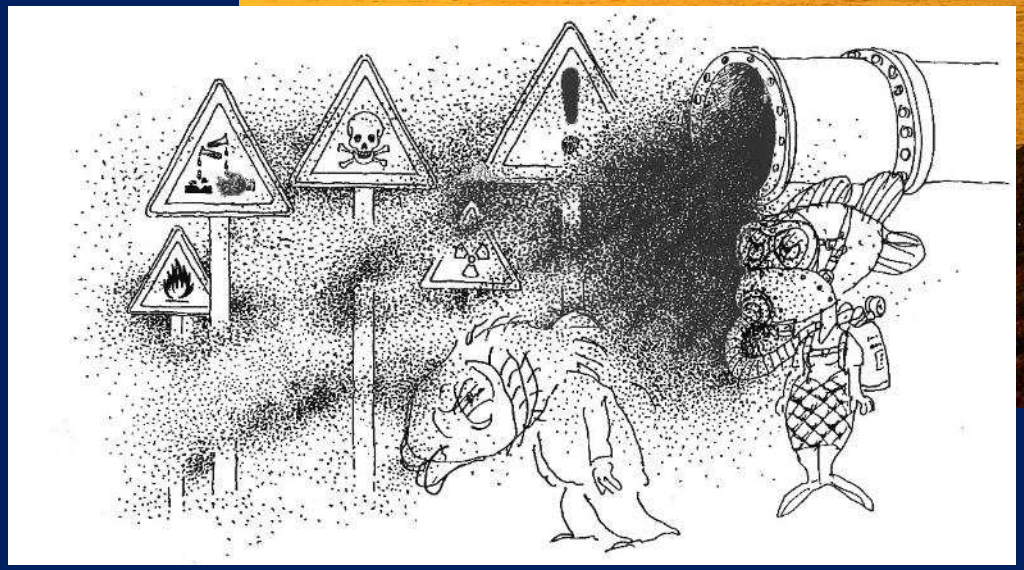
EXCELLENCE IN IRBM - Examples

- **Restoration via IRBM (Rhine, Murray-Darling Basin)**
- Protection via IRBM (Lake Eyre Basin)
- Sustainable development via IRBM (Mekong)

EXCELLENCE IN IRBM RESTORATION (Water quality)
River Rhine – from sewer of Europe to recovery

Winner Tyess International Riverprize 2014





Too much industry
No fish in the Rhine
Lorelei poisoned
Too much embarassment

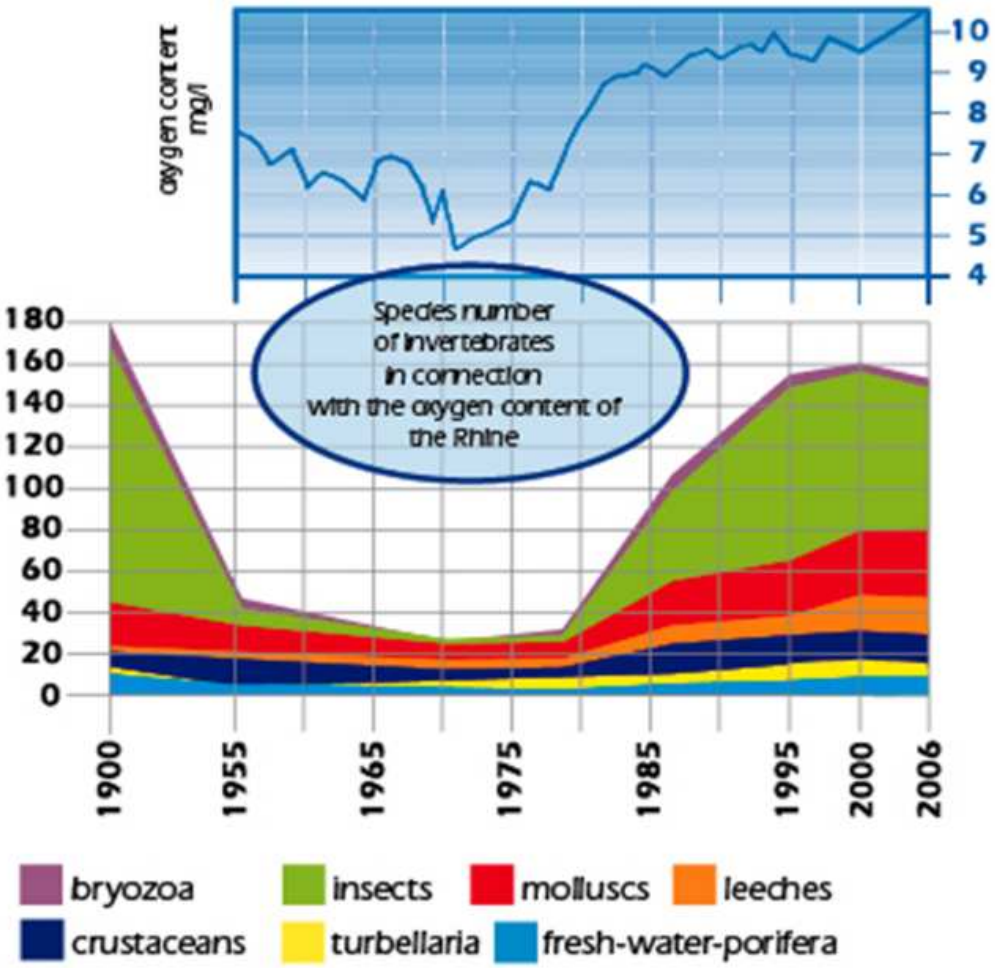
Allen Ginsberg (1979)

Crisis……..1986: Fire at Sandoz, Basel

- 10-30 tons of highly toxic pesticides flowed into the river caused death of all aquatic life for over 400 km downstream
- Led to joint political action and Rhine action plan

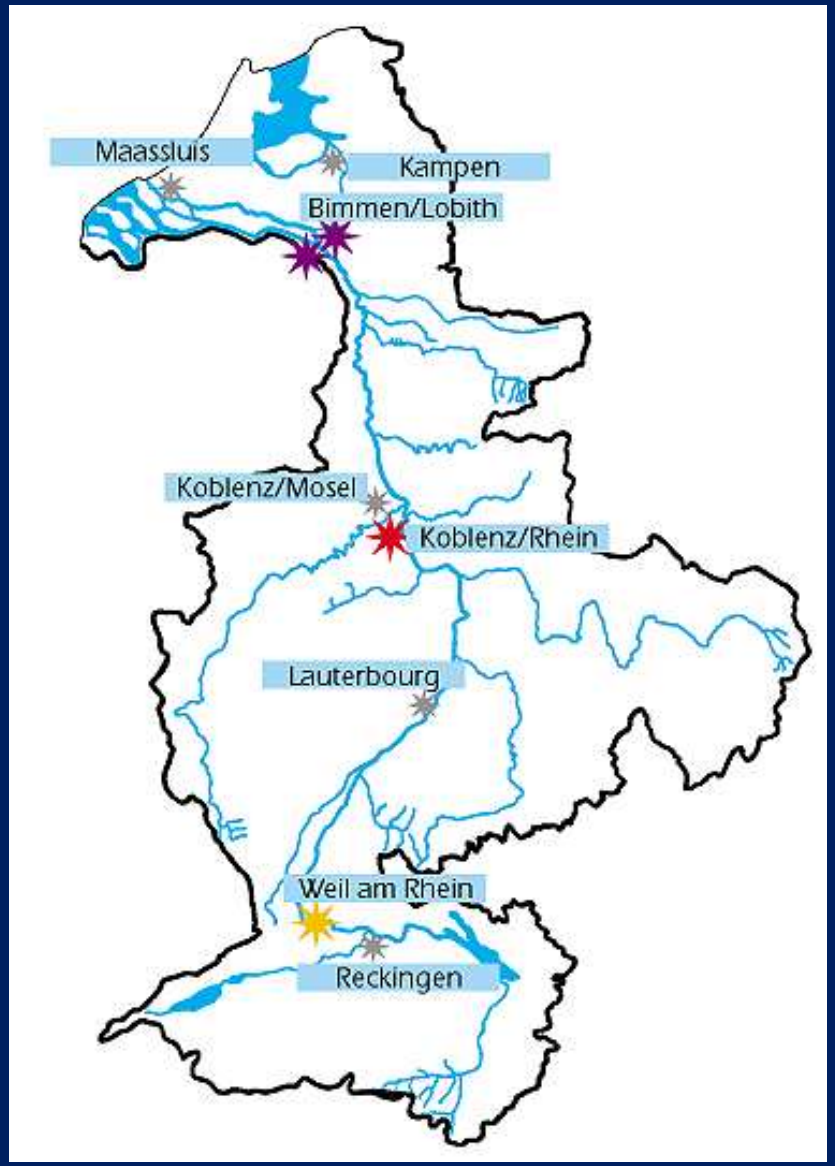
Results

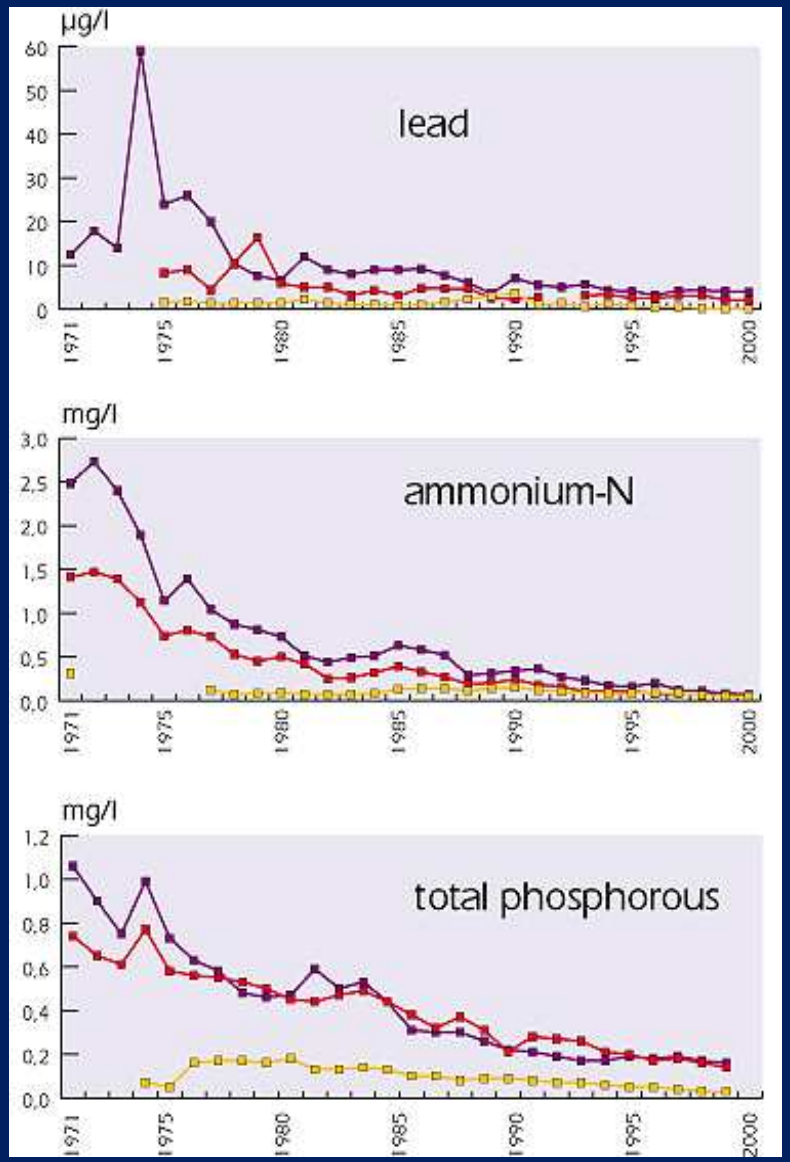
Development of the communities of the Rhine and average oxygen content of the Rhine at Emmerich



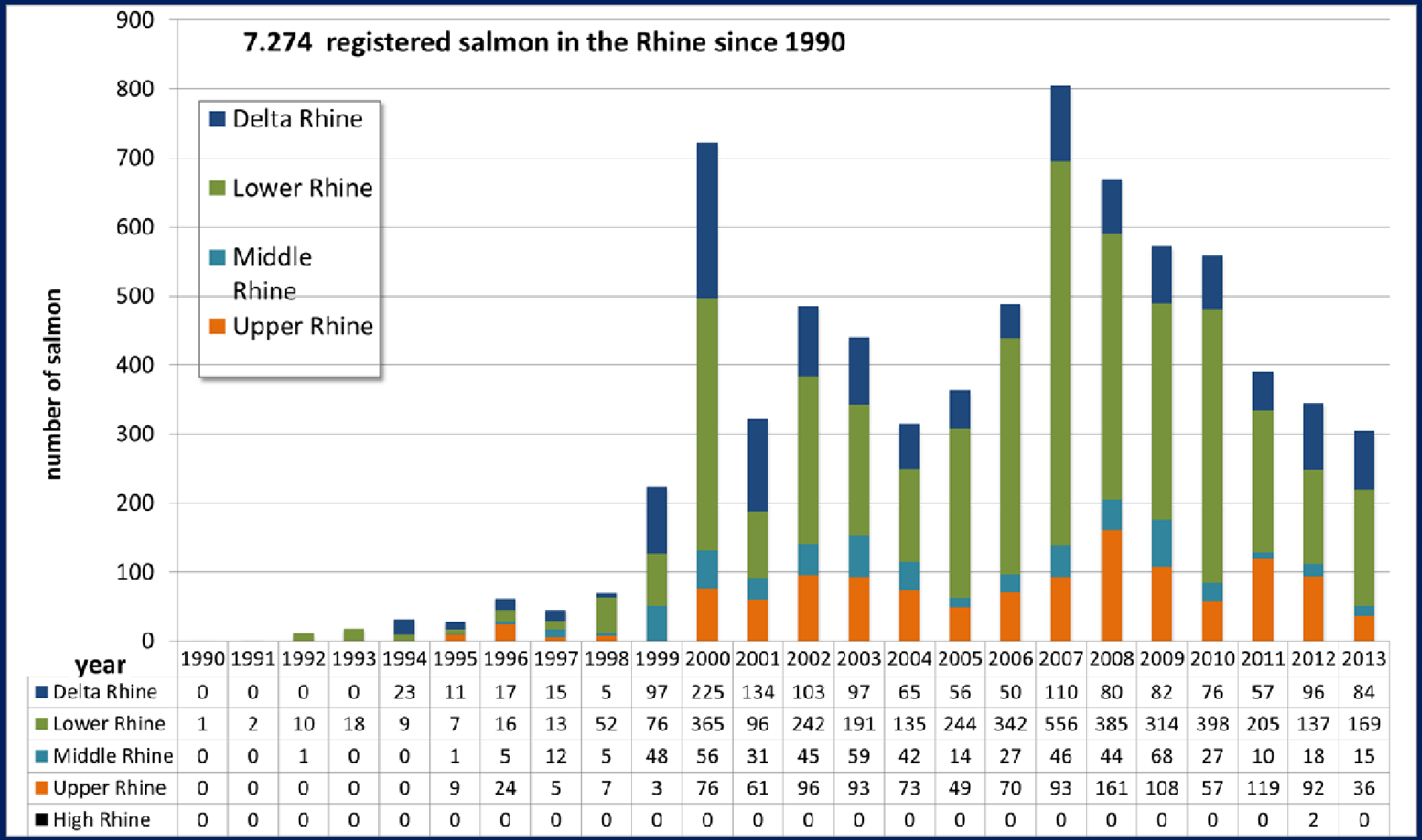
In 2012:
similar results

Water Quality Improvement



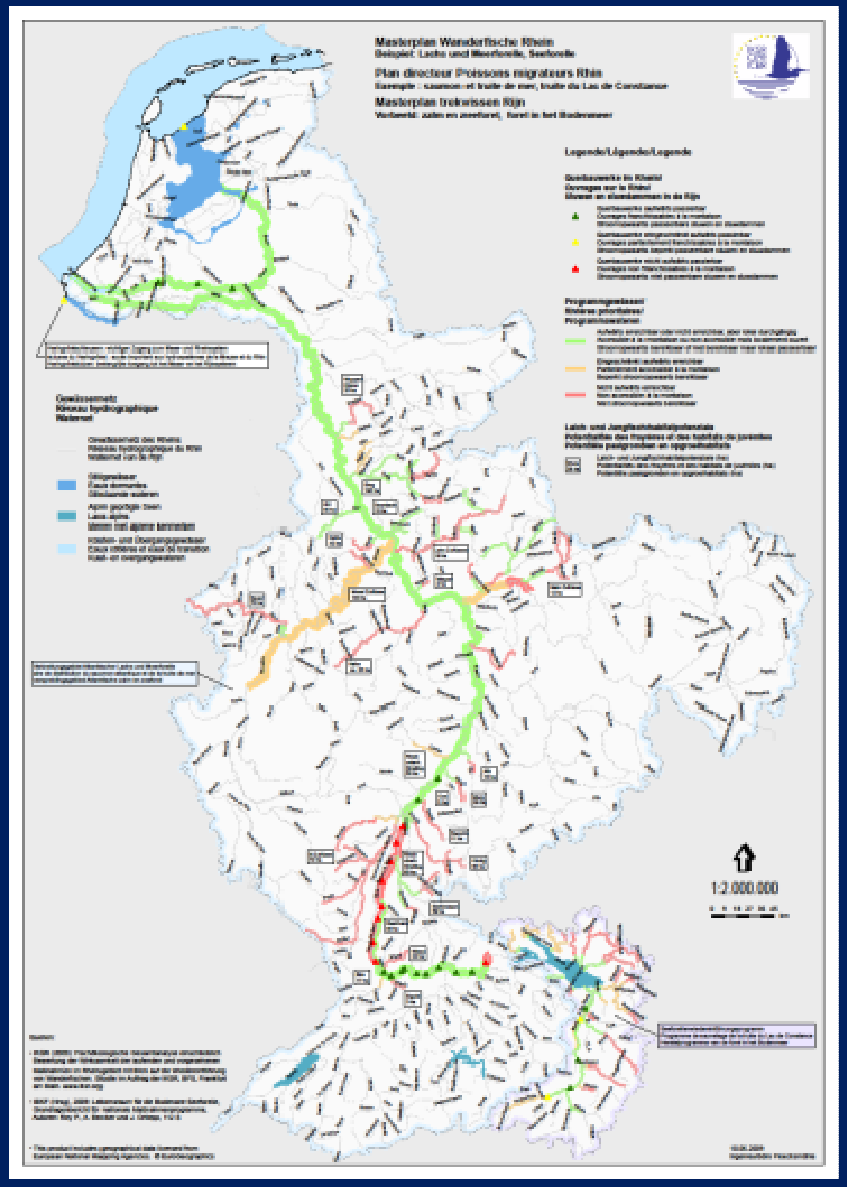


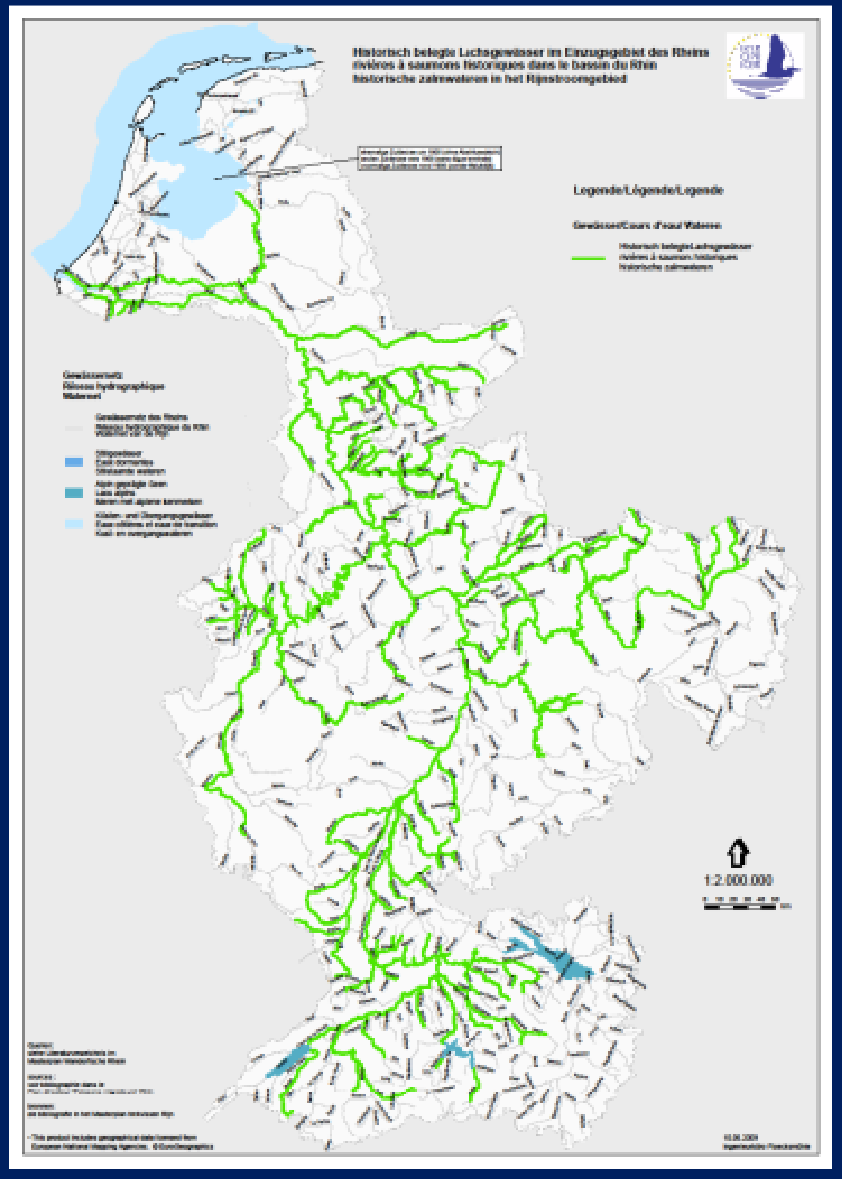
Salmon Returns to the Rhine



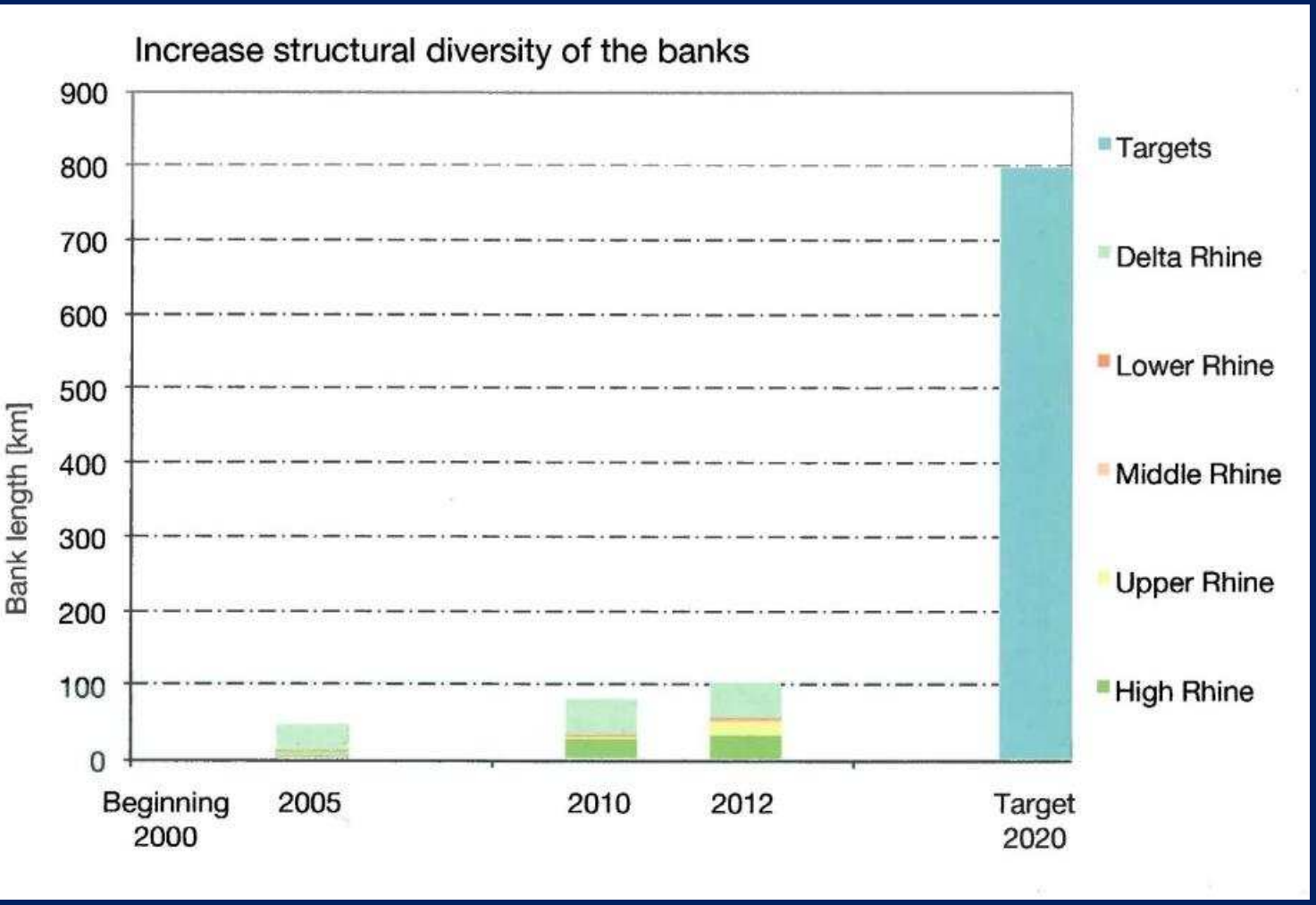
year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Delta Rhine	0	0	0	0	23	11	17	15	5	97	225	134	103	97	65	56	50	110	80	82	76	57	96	84
Lower Rhine	1	2	10	18	9	7	16	13	52	76	365	96	242	191	135	244	342	556	385	314	398	205	137	169
Middle Rhine	0	0	1	0	0	1	5	12	5	48	56	31	45	59	42	14	27	46	44	68	27	10	18	15
Upper Rhine	0	0	0	0	0	9	24	5	7	3	76	61	96	93	73	49	70	93	161	108	57	119	92	36
High Rhine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0

River Continuity





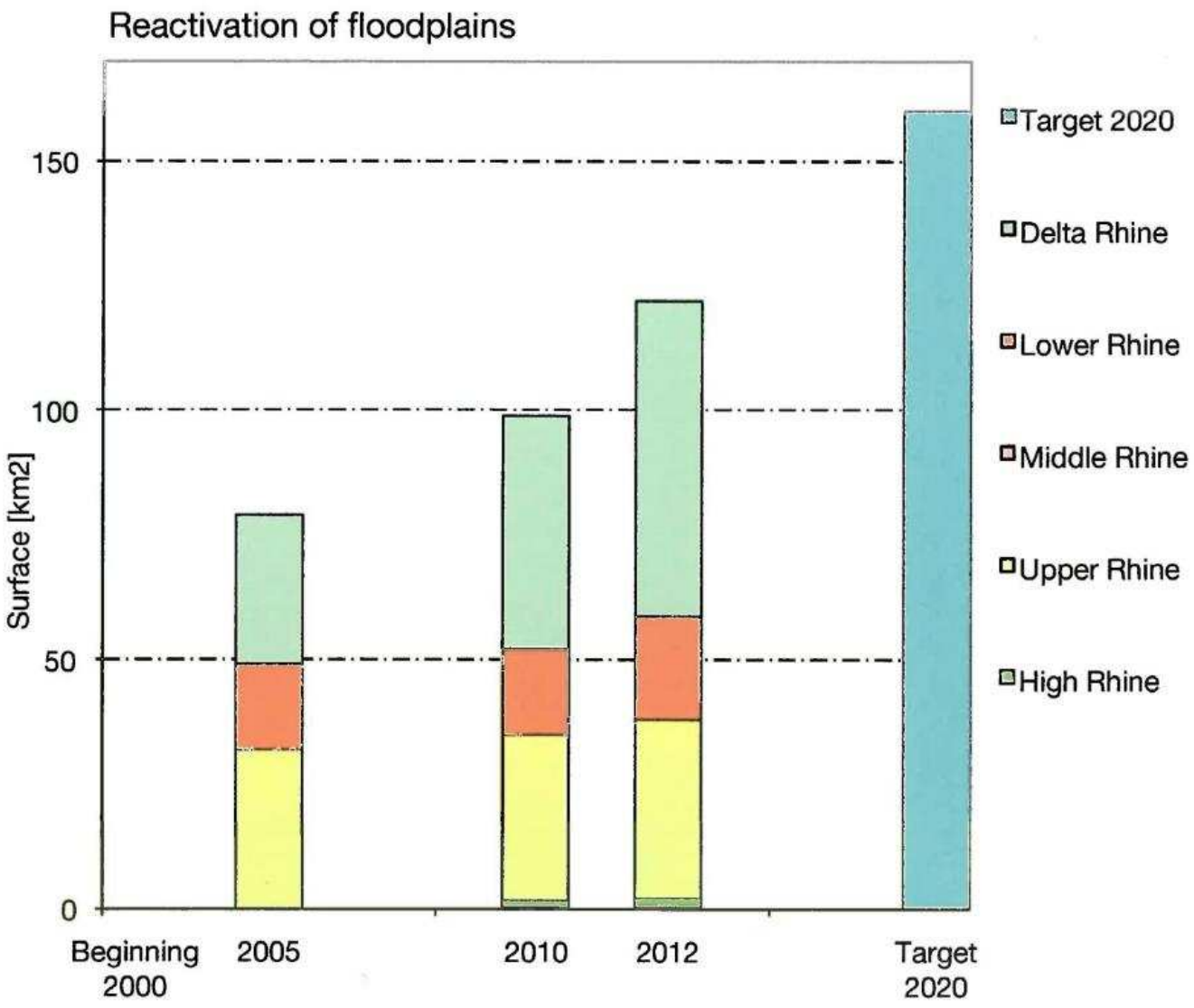
Habitat Diversity of the Banks



before

after

Reactivation of Floodplains



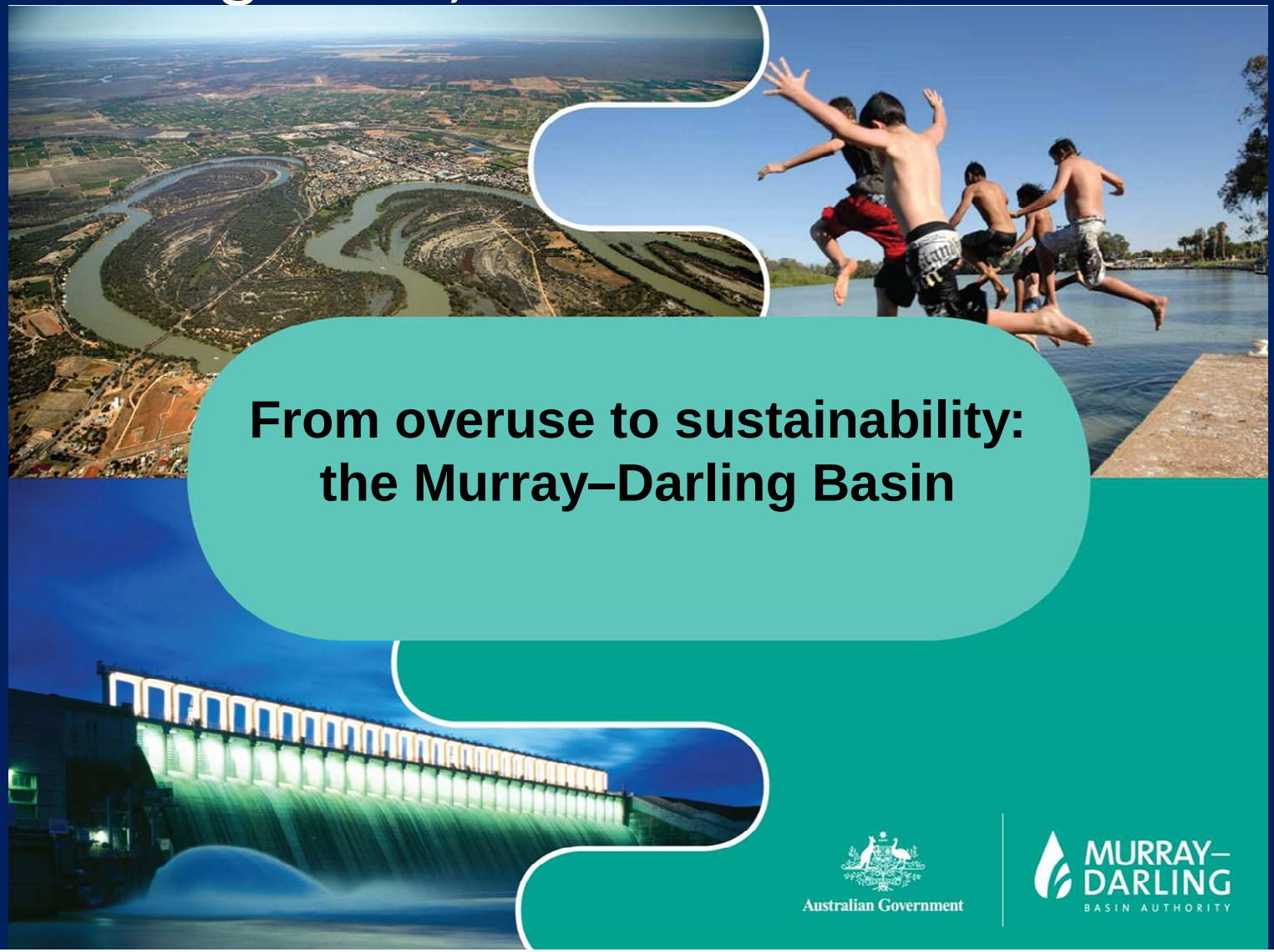
Combine floodplain reactivation with floo mitigation = win-win

122 km²
reactivated floodplains
2000 - 2012

IRBM SCORECARD – River Rhine

CRITERIA	PERFORMANCE
Evidence based (all ways of knowing)	****
Emphasise people processes	****
Inclusivity (sectors, demographics, disciplines, water resources)	****
Manage at the appropriate scale	*****
Integrated information and monitoring based on adaptive management	****
Participation of all stakeholders in planning, decision-making and actions	****
Master plan with clear objectives and multi-year priority investments	****
Mobilization of political will and financial resources	*****
Legal framework to support good water governance	****
Continuous improvement - innovation, review, reporting and foresighting	****
Transfer and exchange knowledge and best practices	***

EXCELLENCE IN IRBM RESTORATION (environmental flows
Murray-Darling Basin, Australia




Murray Darling Basin
Queensland
South Australia
New South Wales
Victoria
Tambo
Augathella
Charleville
Morven
Roma
Chinchilla
Tara
Dalby
Toowoomba
Bollon
St George
Cunnamulla
Warwick
BRISBANE
Goondiwindi
Stanthorpe
Hungerford
Moree
Tenterfield
Walgett
Wanaaring
Bourke
Narrabri
White Cliffs
Darling River
Coonamble
Gunnedah
Armidale
Coonabarabran
Wilcannia
Cobar
Tamworth
Broken Hill
Menindee Lakes
Dubbo
Wellington
Ivanhoe
Forbes
Orange
Lachlan River
Bathurst
Morgan
Lake Victoria
Wentworth
Cowra
Renmark
Murray River
Hay
Griffith
Leeton
Young
SYDNEY
ADELAIDE
Mannum
Balranald
Murrumbidgee River
Narrandera
Murray Bridge
Gundagai
Tumut
Goolwa
Swan Hill
Wagga Wagga
Meningie
Lake Alexandrina
Deniliquin
CANBERRA
Albury
Kerang
Echuca
Wodonga
Cooma
Shepparton
Horsham
Bendigo
Seymour
Omeo
MELBOURNE
0 km 100 200

Issues

Algal blooms

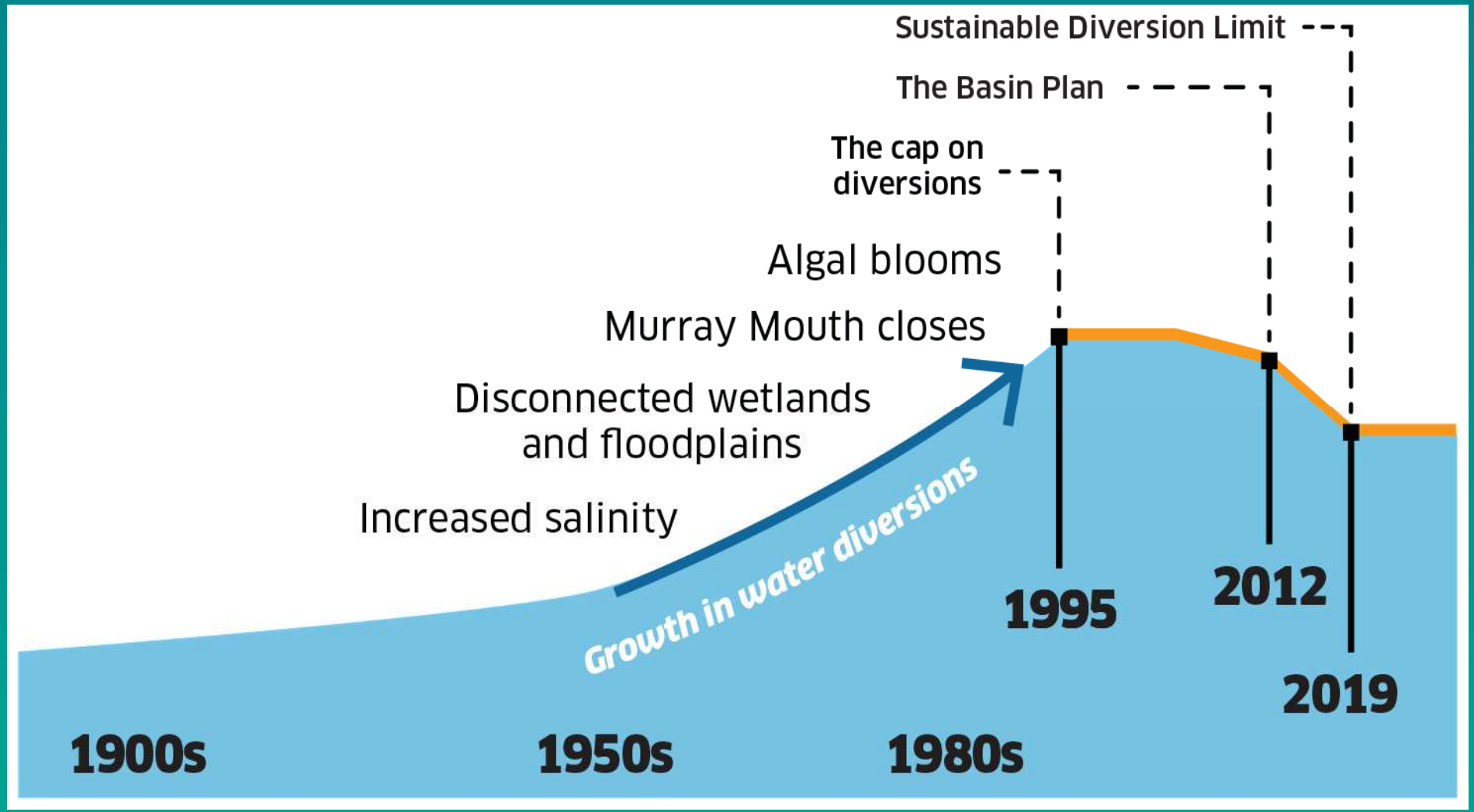
Drought
(Matt Barwick)

Murray Mouth closing

Salinity

Loss of river red gums

MAIN DRIVER: Water over-use in the MDB



Water management actions

7: Basin-wide **cap on water diversions**

0+: Establish a **water market** (separate land and water entitlements, temporary and permanent tra
ate water to most productive uses, increase GDP, help survive drought or exit industry, environmental w
hases by government)

7: **Fund A$10 billion** for water entitlement buy-backs and irrigation efficiencies

8: Creation of an empowered **basin-wide river Authority** via new Water Act

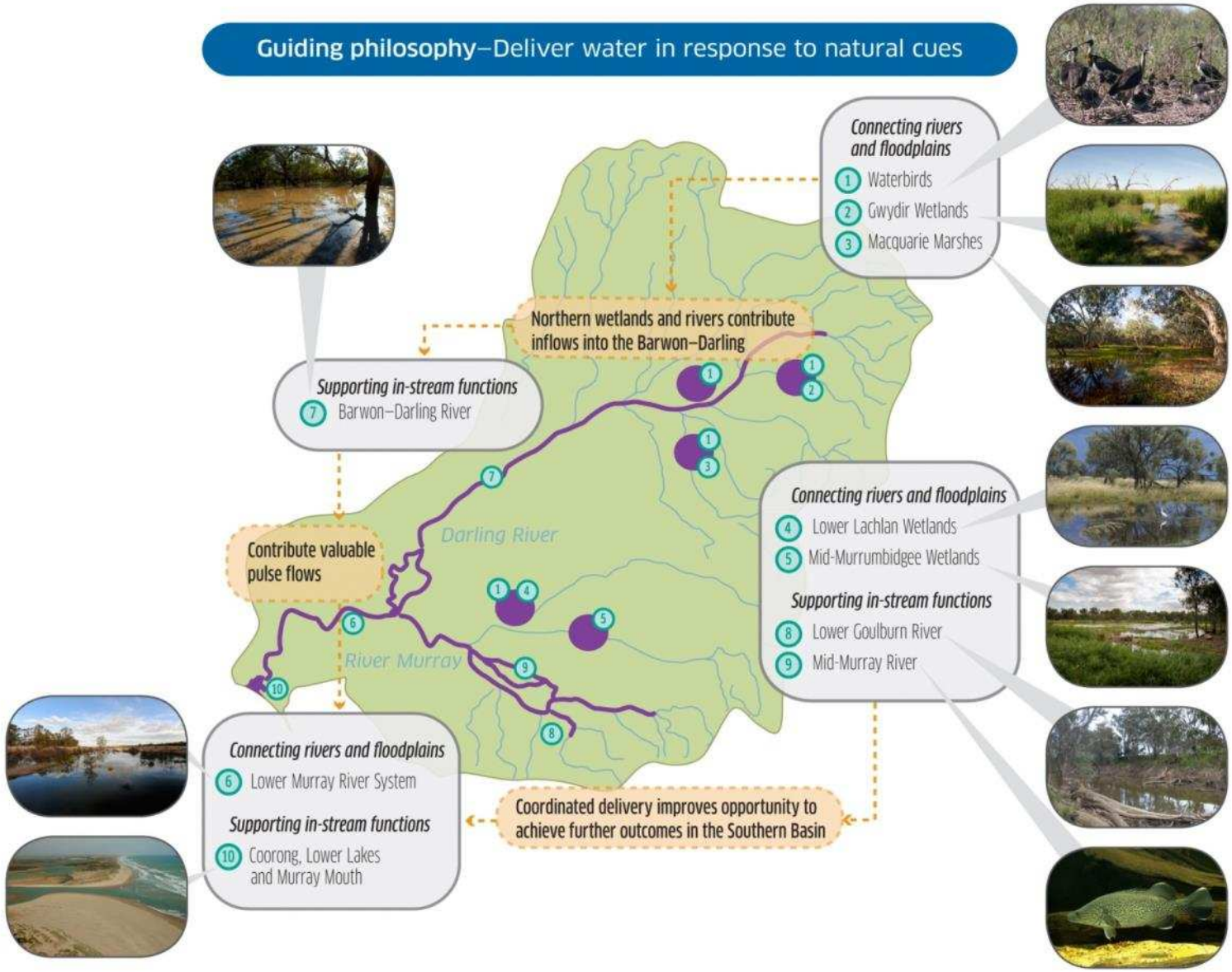
0: Calculate **sustainable diversion limits (SDLs)** in each sub-catchment and groundwate

2: new **water sharing Basin Plan** legislated

9: new water sharing plans encompassing SDLs and **reduced water allocations**

Water use efficiency – better technology

Environmental watering



RESULTS: Bringing back the water

Photos courtesy Commonwealth Environmental Water Holder

IRBM SCORECARD – Murray-Darling Basin

CRITERIA	PERFORMANCE
Evidence based (all ways of knowing)	***
Emphasise people processes	***
Inclusivity (sectors, demographics, disciplines, water resources)	***
Manage at the appropriate scale	*****
Integrated information and monitoring based on adaptive management	***
Participation of all stakeholders in planning, decision-making and actions	**
Master plan with clear objectives and multi-year priority investments	*****
Mobilization of political will and financial resources	*****
Legal framework to support good water governance	****
Continuous improvement - innovation, review, reporting and foresighting	****
Transfer and exchange knowledge and best practices	***

EXCELLENCE IN IRBM

- Restoration via IRBM (Rhine, Murray-Darling Basin)
- **Protection via IRBM (Lake Eyre Basin)**
- Sustainable development via IRBM (Mekong)

EXCELLENCE IN IRBM PROTECTION

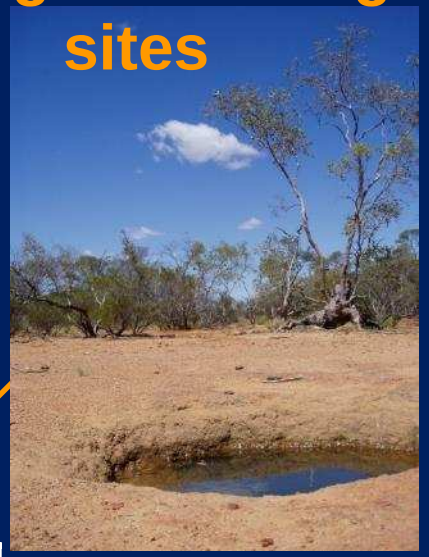
The Lake Eyre Basin Partnership –protecting one of the world's great river systems

2014 Australian River*prize* winner

Significant places

Ramsar wetlands – Coongie Lakes

Aboriginal heritage sites

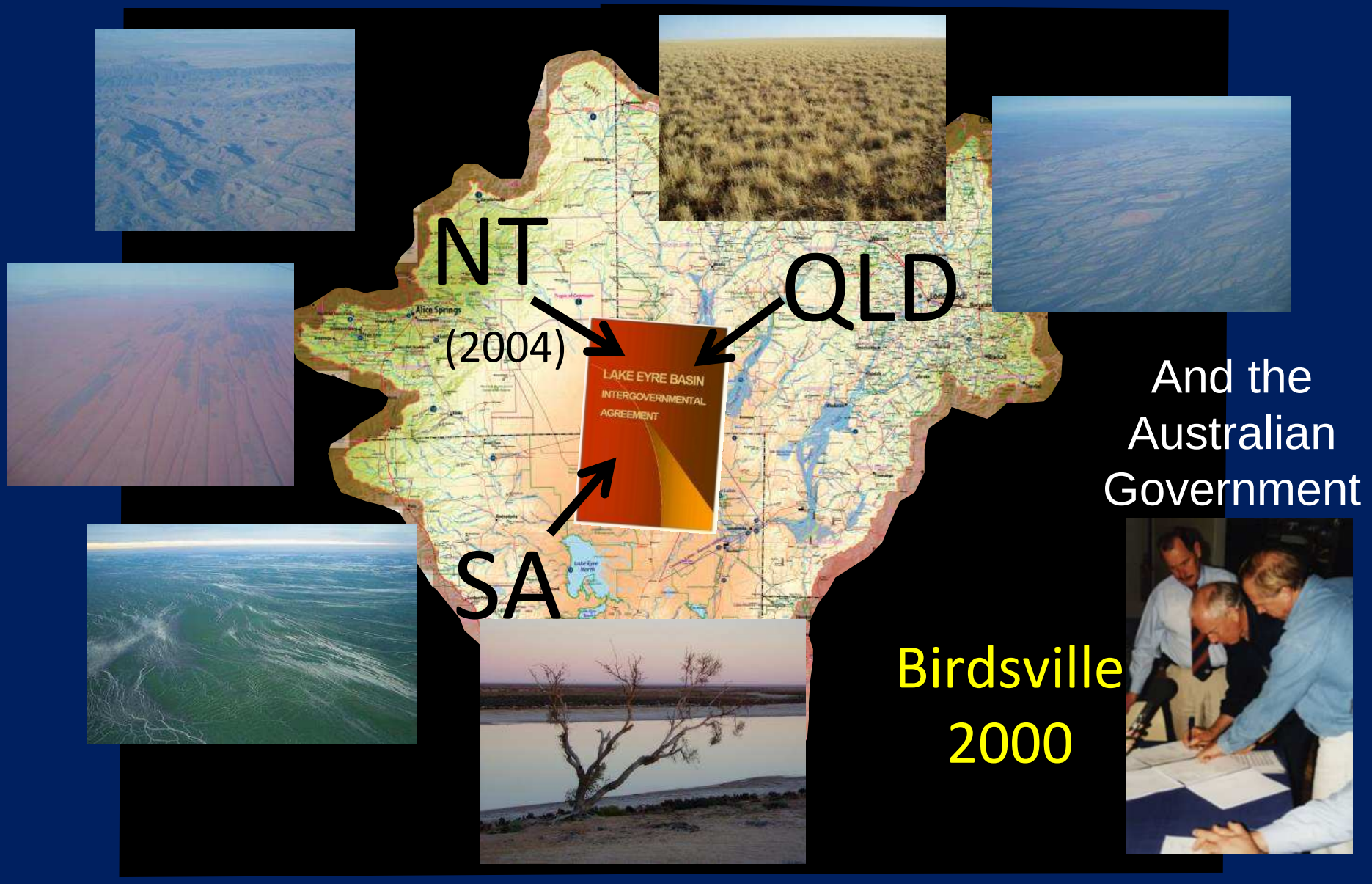


Mound Springs

Permanent waterholes

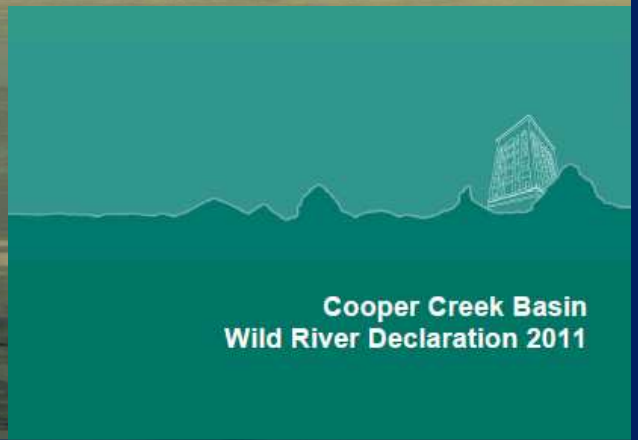
Channel country

The Lake Eyre Basin Agreement to protect river flows



natural resource management

- Mining impacts
  - Unconventional Gas
  - Spills (Lady Annie Mine)
- Invasive species
- Floodplain developments
  - Roads, levee banks
- Dams
- Wild River legislation

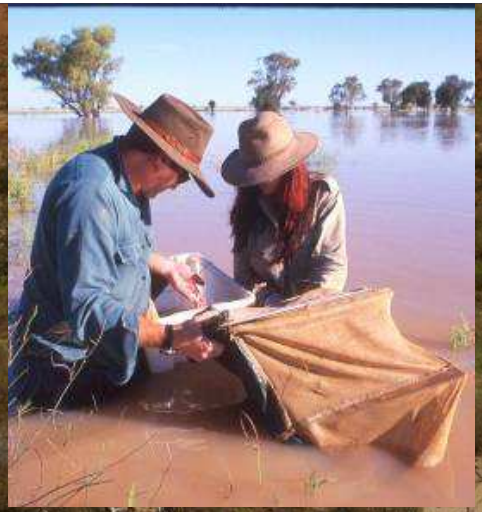


connecting communities

- Upstream to downstream
- Traditional Owners across the Basin
  - Map of Aboriginal communities
- Community, science, government and industry
  - Socio-economic analysis of the Lake Eyre Basin
  - Tourism study
  - Rivers Assessment and research

Science & monitoring

- Lake Eyre Basin Rivers Assessment
  - Fish
  - Invertebrates
  - Flow and water quality
  - Waterbirds
  - Geomorphology
  - Social



- 53 monitored sites
- Long-term commitment by governments to monitoring
- New understandings of biodiversity, threats and vulnerabilities

IRBM SCORECARD – Lake Eyre Basin

CRITERIA	PERFORMANCE
Evidence based (all ways of knowing)	*****
Emphasise people processes	****
Inclusivity (sectors, demographics, disciplines, water resources)	****
Manage at the appropriate scale	*****
Integrated information and monitoring based on adaptive management	****
Participation of all stakeholders in planning, decision-making and actions	****
Master plan with clear objectives and multi-year priority investments	****
Mobilization of political will and financial resources	****
Legal framework to support good water governance	****
Continuous improvement - innovation, review, reporting and foresighting	****
Transfer and exchange knowledge and best practices	***

EXCELLENCE IN IRBM

- Restoration via IRBM (Rhine, Murray-Darling Basin)
- Protection via IRBM (Lake Eyre Basin)
- **Sustainable development via IRBM (Mekong)**

CHALLENGES FOR IRBM SUSTAINABLE DEVELOPMENT
Mekong Case Study

- The Mekong River is one of the most bio-diverse rivers in the world, second only to the Amazon
- 55 million in the Lower Mekong Basin depend directly on the river for food and income – fisheries and agriculture

SUSTAINABLE DEVELOPMENT CHALLENGES

High **population growth** with large **demographic momentum** - 30% under 16

High levels of **poverty**

Rapid migration from **rural to urban** areas

Regional **food demand** is expected to double by 2050

Over-exploitation of **fish stocks** is threatening biodiversity

Climate change is decreasing water availability and food production and increasing temperatures, floods, droughts and sea level

Massive hydropower developments in progress and planned

Transboundary policy development and integrated problem-solving

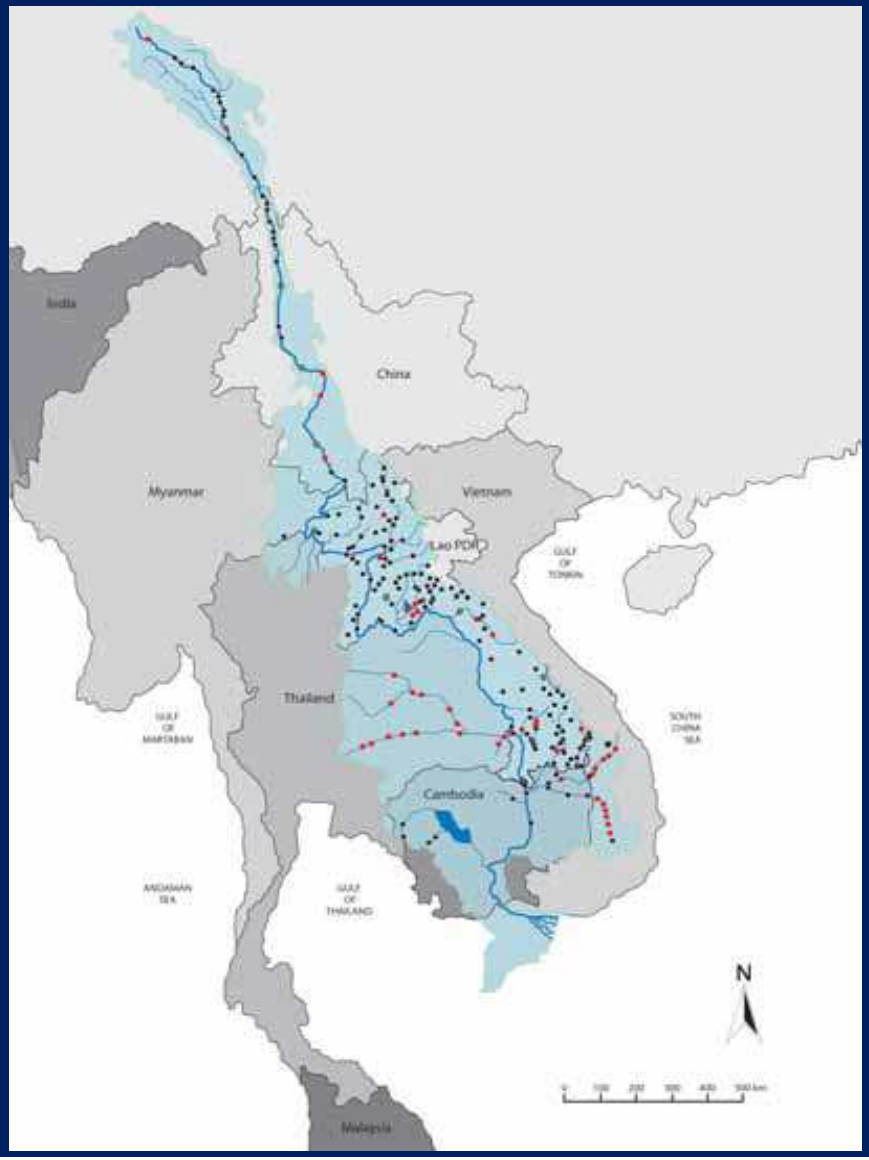
Hydropower – the most contentious issue

The **most significant impact** on the use of water in the Mekong Region is hydropower

Hydropower is the **favoured energy option** for the Mekong's riparian countries

The Lower Mekong, shared by Cambodia, Laos, Thailand, and Vietnam, continues to flow freely but **11 large hydropower dams** on the Lower Mekong River are planned

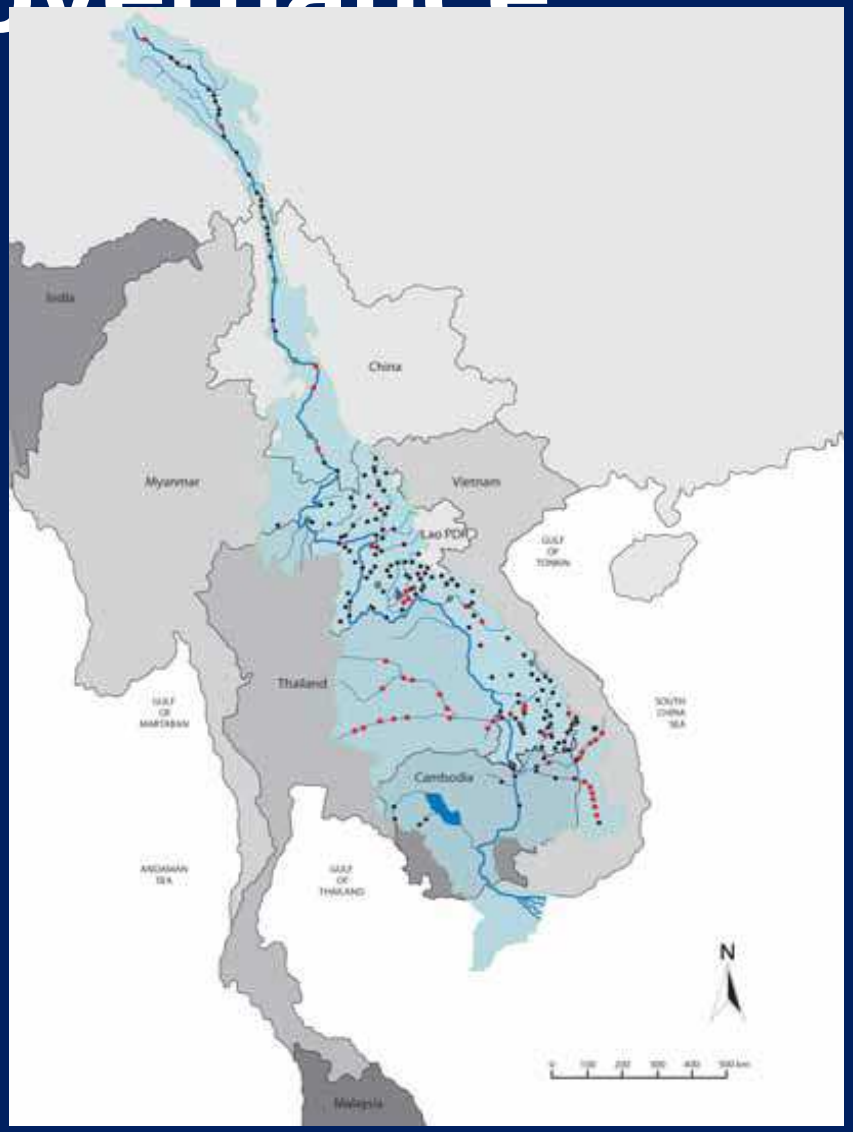
These dams will block the migration of fish and change their natural habitats. **More than 100 species would be at risk of extinction** (MRC 2010)



Greater Mekong Subregion economic corridors

- Developing the economic potentia of the Mekong River for domestic use, hydropower, navigation, irrigation and drought managemer is the **key to fighting poverty and increasing people's welfare**
- Since 1992 the main strategy of Mekong region governments is building **economic linkages**, connect infrastructure, promote cross-border trade and collaborative responses to social and environmental problems

A need for deliberative water governance



"Ideally decisions will be the result of an informed and negotiated process that has assessed options and impacts, respected rights, accounted for risks, acknowledged responsibilities and sought to fairly distribute rewards – the essence of deliberative water governance." Dore et al.2012

IRBM SCORECARD – Mekong Basin

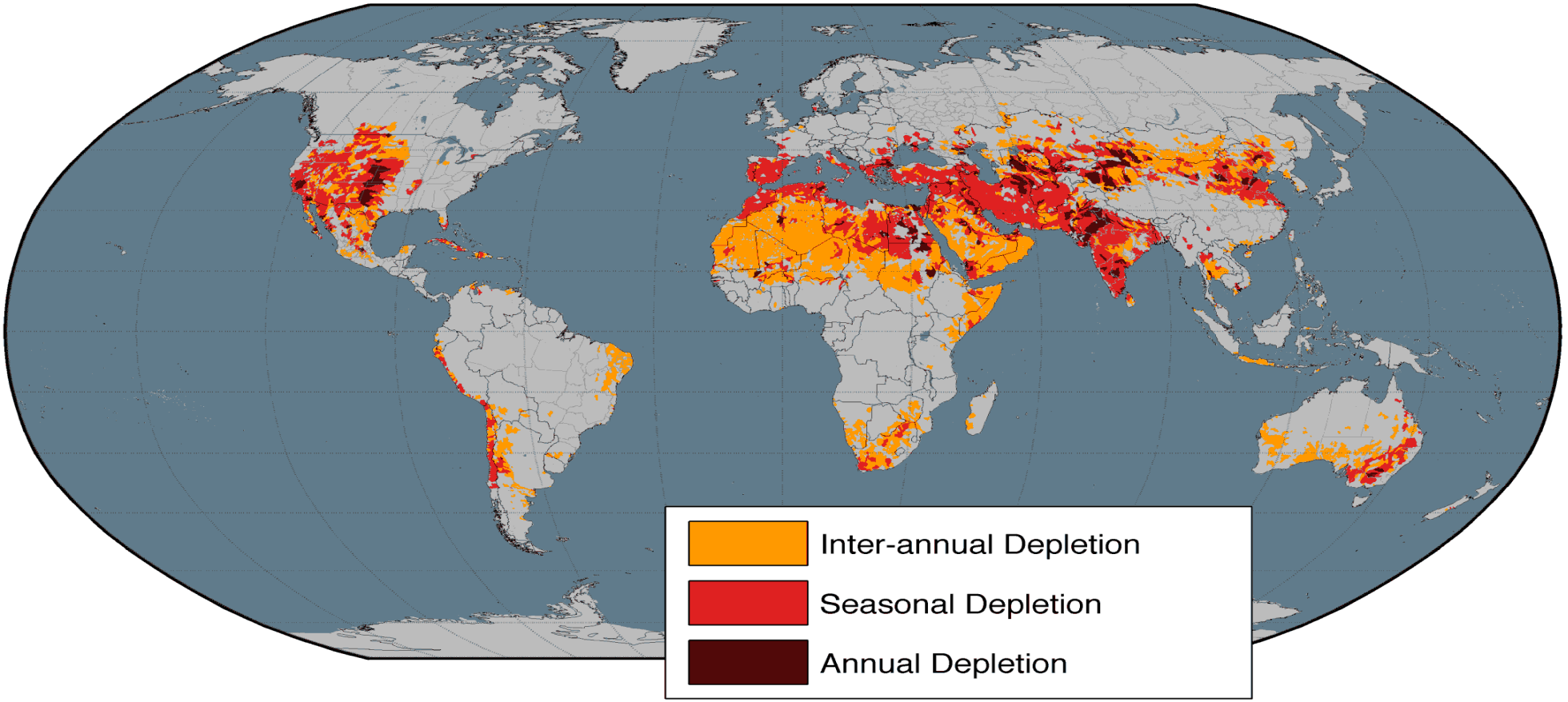
CRITERIA	PERFORMANCE
Evidence based (all ways of knowing)	**
Emphasise people processes	**
Inclusivity (sectors, demographics, disciplines, water resources)	**
Manage at the appropriate scale	****
Integrated information and monitoring based on adaptive management	**
Participation of all stakeholders in planning, decision-making and actions	*
Master plan with clear objectives and multi-year priority investments	***
Mobilization of political will and financial resources	***
Legal framework to support good water governance	***
Continuous improvement - innovation, review, reporting and foresighting	***
Transfer and exchange knowledge and best practices	**

FUTURE OF IRBM

Three prominent IRBM challenges

- Water scarcity
- Water infrastructure
- Climate change

Water scarcity - Running Dry

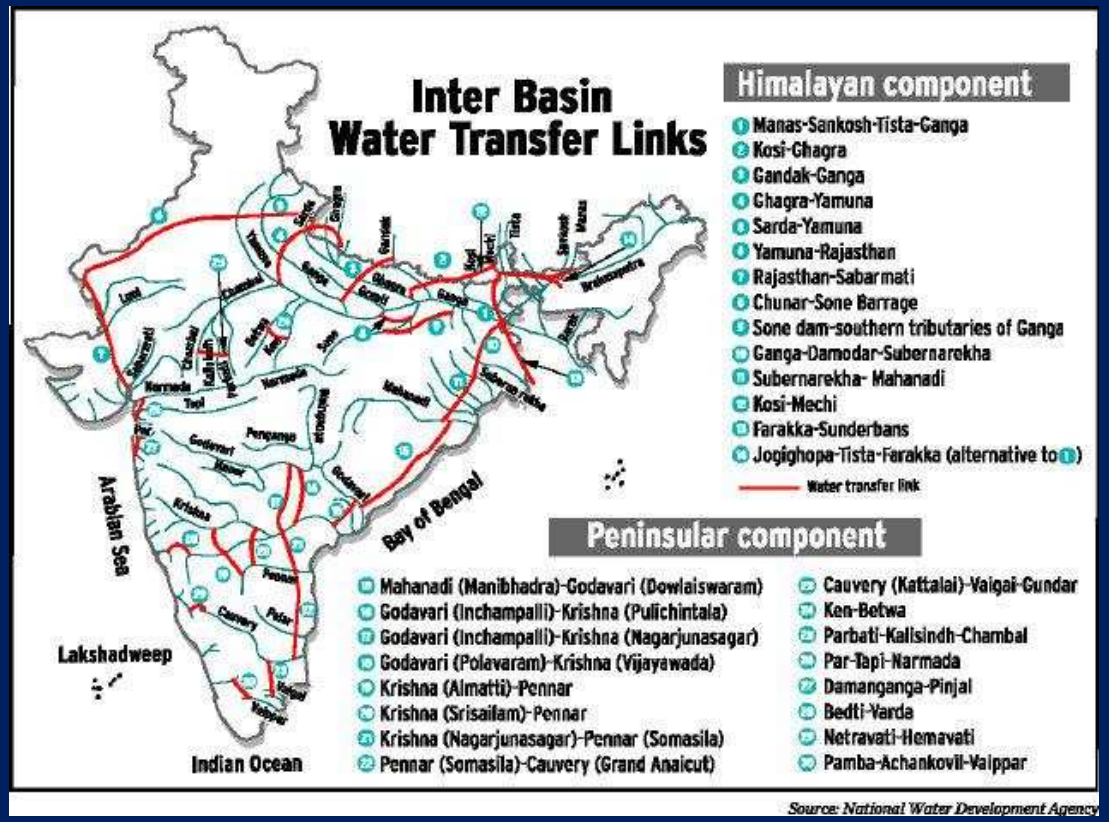


Water shortages are occurring in 1/3 of the planet's watersheds and aquifers
1/2 of the world's population is affected
3/4 of the world's irrigated acreage is affected

Devastating to local economies

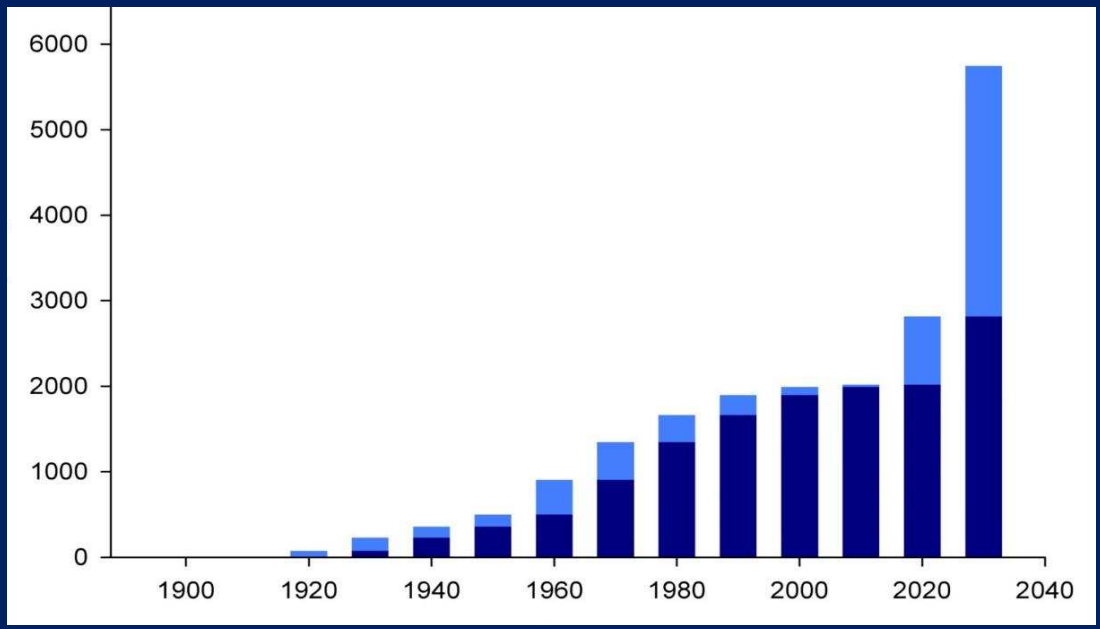
Texas lost $12B in 2011

Large (water) infrastructure programs

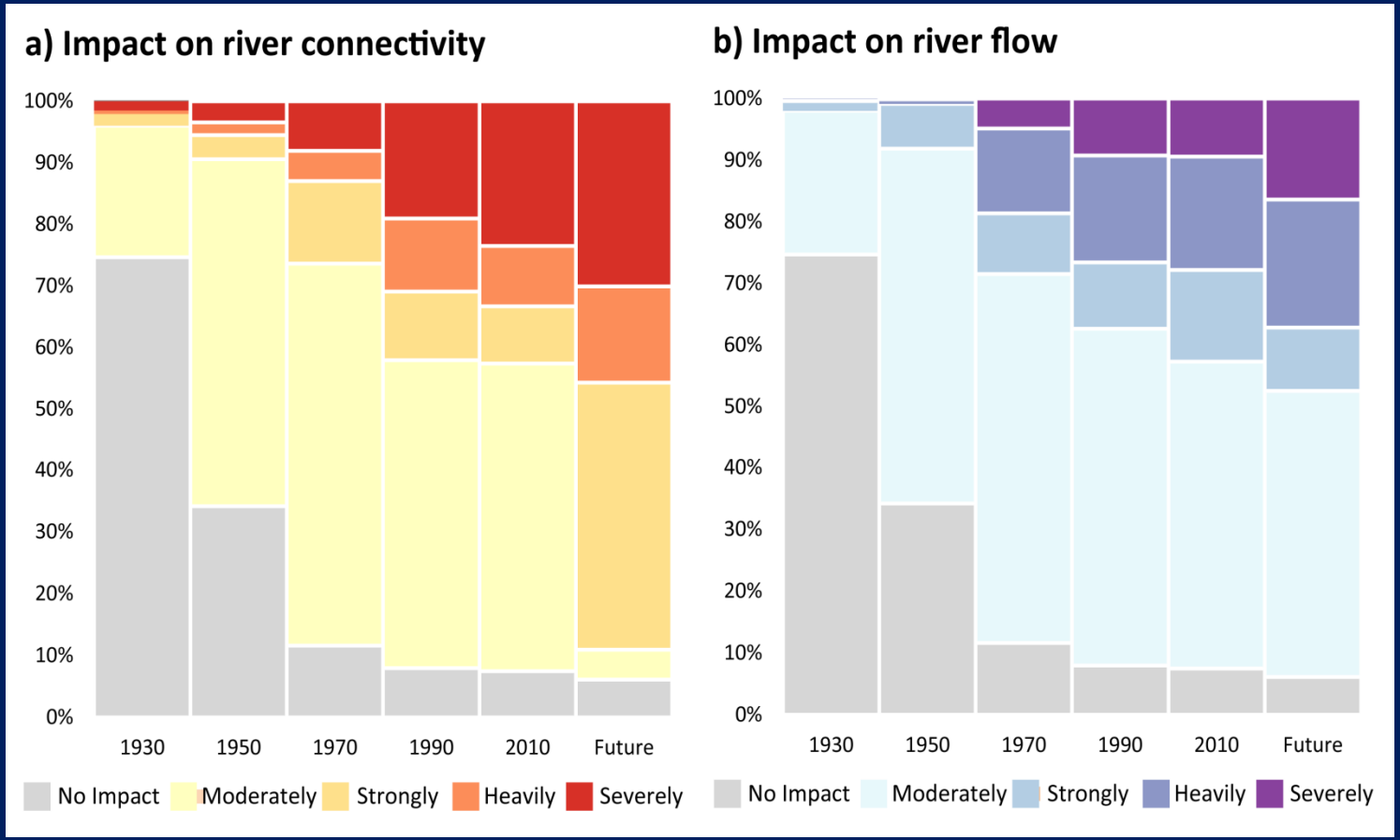


Source: National Water Development Agency

Hydropower development



Proportion of global river volume impacted by fragmentation (a) and flow regulation (b)



(Grill *et al.* in rev. Env. Res. Letter)

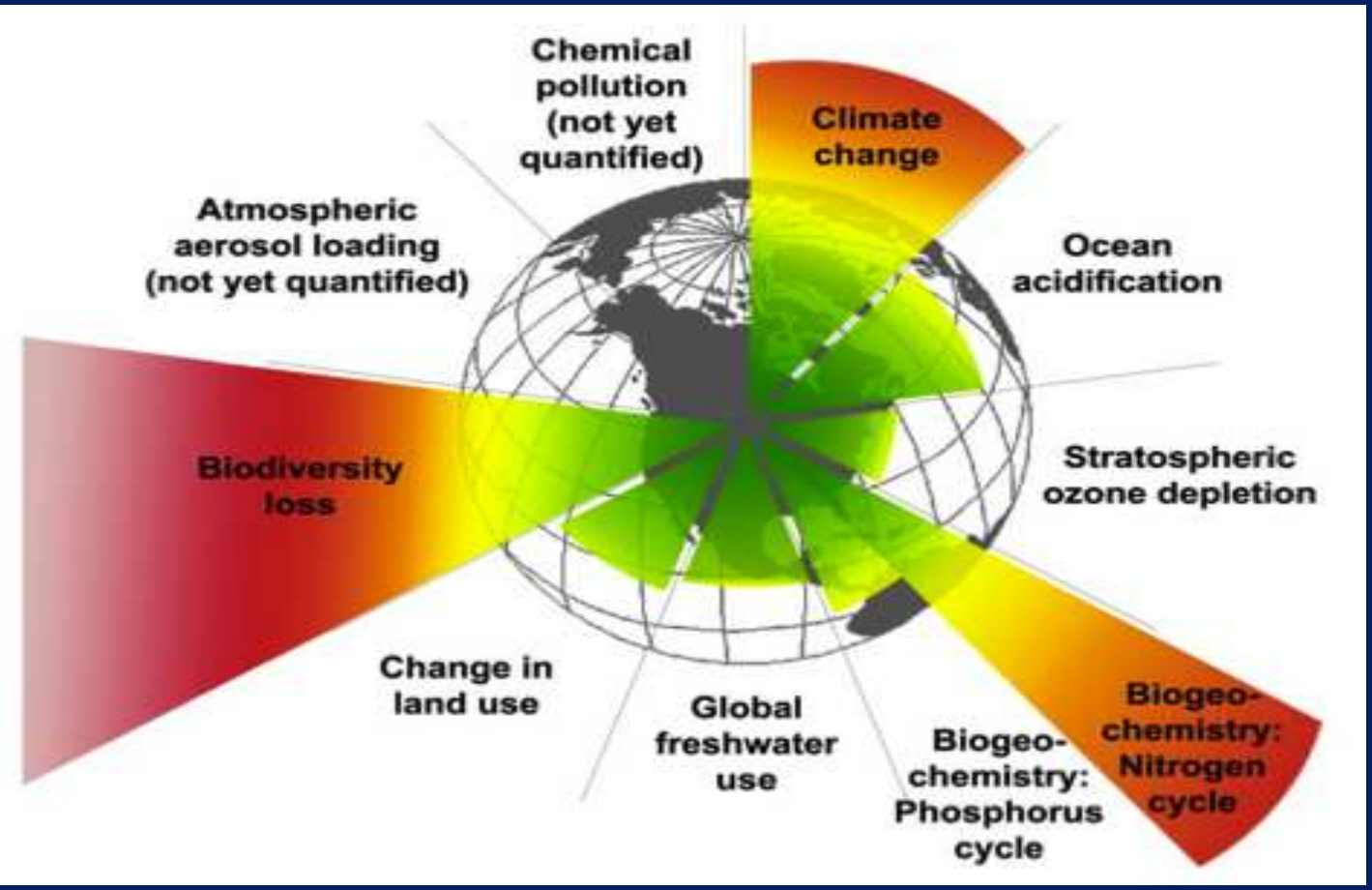
Climate change consequences

Climate change is likely to increase the frequency of extreme events, such as floods and droughts

FUTURE OF IRBM

Subset of wider change

LANETARY BOUNDARIES: Fundamental ological constraints exceeded



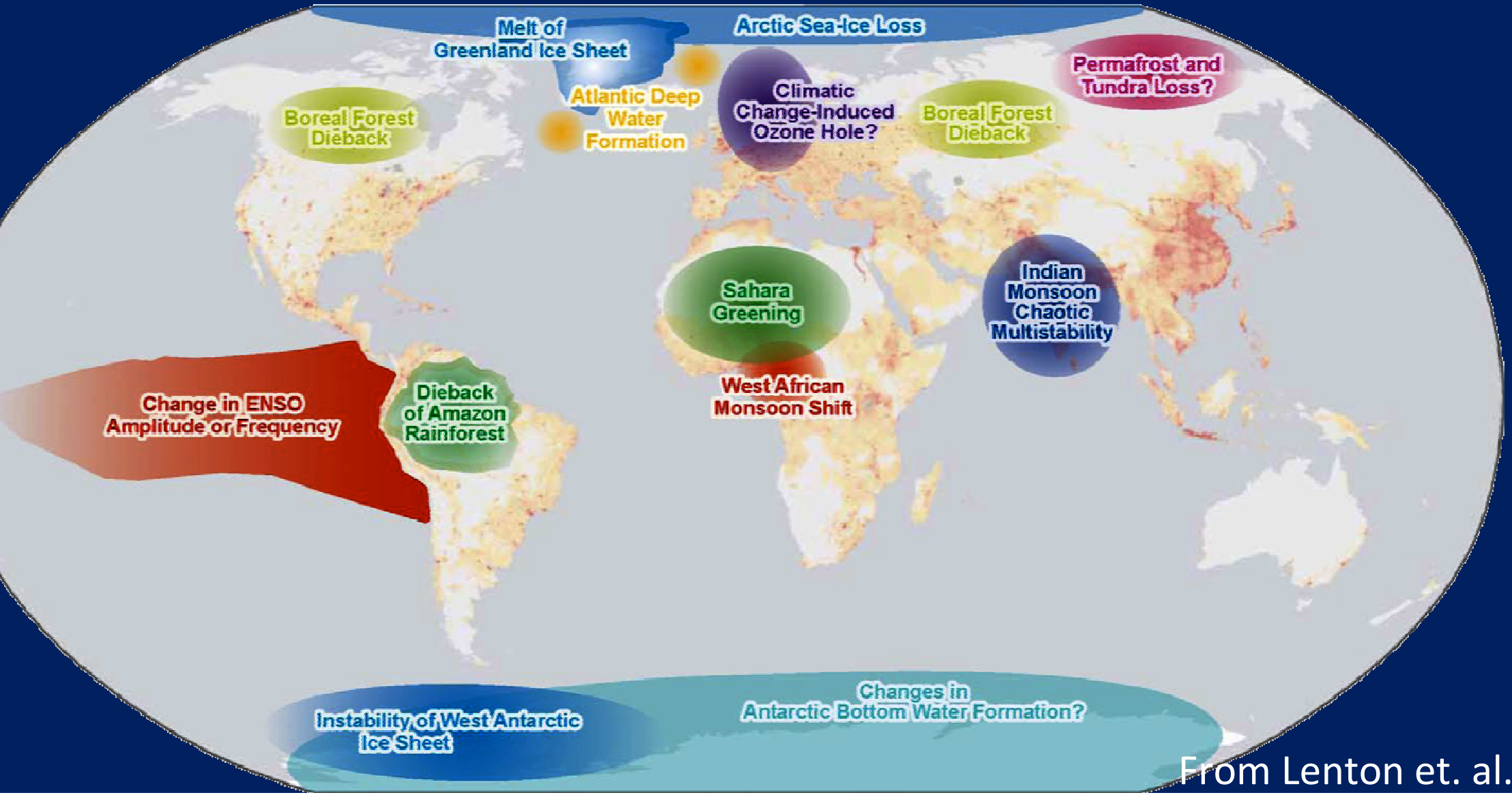
Rockström, J., et al. 2009. **A safe opera space for humanity.** ***Nature*** **461:472-4**

Steffen, W., J. Rockström, and R. Costa 2011. **How Defining Planetary Bounda Can Transform Our Approach to Grow** ***Solutions*****. Vol 2, No. 3, May 2011**

Human influence on the earth system is now so large, that a new geologic era (*the Anthropocene*) ha begun.

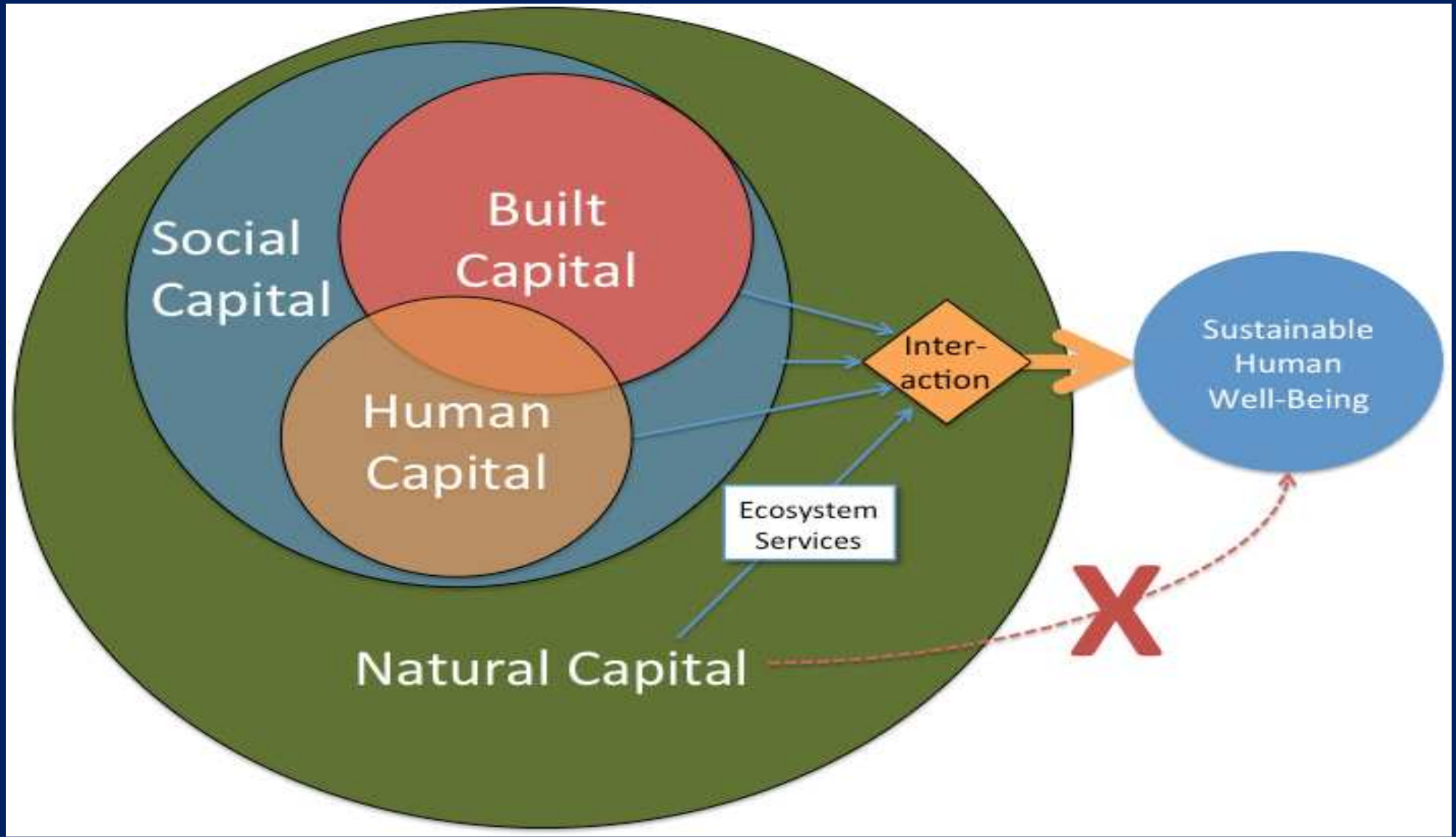
usiness as usual is NOT an option

orld and basins are complex, non-linear, adaptive
stems, with thresholds, tipping points and surpris



From Lenton et. al. 2

New thinking for a sustainable world

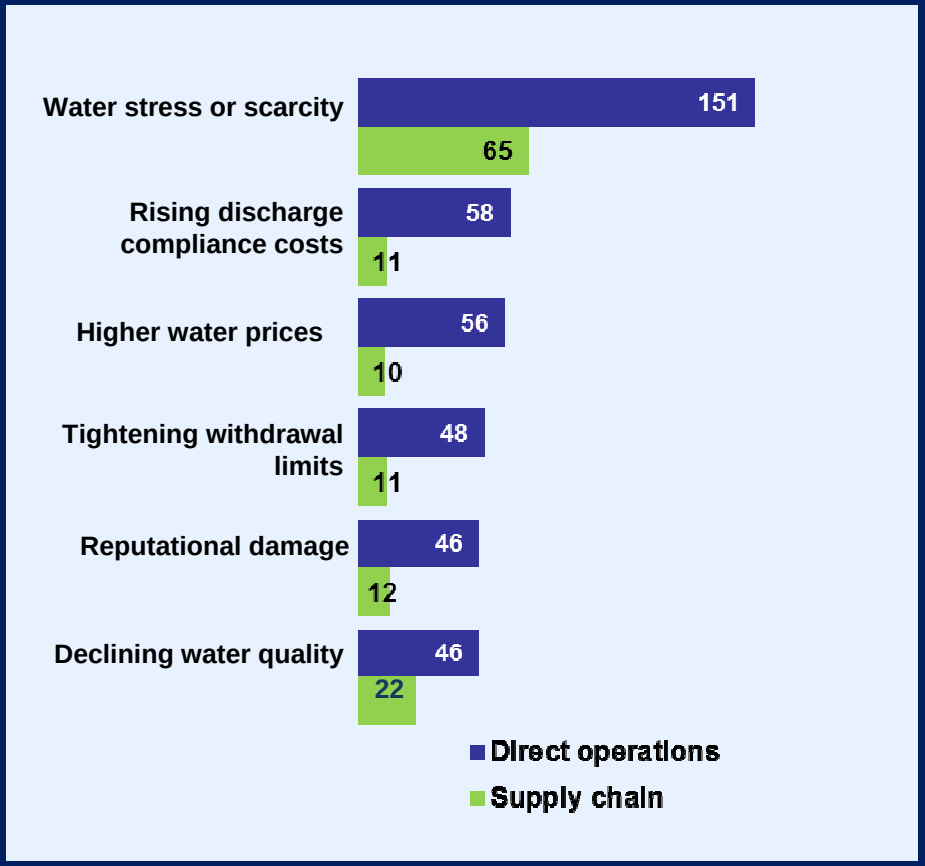


Engaging business - recognising risks

70%

Companies reporting exposure to substantive water risks

19% increase from 2011



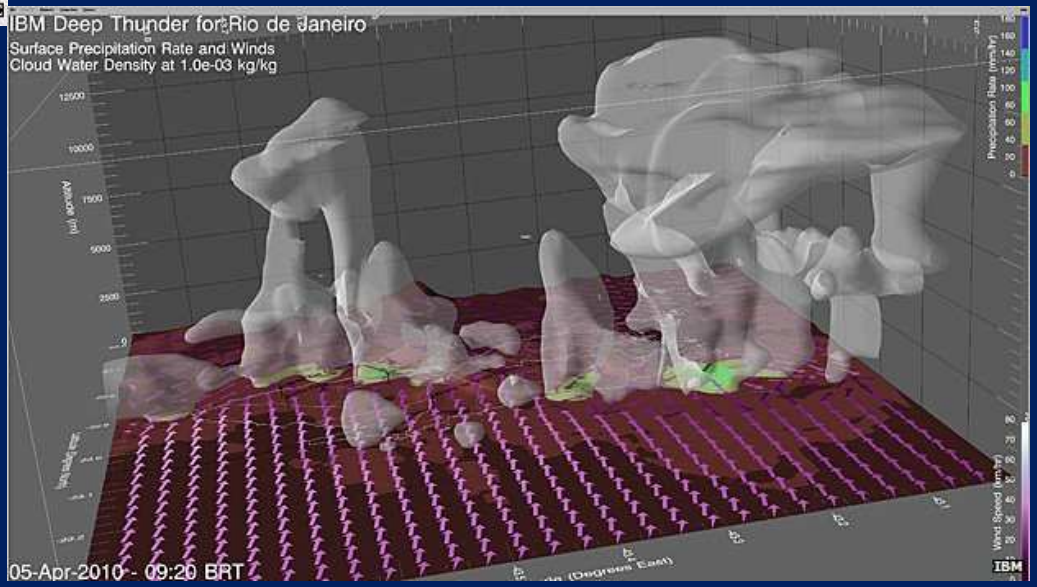
Source: CDP and Norges Bank Investment Management

Water shortages flagged by World Economic Forum as a ‘Top 3’ global risk

Engaging business – part of the solution

"Business finds new ways to save water for the future"

By Daniel Thomas,
Business reporter
11 September 2014, BBC News



Take Home Messages

- **IRBM** is well established and **performing highly**
- Very **good examples** of IRBM best practice exist
- Key **success criteria** have emerged
- IRBM takes **time, persistence and money**!
- **Sharing** IRBM experiences **is increasing**
- **Sustainable development** of healthy rivers and basins is a **major challenge**
- Future **pressures** on rivers and basins **are enormous** (population, infrastructure, climate change)
- IRBM is a **subset of** needed **wider socio-ecological change**
- **Engaging business** in IRBM **is part of the solution**