Excellence, collaboration and integration in large river management

Dr Nick Schofield
International RiverFoundation
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 Thiess 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

In 2012: similar results
Water Quality Improvement

- Lead
- Ammonium-N
- Total phosphorous

Locations:
- Maassluis
- Kampen
- Bimmen/Lobith
- Koblenz/Mosel
- Koblenz/Rhein
- Lauterbourg
- Weil am Rhein
- Reckingen
Salmon Returns to the Rhine

7,274 registered salmon in the Rhine since 1990

- Delta Rhine
- Lower Rhine
- Middle Rhine
- Upper Rhine

Yearly counts from 1990 to 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, 355, 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, 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, 0, 0, 0, 0, 2, 0
River Continuity
Habitat Diversity of the Banks

Increase structural diversity of the banks

- Targets
- Delta Rhine
- Lower Rhine
- Middle Rhine
- Upper Rhine
- High Rhine

Before

After
Reactivation of Floodplains

Combine floodplain reactivation with flood mitigation = win-win

122 km² reactivated floodplains 2000 - 2012
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EXCELLENCE IN IRBM RESTORATION (environmental flows)
Murray-Darling Basin, Australia

From overuse to sustainability: the Murray–Darling Basin
Issues

Algal blooms

Drought
(Matt Barwick)

Murray Mouth closing

Loss of river red gums

Salinity
MAIN DRIVER: Water over-use in the MDB

- Sustainable Diversion Limit
- The Basin Plan
- The cap on diversions
- Algal blooms
- Murray Mouth closes
- Disconnected wetlands and floodplains
- Increased salinity

Growth in water diversions

1900s  1950s  1980s  2019

1995  2012
Water management actions

7: Basin-wide cap on water diversions

20+: Establish a water market (separate land and water entitlements, temporary and permanent trades, allocate water to most productive uses, increase GDP, help survive drought or exit industry, environmental water purchases 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

10: Calculate sustainable diversion limits (SDLs) in each sub-catchment and groundwater

2: new water sharing Basin Plan legislated

9: new water sharing plans encompassing SDLs and reduced water allocations
Water use efficiency – better technology

$10 billion
Early years – watering during drought

Environmental watering

Guiding philosophy – Deliver water in response to natural cues

Connecting rivers and floodplains
1. Waterbirds
2. Gwydir Wetlands
3. Marlopi Marshes

Connecting rivers and floodplains
4. Lower Lachlan Wetlands
5. Mid-Murrumbidgee Wetlands

Supporting in-stream functions
6. Lower Goulburn River
7. Mid-Murray River

Supporting in-stream functions
8. Coong, Lower Lakes and Murray Mouth

Northern wetlands and rivers contribute inflows into the Barwon–Darling

Contribute valuable pulse flows

Supporting in-stream functions
9. Barwon–Darling River

Coordinated delivery improves opportunity to achieve further outcomes in the Southern Basin
RESULTS: Bringing back the water

Photos courtesy Commonwealth Environmental Water Holder
## IRBM SCORECARD – Murray-Darling Basin

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• 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 Riverprize winner
Significant places

- Ramsar wetlands – Coongie Lakes
- Mound Springs
- Permanent waterholes
- Channel country

Aboriginal heritage sites
The Lake Eyre Basin Agreement to protect river flows

And the Australian Government

Birdsville 2000
natural resource management

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

Cooper Creek Basin
Wild River Declaration 2011
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

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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
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 potential of the Mekong River for domestic use, hydropower, navigation, irrigation and drought management 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
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FUTURE OF IRBM

Three prominent IRBM challenges

• Water scarcity
• Water infrastructure
• Climate change
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

Hydropower development

Inter Basin Water Transfer Links

Himalayan component
- Manas-Senkata-Tista-Ganga
- Kosi-Chakra
- Gandak-Ganga
- Ganges-Yamuna
- Sarda-Yamuna
- Yamuna-Reejahsh
- Rajasthan-Sabarmati
- Chunar-Sone Barrage
- Some dam southern tributaries of Ganga
- Ganges-Narmada-Sabarmati
- Sabarmati-Vardhman
- Kosi-Machhi
- Farakka-Sunderbans
- Jogighothe-Tista-Farakka (alternative route)

Peninsular component
- Mahanadi (Mohanbhum)-Godavari (Bawahiwara)
- Godavari (Imbentole)-Krishna (Palikhantola)
- Godavari (Imbentole)-Krishna (Nagpur-Kurnool)
- Godavari (Polevar)-Krishna (Yajaywada)
- Krishna (Venna)-Pennaer
- Krishna (Srisailam)-Pennar
- Krishna (Nagpur-Kurnool)-Pennar (Sirmour)
- Pennar (Srimoula)-Cauvery (Grand Anicut)

Source: National Water Development Agency

Hydropower development

Source: National Water Development Agency
Proportion of global river volume impacted by fragmentation (a) and flow regulation (b)

(Grill et al. in rev. Env. Res. Letter)
Climate change is likely to increase the frequency of extreme events, such as floods and droughts.
PLANETARY BOUNDARIES: Fundamental ecological constraints exceeded


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

Business as usual is NOT an option
World and basins are complex, non-linear, adaptive systems, with thresholds, tipping points and surprises.

From Lenton et. al. 2008
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**