



NORTHERN TERRITORY ECOSYSTEMS *What are they worth?*

Valuing enhanced water quality in the NT

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Defining Water Quality as an Environmental Service in a continuum flanked by 'monitoring' and 'ecosystem service'

Environmental monitoring

Environmental services

Ecosystem services

People perform the service

- Environmental monitoring
- Impact statements
- Etc.

People + natural processes perform the service

- Carbon farming
- Water credits
- Biodiversity credits
- Wild rice
- Biological controls of pests
- Etc.

Ecosystems perform the service

- Plants sequestering carbon
- Mangroves as filters and nurseries
- Biodiversity promoting resilience
- Pollutant breakdown
- Etc.



Environmental Services ...payment for

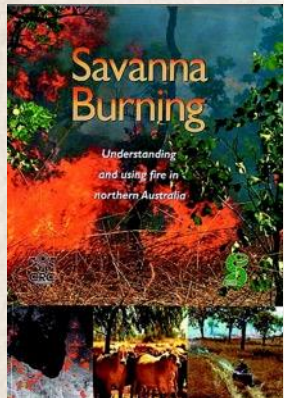
- **Marketable services e.g.**

- **Savanna burning for GHG emissions abatement**

1. **Effective indicator of ecosystem condition**
2. **Readily measurable using accepted methods/approaches**
3. **Accepted valuation**
4. **Formal market instruments**

- **Develop other services - products and markets**

- | | | | | |
|-------------------------------|------------------------------|------------------|------------------|------------------|
| • Water credits | 1.√√ | 2.√ ^a | 3.X | 4.X |
| • Biodiversity credits | 1.√ ^b | 2.√ ^a | 3.X | 4.X |
| • Soil processes | 1.√√ | 2.√ ^a | 3.X | 4.X |
| • Ecotourism | 1.√ | 2. NA | 3.√ ^a | 4.√ ^a |
| • Commodities | Final product + value adding | | | |



^a Local validation required

^b Establish link between biodiversity and ecosystem condition

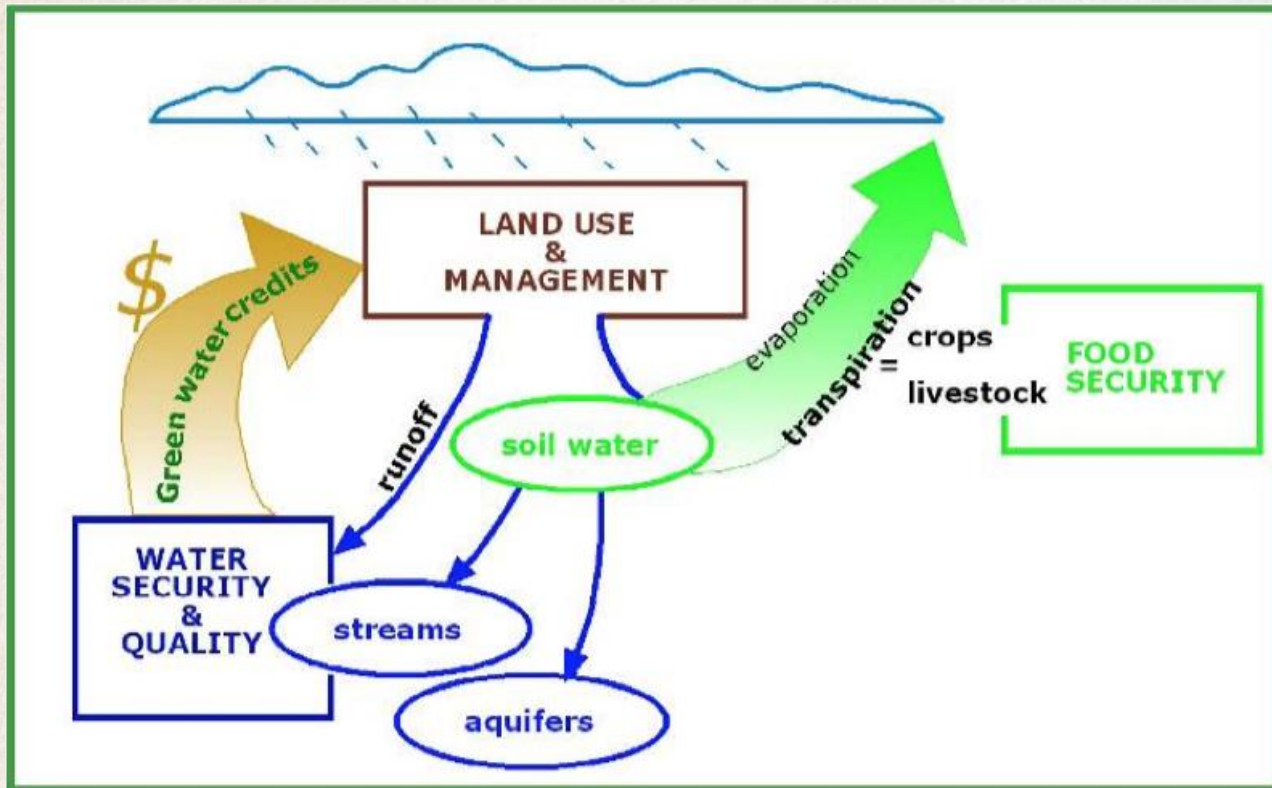
*Green Water Credits (GWC)*¹

- Mechanism for payments to land users in return for specified land and soil management activities that determine the supply of fresh water at source
- These activities are presently unrecognised and unrewarded
- Direct payment represents an incentive for better management
- GWC represents a reliable diversification of incomes
- Facilitate community resilience and adaptation to economic, social and environmental change

¹Droogers P, JH Kauffman, JA Dijkshoorn, W Immerzeel and JRM Huting 2006 *Green water credits: Basin identification*. Green Water Credits Report 1, ISRIC Report 2006/4. ISRIC, Wageningen

GWC focuses on activities that determine the supply of green and blue water at source

A green-blue approach to water resource planning and management¹



Green water is the water held in soil and available to plants
Blue water is groundwater and stream flow

¹Falkenmark, M., & Rockström, J. (2006). The new blue and green water paradigm: Breaking new ground for water resources planning and management. *The Journal of Water Resources Planning and Management* 132 (3): 129-132

GWC Process - ongoing

- Criteria for selecting a particular region
 - qualitative selection matrix – reality, potential \$, conflict¹
- Hydrological basin scale model
 - eg Soil and Water Assessment Tool (SWAT) uses spatial distributed data (digital elevation models, land cover, stream flow which can include water quality)²
- Green water and Blue water Assessment Toolkit
 - uses SWAT and available data to quantify potential benefits from management actions for users (community WQ, aquaculture)³
- Biophysical assessment to quantify GWC practices on WQ
 - co-operative knowledge - slides 7, 8
- Connected value proposition
 - multi year commitment – slide 9
- **Connected value capture**
 - **few examples as yet**

¹Droogers, P., J.H. Kauffman, J.A. Dijkshoorn, W.W. Immerzeel, J.R.M. Huting. 2006. Green Water Credits: Basin identification. Green Water Credits report 1. ISRIC report 2006/04. ISRIC, Wageningen

²Droogers, P., S. Mantel, J.H. Kauffman. 2006. River basin models to support Green Water Credit Assessment. FutureWater Report 53

³Hunink, J.E., P. Droogers, S. Kauffman, B.M. Mwaniki, J. Bouma. 2012. Quantitative simulation tools to analyze up- and downstream interactions of soil and water conservation measures: Supporting policy making in the Green Water Credits program of Kenya. Journal of Environmental Management 111: 187-194

Biophysical assessment to quantify GWC practices on WQ

Table 17. Absolute and relative changes (green = increase, red = reduction) of the key indicators for the 3 scenarios compared to the baseline situation

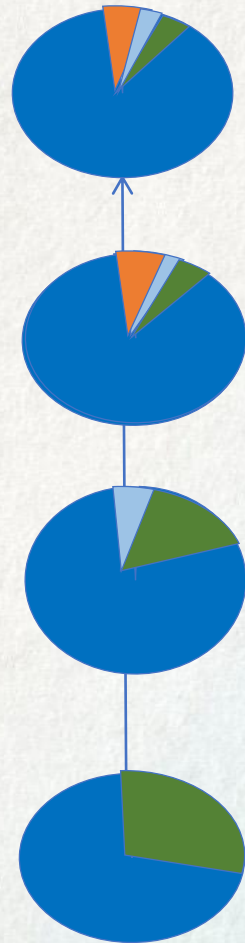
Key indicators	Contour Strips				Mulching				Tied Ridges			
	2005		2006		2005		2006		2005		2006	
Inflow Masinga (MCM/y)	-3	0%	-145	-7%	19	2%	27	1%	-8	-1%	-132	-6%
Sediments Inflow Masinga (10 ³ ton/y)	-311	-26%	-965	-23%	8	1%	12	0%	-327	-27%	-883	-21%
Outflow Kiambere (MCM/y)	-12	-1%	-110	-5%	35	3%	36	2%	-6	-1%	-125	-5%
Outflow Low Grand Falls (MCM/y)	-7	0%	-215	-4%	52	3%	58	1%	7	0%	-277	-5%
Crop Transpiration (mm/y)	1	0%	0	0%	5	1%	3	1%	1	0%	1	0%
Soil Evaporation (mm/y)	0	0%	0	0%	-7	-5%	-8	-5%	0	0%	1	0%
Groundwater Recharge (mm/y)	12	21%	31	14%	2	3%	3	1%	16	27%	38	17%
Sediment loss (ton/ha/y)	-1	-45%	-4	-39%	0	-12%	-1	-13%	-1	-32%	-2	-21%
Precipitation (MCM/y)	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Transpiration (MCM/y)	11	0%	8	0%	88	1%	52	1%	11	0%	10	0%
Evaporation (MCM/y)	5	0%	7	0%	-127	-5%	-134	-5%	7	0%	9	0%
Outflow (MCM/y)	-7	0%	-215	-4%	52	3%	58	1%	7	0%	-277	-5%
Storage Change (MCM/y)	9	1%	-200	-4%	14	-1%	-24	0%	25	1%	-258	-5%

Adoption of GWC practices can help restore SOM, contributing to CO₂ mitigation and native pasture production, as soils will have a higher water holding capacity.

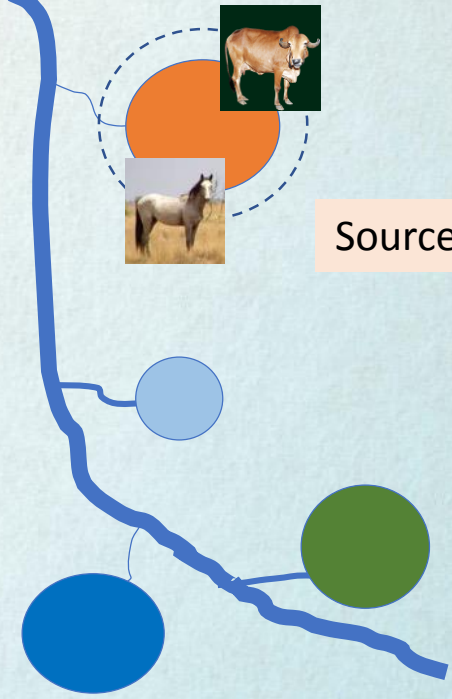


Water credits

1. Collect water from sources & sites along the 'sink'
2. Measure source fingerprint
3. Waterhole management
4. Measure improvement



Water flow



GWC 'Connected value(\$) proposition'

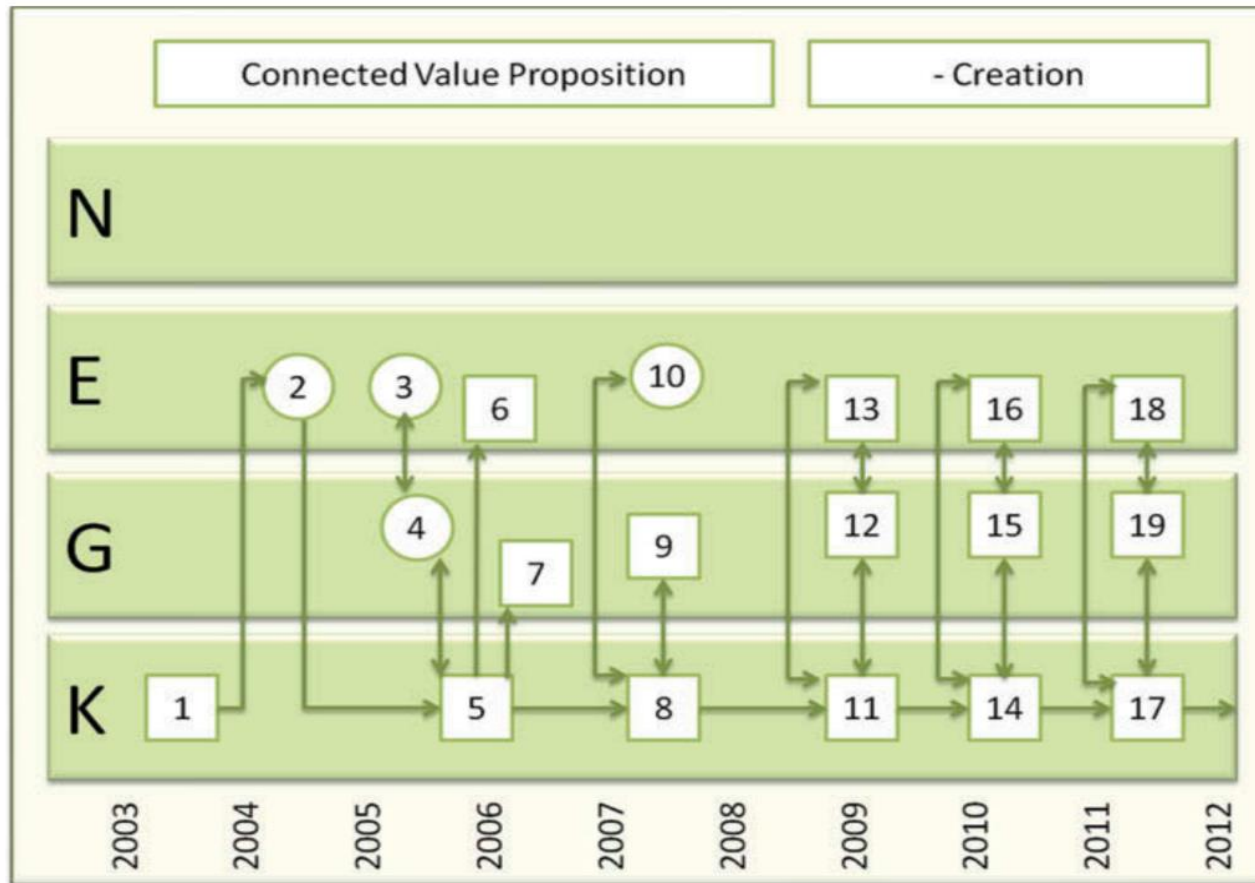


Figure 5. Timeline illustrating developments after proposing and implementing a GWC approach in the Tana River basin, Kenya. K = knowledge community, G = governmental at different levels, E = enterprises and business, N = NGOs (for box numbers, see text).

Four domains needed to realize GWC: (1) soil and water management; (2) livelihoods; (3) institutions and regulations; & (4) financial mechanisms.

'Value' other than \$

- Freshwater country – healthy country plans¹
 - Freshwater values in traditional knowledge
 - Different knowledges known and used in GWC
- Safe freshwater is far reaching
 - The costs of not providing safe water for communities
 - The benefits of healthcare hubs in remote locations
 - Safe water is an enterprise

Although PES(GWC) is in its infancy, the benefits of doing it outweigh the costs because water is precious

The value to communities at all levels:

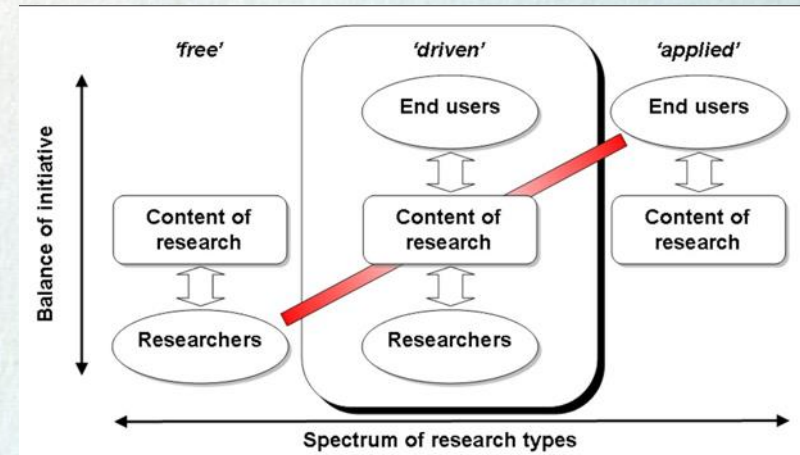
- Livelihoods – GWC
- New enterprises – primary production/aquaculture
- Safe drinking water – health and an enterprise with new skills
- Water for healthcare services – wellbeing and on country care

¹ Arafura Swamp Rangers Aboriginal Corporation 2107. Arafura Swamp Rangers Healthy Country Plan 2017-2027. ASRAC, Ramingining, Arnhem Land.



An Environmental Services Hub

- Core support services (not unique to ES)
 - Technology
 - Business
 - Financing and risk management
- Problem-based research (CoE)
 - User-driven
 - Innovation embraced



Funding models

- Compliance and targets
- Offsets
- Conventional market forces
- North Australia conservation estate
 - Working on Country
 - IPA funding programs
 - 650 Indigenous FTE positions*