

Centrality of water in adaptation: Early results from a meta- review

Aditi Mukherji

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The Global Challenge



Hydrological cycle

CC impacts every component of the hydrological cycle



Food systems

Impacts of changes in hydrological cycle due to CC felt across all systems, including food system



Adaptation

Water is central to adaptation



Mitigation

Some mitigation measures have high water footprint





Main questions

- How important is water in the adaptation space?
- Do the current water adaptation responses help in reducing climate and other risks?
- Are those responses transformational?
- We answer through a meta review of 1800 plus papers

Rationale and justification



If mitigation is about energy, adaptation is about water

2007, Henk van Schaik
(German GTZ- Cooperative Program on Water and Climate)

- This is a known mantra within the water community
- Thousands of case studies that documents adaptation responses
- Yet, very little synthesis of these diverse responses
- Do these responses work?

Defining water adaptation responses

Water adaptation response means two things:

- If the **risk** (combination of hazard, vulnerability and exposure) **is water related**, e.g. it is about floods, droughts, rainfall variability etc., then any adaptation measure (whether water related or not) counts as water related adaptation. Example, creation of a new institutional arrangement or a law for dealing with, say floods in urban context will count as a water adaptation.
- if the risk is not directly water related, but is, say, high heat and resulting thermal discomfort and ill health, but the **adaptation is water related**, example, traditional methods of cooling with water, it's counted as water adaptation.

Defining effectiveness of water adaptation responses

A water-adaptation response is “effective” (or non-effective/potentially maladaptive) if it reduces (or increases) risks through changes (positive/negative) in outcomes on any one of these six parameters:

- Financial/economic
- Outcomes on vulnerable groups
- Water related outcomes
- Ecological/environmental outcomes
- Institutional/socio-cultural outcomes
- Any other outcomes

The meta-review protocol

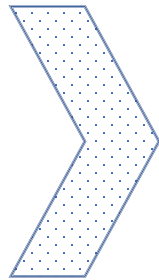
- Keyword search
- Screening
- Database



GAMI database

Global Adaptation Mapping Initiative

- Coding protocol
- Cleaning
- Preliminary results



Separate coding protocol
developed



Six inclusion criteria

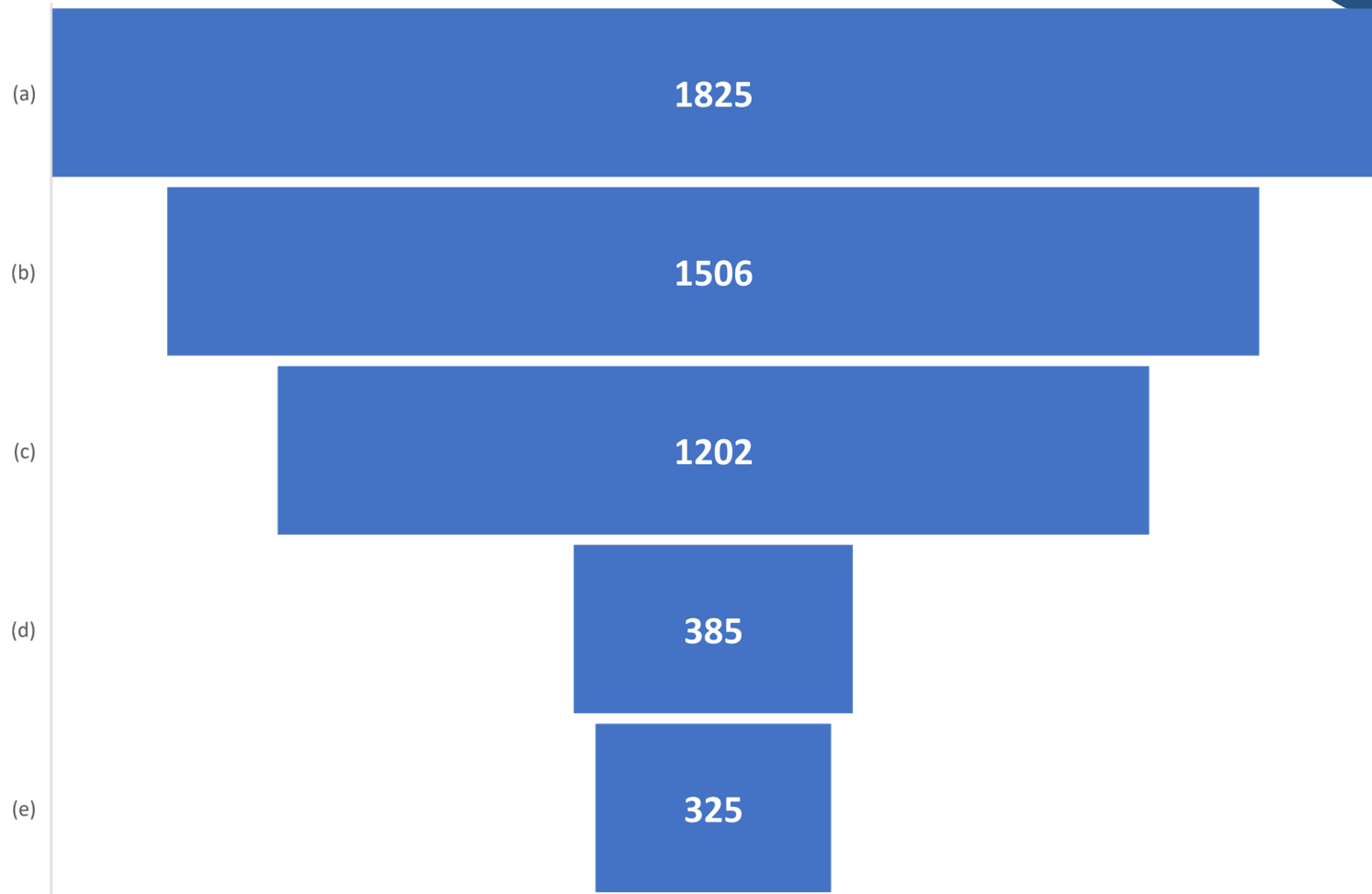
- Documents water-related adaptation response as defined above;
- Documents implemented case study of water related adaptation responses/interventions as opposed to planned responses/interventions;
- Evaluates the impact/effectiveness of that adaptation response/intervention in reducing climate and associated impacts, in credible and (semi) causal ways, including through a well enunciated theory of change;
- Includes at least one tangible (either quantitative or qualitative) indicator of effectiveness as mentioned above;
- Paper was published in, or after 2014;
- Paper has enough (at least half a page) information about the water related adaptation response/intervention that is being coded.



The coding protocol

Section 1	Section 2:	Section 3	Section 4	Section 5	Section 6
Inclusion/Exclusion	Adaptation response	Hazard, vulnerability,risk	Effectiveness	Enabling conditions and limits	Data & Methods
Boolean & String	Boolean/categorical/string	Boolean/categorical/string	Mostly Boolean & Strings	Boolean/categorical/string	Mostly Boolean & Strings
Requires user consensus	User consensus not needed	User consensus not needed	Requires user consensus	User consensus not needed	User consensus not needed
Water-related adaptation	Describe water-adaptation	Hazard	Evaluate effectiveness	Bottom-up participative goernance	Confidence in methods
Case study of implemented response	Categorize water adaptation into 16 sub-categories	Vulnerability/exposure	Indicators of effectiveness	Polycentric governance	Type of data
Evaluates "effectiveness"	Category of response	Risk	Economic/Financial	Political support	Adequacy in data
Has at least 1 out of 6 effectiveness indicators	"Water use" subsectors	Categorize risk into 10 sub-categories	Impact on vulnerable groups	Limits to adaptation	Coherence of evidence
Published in or after 2014	Location		Water related outcomes		Relevance of evidence
Sufficient for coding	Scale of response		Ecological/environmental outcomes		Attribution of causality -- Is adaptation response to risk reduction causal?
	Indigenous & Local Knowledge		Social/cultural/institutional outcomes		
	Who responds/who initiated?		Any other outcomes		
			Which aspect of risk (hazard/vulberability/exposure) is reduced?		
	Water chapter codes		Maladaptation & Co-benefits		
	GAMI derived codes		Adaptation cost & Finance		

The database – included vs. excluded articles



a) # of studies in the adaptation meta review database

b) # of studies on water-related adaptation responses (implemented or otherwise)

c) # of studies on implemented water related adaptation responses

d) # of case studies on implemented water related adaptation responses that measures effectiveness

e) # of case studies on implemented water related adaptation responses that are effective

The coding platform



Chapter 4 IPCC Water Adaptati x +

sysrev.com/u/1502/p/28357

a.mukherji / Chapter 4 IPCC Water Adaptation Meta Review

Clone Private

Overview Articles Analytics Review Manage

This is a systematic review of water related adaptation responses/interventions. The purpose of this review is to assess the effectiveness of water related adaptation interventions in reducing stated climate hazard, associated vulnerability and exposure, and resultant risk. Findings from this review will be reported in the Water Chapter (Working Group 2) of the IPCC. We also expect several papers from this review.

Review Status

2121 articles reviewed of 2121 total

Include	
Full (419)	Partial (0)

Exclude	
Full (1701)	Partial (0)

Conflict (1)	Resolved (293)
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Member Activity

Include Exclude

Member	Include	Exclude
a.mukherji	10	1711
calynn.dowler	10	1691
lakshmikantha.nr	10	1691
sanchari.bdn	10	1691
uday.cess	10	1691
cydneykate	10	1691
pkpanday	10	1691
Jaishri.Srinivasan	10	1691
shuchi.vora	10	1691
rinankshah	10	1691
mmillsnova	10	1691
aprajita.singhn	10	1691
brock.ternes	10	1691
g.shrestha	10	1691
mahantiaswina	10	1691
jagadish.parajuli	10	1691

Label Predictions

Last updated: 2020-06-04 19:27:52 UTC

Trained from 2115 labeled articles; 2121 article predictions loaded

Message 1: Majority of adaptation responses are water related

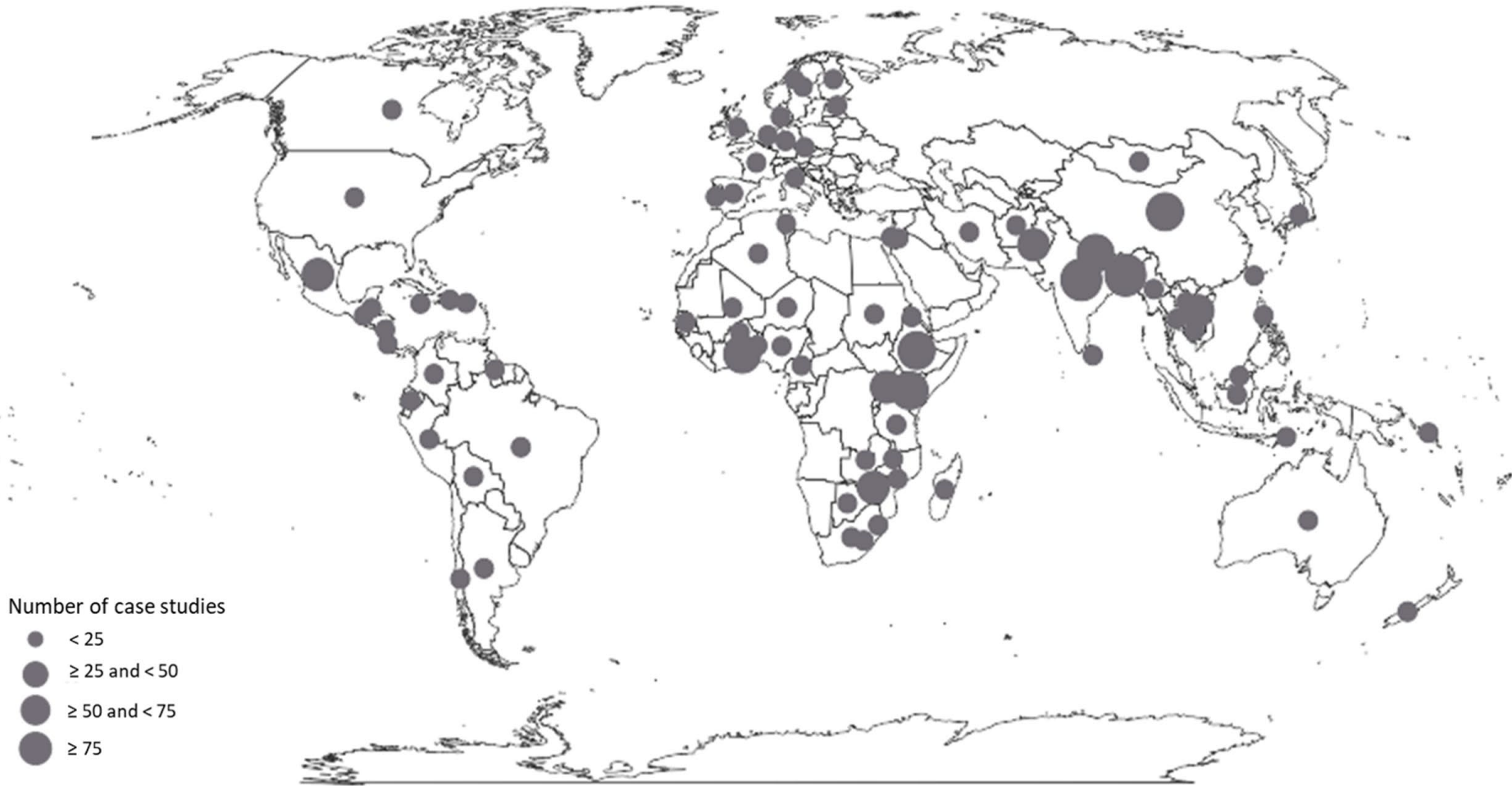
- ~82% (1506 out of 1825) of all documented case studies of adaptation in post 2014 period are about water – either the hazard, vulnerability or exposure is water related; or the adaptation response is water related

Hazard	Water for agriculture	Water for urban and peri-urban	Freshwater ecosystems	Water for health and sanitation	Water for energy and industry	Other water use sub sectors
Drought (251)	OO	O	O	O	OO	O
Floods (221)	OO	O	O	O	O	OO
General climate impacts (186)	OO	O	O	O	OO	O
Heat (42)	OO	OO	O	O	OO	O
Groundwater depletion (33)	OO	OOO	OOO	O	OOO	O
Cryosphere change (23)	OOO	OO	O	OOO	O	OOO
Poor water quality (12)	OOO	OO	O	O	OOO	O

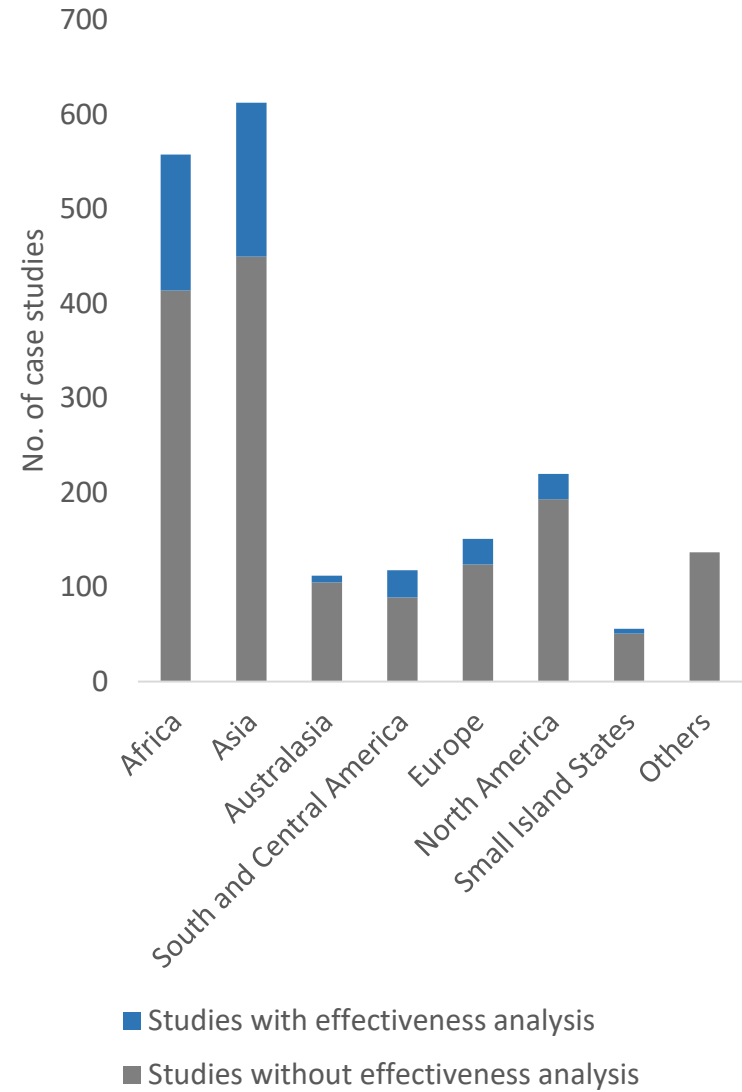
Evidence (number of cases)		Confidence (quality of case studies)	
	>40 (High)	OOO	>67% (High)
	10 to 40 (Medium)	OO	50-67% (Medium)
	<10 (Low)	O	<50% (Low)

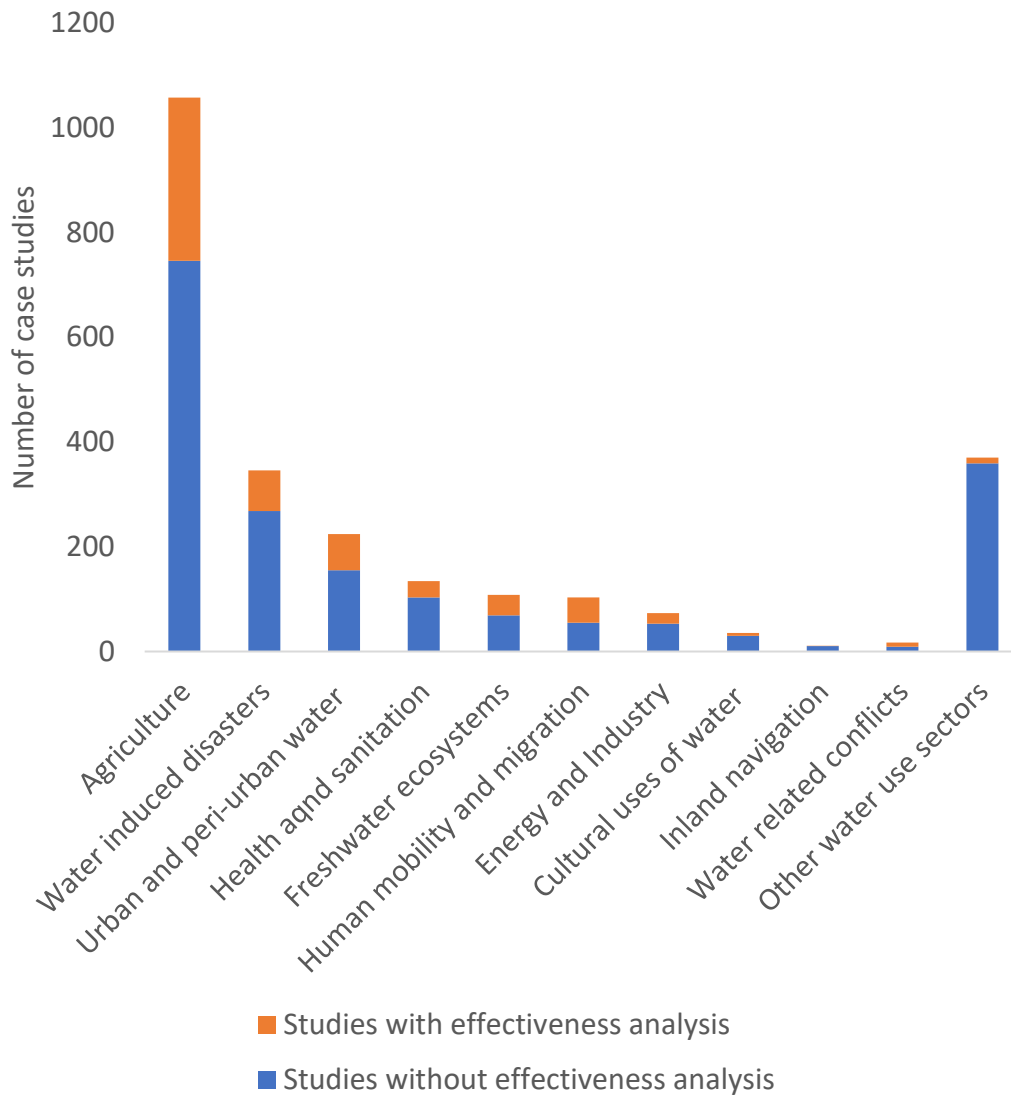
Message 2:
Droughts and floods are the main hazards

Location of water adaptation case studies that measures effectiveness (n=385)



Message 3:
Majority of
adaptation
responses have
been implemented
in Asia and Africa





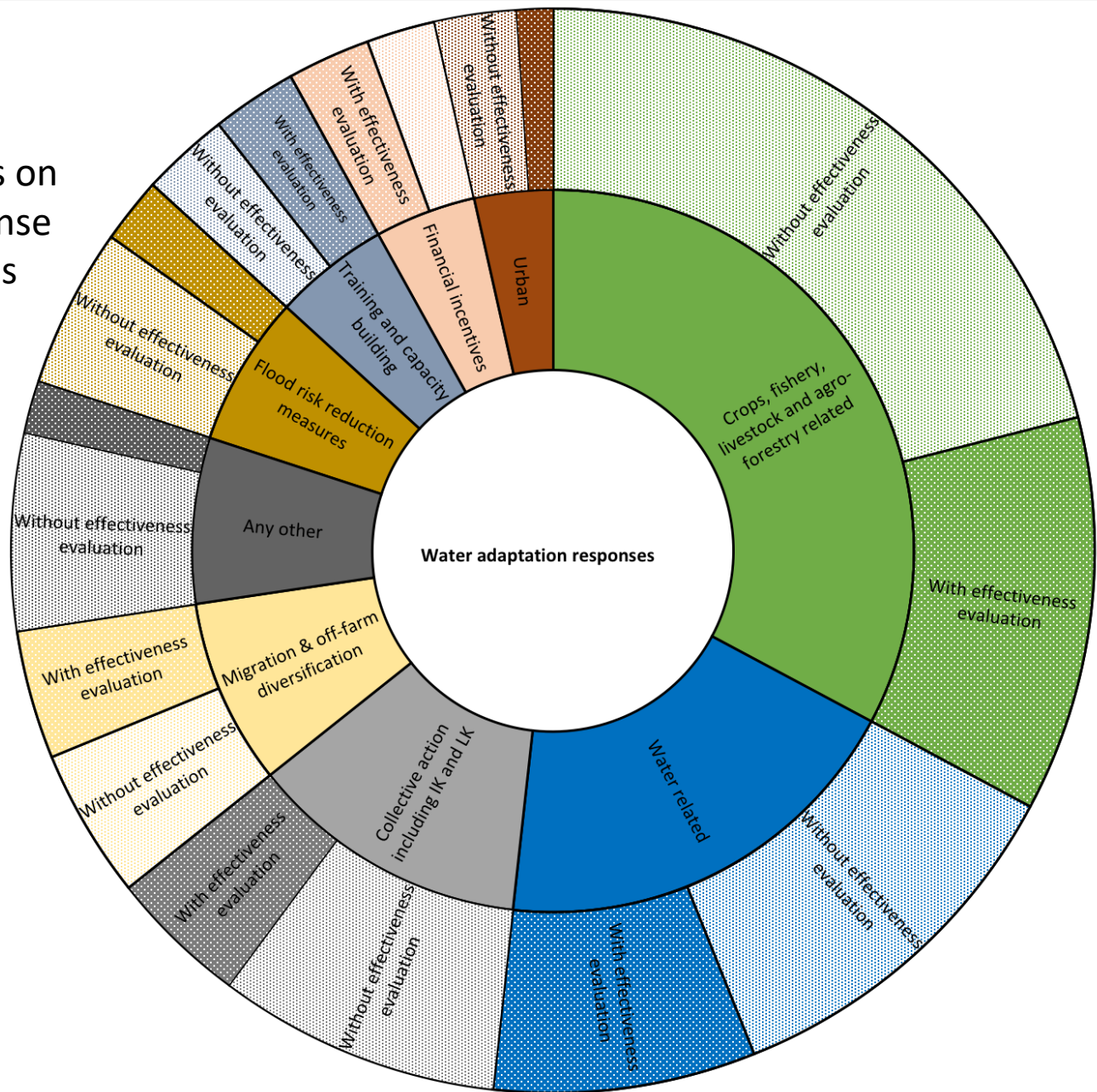
Message 4:
Almost 80% of all
water adaptation
responses are
about agriculture

Message 5:

Only a quarter of studies measure effectiveness of water adaptation responses in reducing risks

- ~25% (385 out of 1506) of all documented case studies of adaptation in post 2014 period are measure effectiveness of water adaptation responses in reducing climate and related risks
- However, a majority of (325 out of 385) studies measures effectiveness, finds that adaptation response was effective in reducing risk – perhaps a bias towards documenting “success” stories

Most case studies on adaptation response lacks effectiveness analysis



- Crops, fishery, livestock and agro-forestry related
- Water related
- Collective action including IK and LK
- Migration & off-farm diversification
- Financial incentives
- Training and capacity building
- Flood risk reduction measures
- Urban
- Any other

Message 6: Irrigation, water management, improved agronomic practices are some of the more effective responses

Water adaptation responses	Evidence on effectiveness of adaptation in reducing risk	Positive economic outcomes as a result of adaptation response	Positive outcomes for vulnerable people	Positive water related outcomes	Positive ecological or environmental outcomes	Positive institutional and socio-cultural outcomes	Co-benefits	Maladaptive outcomes
Improved cultivars and agronomic practices	000	000	000	00	00	00	0	00
Changes in cropping pattern and crop systems	000	000	000	00	00	00	0	00
On farm irrigation and water management	000	000	000	000	00	00	00	000
Water and soil moisture conservation	000	00	000	00	000	00	00	00
Collective action, policies, institutions	0	0	0	0	0	0	0	0
Migration & off-farm diversification	00	00	00	00	00	00	0	0
Economic/financial incentives	00	00	00	0	00	0	0	00
Training and capacity building	00	00	000	00	00	0	0	00
Agro-forestry and forestry interventions	00	000	000	00	000	00	00	0
Flood risk reduction measures	00	00	000	0	000	0	0	0
Livestock and Fishery related	0	00	0	0	0	0	0	0
IK and LK based adaptations	0	0	00	0	0	0		00

Evidence (number of case studies on the topic)

Low	<10
Medium	10 to 40
High	>40

Confidence (quality of case studies)

0	Low	< 50% of studies are of high and medium quality
00	Medium	50-67% of studies are of high and medium quality
000	High	>67% of studies are of high and medium quality

Main concern

Majority of adaptation options that are effective, are mostly incremental in nature, not enough transformative adaptation is happening in the water sector.

Off-farm diversification, economic and financial incentives and trainings and capacity building are some examples where transformative adaptation is more likely, because they do address (partly) the root causes of vulnerability



IWMI's work on
water,
adaptation,
mitigation

- Effectiveness of adaptation
- Transformational adaptation
- Adaptation gap report
- Inputs to NAPs and NDCs

Water and climate change adaptation

- SIPs as water neutral mitigation
- Framework for synergies & trade-offs

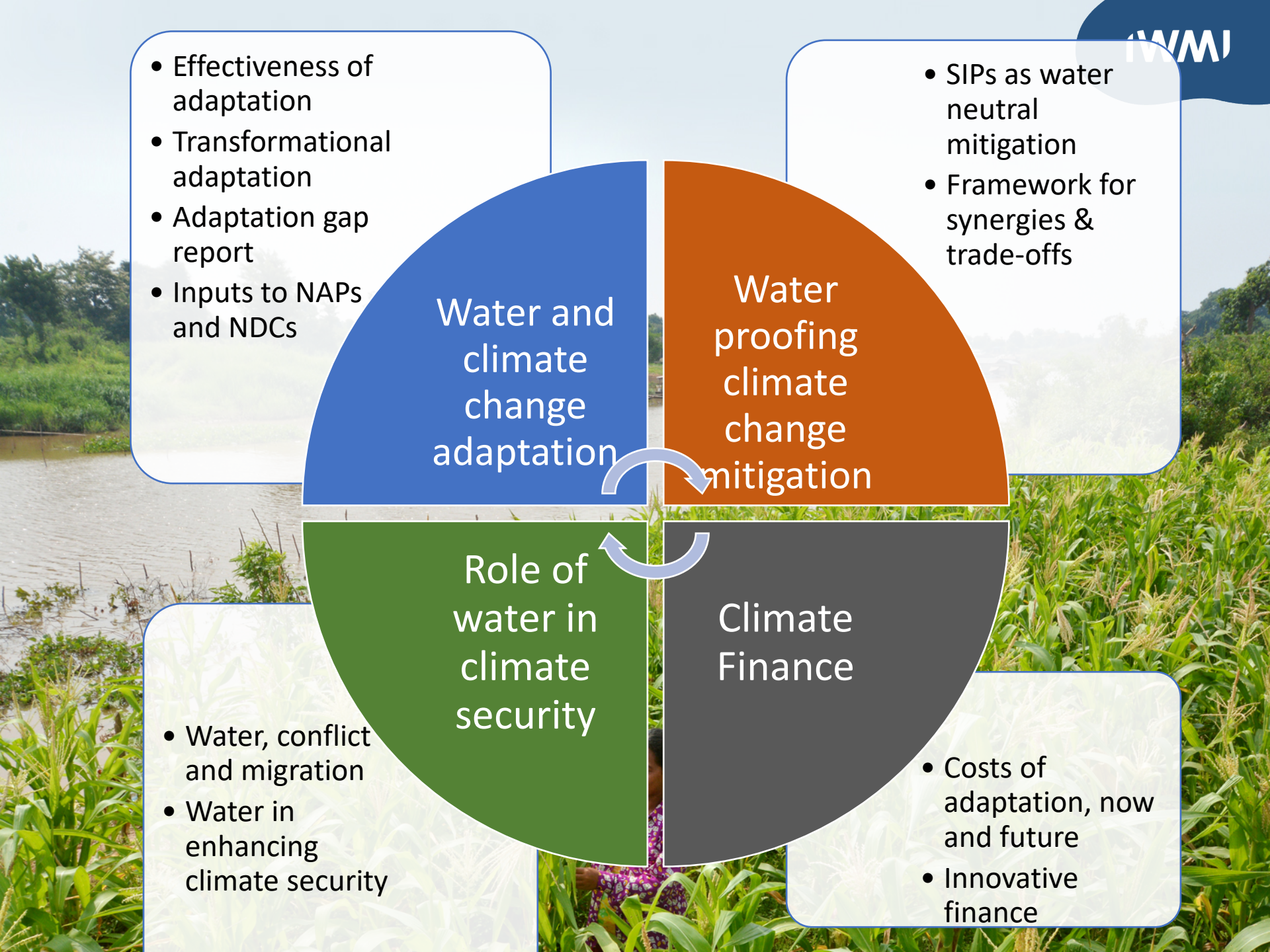
Water proofing climate change mitigation

Role of water in climate security

- Water, conflict and migration
- Water in enhancing climate security

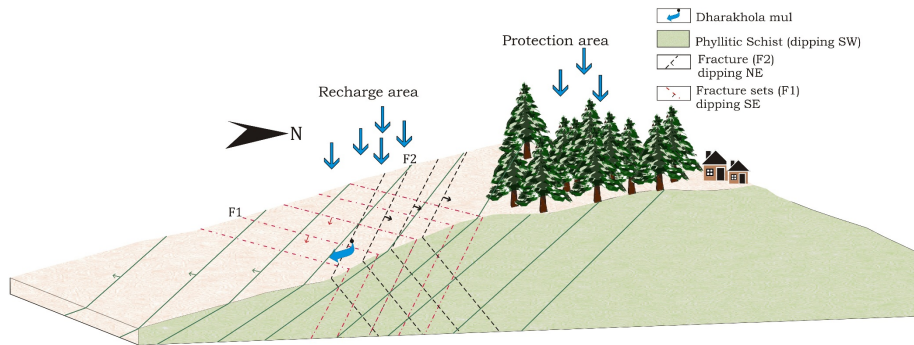
Climate Finance

- Costs of adaptation, now and future
- Innovative finance

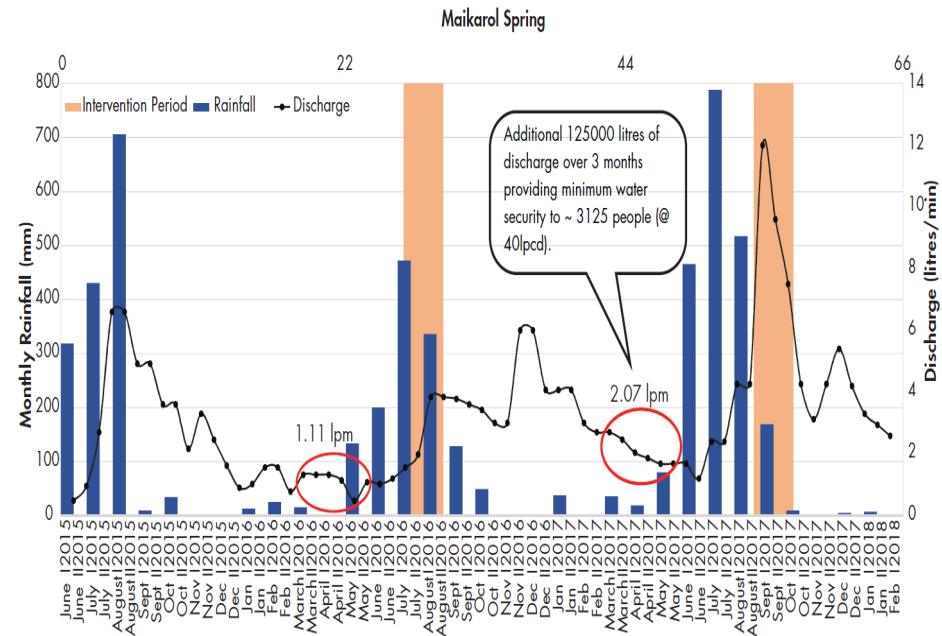


Reviving mountain springs by combining hydrogeology and community knowledge

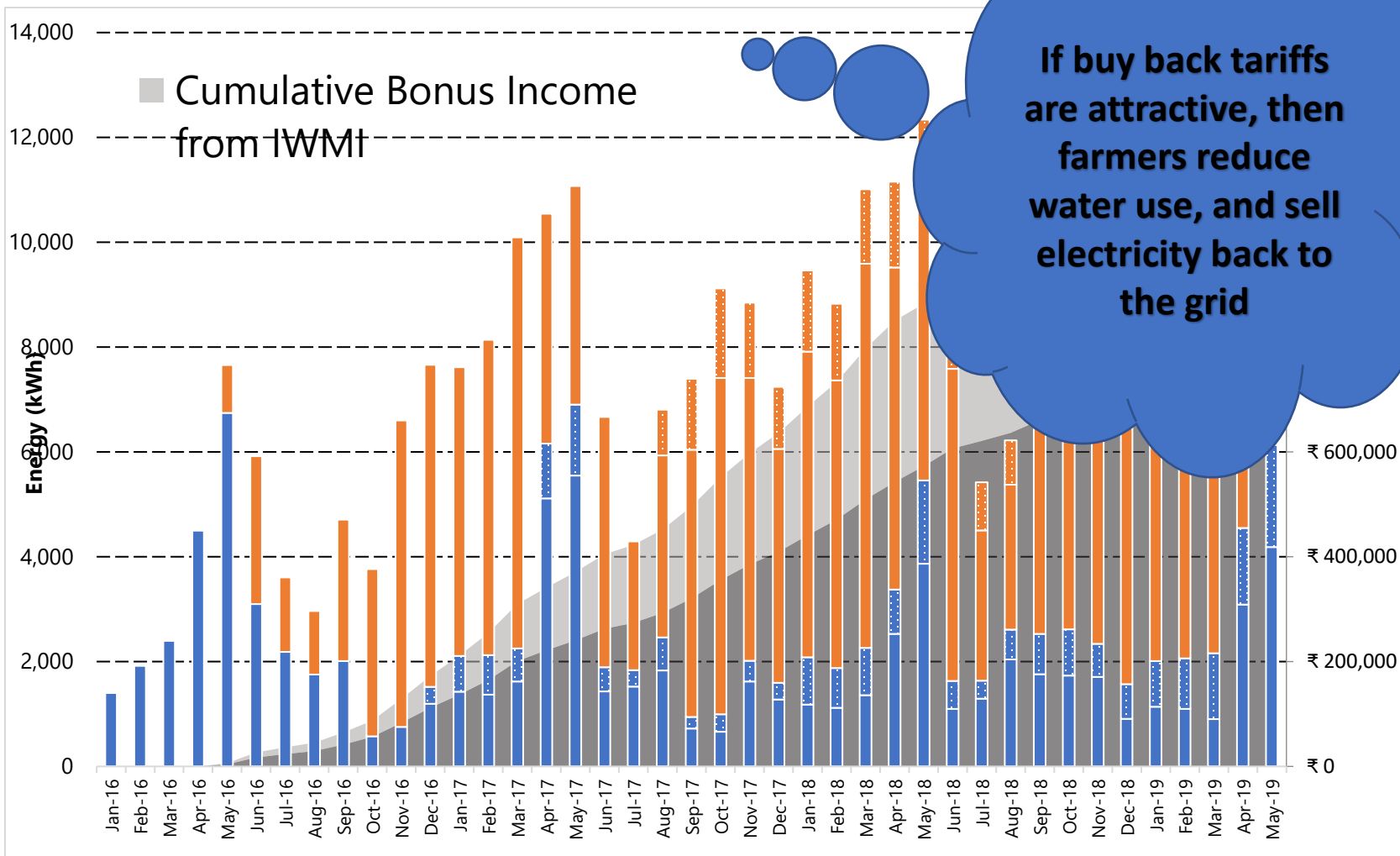
Identifying recharge area



Recharge interventions



Grid connected solar irrigation pumps to incentivize farmers to pump less groundwater, and earn income by selling solar electricity



If buy back tariffs are attractive, then farmers reduce water use, and sell electricity back to the grid



International Water
Management Institute



Thank you

List of coders

Calynn Dowler
Lakshmikanta NR
Uday Bhaskar Reddy
Cydney Kate Seigerman
Prajjwal Pandey
Jaishri Srinivasan
Shuchi Vora
Rinan Shah
Meg Mills-Novoa
Aprajita Singh
Brock Ternes
Ashwina Mahanti
Jagadish Parajuli
Sharlene L. Gomes
Lieke Brackel
Mamta Mehar
Balsher Singh Sidhu
Holly Berman
William Delgado
Pam Rittlemeyer
Valeria Fanghella
Ritu Priya
Benjamin Gray
Martina Angela Caretta
Greeshma Hedge
Jonathan Lautze
Gitta Shrestha
Sanchari M.