WATER SECURITY PLANS

Part I: Insights from the review of water security plans: towards ensuring rural water security

CENTRE FOR SOCIAL & ENVIRONMENTAL INNOVATION

India Climate Collaborative

August 2021

Ashoka Trust for Research in Ecology and the Environment (ATREE)

Ashoka Trust for Research in Ecology and the Environment (ATREE) is a global non-profit organisation which generates interdisciplinary knowledge to inform policy and practice in the areas of conservation and sustainability.

ATREE envisions a society committed to environmental conservation, and sustainable and socially just development.

For over two decades, ATREE has worked on issues like biodiversity and conservation, climate change mitigation and development, land and water resources, forests and governance, and ecosystem services and human well-being.

ATREE has consistently ranked in the top 20 Environment and Water Security think-tanks in the world.

Centre for Social and Environmental Innovation (CSEI)

ATREE's Centre for Social and Environmental Innovation (CSEI) aims to translate research to enhance human well-being, while also conserving the natural environment.

CSEI aims to co-create scalable solutions working with partners. We hope to build impact ecosystems to address the problems we work on.

Our solutions are rooted in scientific research. CSEI currently focuses on three problems: water & foods, invasive plant species, and climate resilient/green cities.

The Centre's focus is on empowering the 'first mile'- in their role as citizens, producers, or consumers. Our goal is to enable a transition to a more sustainable and fair system.

About India Climate Collaborative

The India Climate Collaborative (ICC) is a first-of-its kind India-led, India-focused initiative bringing together leading private and corporate philanthropies to enable a collective response to climate change in India.

The ICC seeks to connect and strengthen the Indian climate community, build a compelling India-focused climate narrative, and drive solutions that help people and nature thrive.

Mandated to amplify and spread local solutions, ICC aims to inspire and connect governments, businesses, impact investors, research institutions and civil society to work together to solve India's climate crisis with the support of the international climate community.

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We would also like to thank Arghyam for sharing the water security plans that the CSOs in their network had developed, and for sharing their learnings from preparing water security plans.

Why are we studying water security plans?

Water security plans (WSPs) are an important component of rural water security programmes. A WSP is a document describing the current state of water challenges in the region under study, and the interventions planned.

Many communities are now required to prepare WSPs under the Atal Bhujal Yojana, a central government scheme implemented to facilitate sustainable groundwater management. Under this scheme, a key disbursement linked indicator is the preparation of community-led WSPs, on completion of which a gram panchayat can receive 15% of the incentive funds available to it.

Our previous interviews with communities revealed a clear need to ease the process of preparing WSPs. As a first step towards helping with the preparation of WSPs, we have undertaken this study to understand what WSPs entail in more detail.

What are the different parts of this study?

We analysed and interpreted WSPs and water balances, to understand the types of digital tools we can develop to ease the process of preparing both.

We have developed three research briefs on these topics:

Part I: This first brief reviews WSPs developed by various rural water security programme implementing agencies.

Part II: The second brief will demonstrate how a water balance estimation exercise is carried out for Aralumallige and Hadonahalli watersheds in Karnataka. (To be released by end of August/early September)

Part III: The third brief will be a compendium of digital tools used in some rural water security programmes for data collection, water balance estimation, crop water budgeting and intervention planning. (To be released by end of August/early September.)

This research brief is the first in this series.

HOW WE AIM TO CREATE IMPACT WITH THIS WORK?

Ease Water Balance Estimation & Help Prepare Water Security Plan

Part I: A review of water security plans prepared by rural water security programmes implementing agencies

Part II: Water balance estimation exercise: A case study of Aralumallige and Hadonahalli watersheds.

Part III: A compendium of digital tools used in some rural water security programmes for data collection, water balance estimation, crop water budgeting and intervention planning.

Developed "Jaltol" an open source water budget tool (QGIS plugin): Ease water balance estimation and identify suitable interventions.

Build the capacity of Gram Panchayats: Help them prepare WSPs and identify suitable interventions, as required under the Atal Bhujal Yojana and Jal Jeevan Mission.

EXECUTIVE SUMMARY

We found that WSPs recommend building structures to make more water available to farmers (supply-side management), but that approach is ineffective when water is scarce. Overall, WSPs need to be more streamlined and shift focus towards using water more efficiently (demand-side water management) and equitably.

INSIGHT 1: There are no standard templates, resulting in non-comparable, sometimes unscientific WSPs.	**SOLUTION 1:** Create customisable and comparable WSP templates and methods that are scientifically sound.
INSIGHT 2: The process of making WSPs does not account for climate change and farmer behaviour.	**SOLUTION 2:** Conceptualise and prepare Water Security Plans considering dynamic conditions, including what-if scenarios.
INSIGHT 3: Multiple factors result in WSPs favouring supply side interventions	**SOLUTION 3:** New tools that make the invisible "commons" visible, and promote demand-side techniques where needed.
INSIGHT 4: WSP planning process do not always account for operation and maintenance	**SOLUTION 4:** Design water security plans to include detailed operations and maintenance (O&M) details
INSIGHT 5: WSPs often ignore the problem of inequitable water distribution.	**SOLUTION 5:** Factor tools and techniques for tracking equity explicitly in WSPs - both before and after interventions.

List of acronyms and abbreviations

ATREE	Ashoka Trust for Research in Ecology and the Environment
BCC	Behaviour Change Communication
CSEI	Centre for Social and Environmental Innovation
CSO	Civil Society Organisation
DPR	Detailed Project Report
GP	Gram panchayat
GW	Ground water
LU/LC	Land Use/ Land Cover
NREGA	National Rural Employment Guarantee Act
O&M	Operation and Maintenance

List of acronyms and abbreviations

PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution
QGIS	Quantum Geographic Information Systems
SO	Support Organisations
SW	Surface Water
VES	Vertical Electrical Sounding
VWSC	Village Water Security Committee
WSP	Water Security Plans
ZBNF	Zero budget natural farming

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CONTEXT

This section provides a brief introduction to the concept of water security, the various phases of rural water security programmes–stakeholders and activities involved, and the method we adopted to review a few water security plans.

WHY DO WE NEED TO ADDRESS RURAL WATER SECURITY?

India is one of the most water-stressed countries in the world. However, India ranks second worldwide in agronomic production, with agriculture and its allied sectors being major contributors for livelihoods and economy. Hence, water security is particularly important with respect to agriculture. However, off season rainfall, dry spells, groundwater depletion, flooding and numerous other uncertainties have adversely affected water security of Indian agriculture.

Rural communities and implementing C, with support from government agencies and philanthropic organizations, have been focusing on increasing water availability and water use efficiency via various rural water security programmes.

These seek to address issues of acute scarcity of water due to erratic rainfall, contamination of water sources, excessive abstraction of groundwater etc. Water security plan (WSP) preparation is an important part of these programmes.

WHAT ARE THE PHASES AND ACTIVITIES? WHERE DO WSPs FIT IN?

PHASES	PREPARE		PLAN					IMPLEMENT	ASSESS
ACTIVITIES	Define scale and scope	Set up local committee	Collect data for planning	Conduct PRA	Estimate water balance	Design interventions	Prepare DPR	Implement interventions	Assess
DURATION	1-2 months		2 months - 12 months					3-5 years	A few months

Water Security Plans (WSPs) are made during the planning phase. WSPs record findings from collected data and PRAs, based on which they build an understanding of water demand. That is matched against water availability (ground and surface water sources). They then recommend interventions for the implementation phase.

WHAT ARE THE ACTIVITIES & WHO ARE THE STAKEHOLDERS?

Phase	Activity	Stakeholder	Stakeholder roles
Phase I: Prepare	 **Define scale and scope** Define objectives of the programme and identify target GPs. Criteria for selecting GPs include scale of the programme, benefits, outcomes, costs, resource needs and feasibility.	CSOs, Gram Panchayat (GP), Village Water Security Committee (VWSC)	Prepare and implement rural water security programme.
	 **Set up local committee** Gather and hold discussions with local leaders to hear disparate views and understand community expectations.	CSOs, GP, VWSC	Bring together all stakeholders involved in the project and assign roles and responsibilities to create a WSP.
Phase II: Plan	 **Collect data for planning** Collect data for planning from primary and secondary sources.	VWSC	Collect all baseline information such as toposheets, groundwater prospect maps, census data, etc.

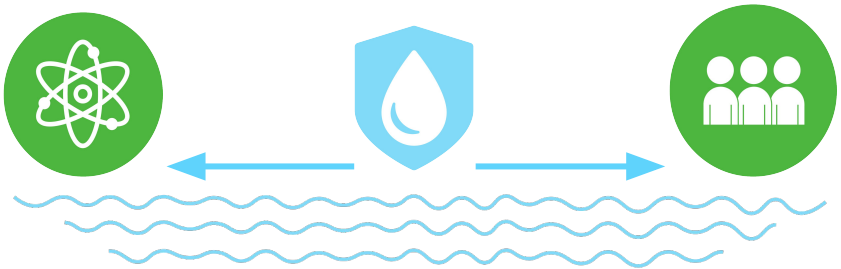
WHAT ARE THE ACTIVITIES & WHO ARE THE STAKEHOLDERS?

Phase	Activity	Stakeholder	Stakeholder roles
Phase II: Plan	 **Conduct PRA** Conduct PRA to understand community perceptions of water, make problem and solution maps with community inputs.	Farmers, Community members	Participate in PRA.
		CSO	Conduct and lead PRA.
	 **Estimate water balance** Evaluate inflows/outflows in the geographical area under study.	VWSC	Collect data for water balance estimation.
		CSO	Estimate the water balance of the region under study.
	 **Design interventions** Design interventions based on findings from data and PRA.	Farmers	Provide inputs as primary water users.
		GP	Call Gram Sabha meeting for WSP approval.
		CSO	Assess feasibility of interventions with experts; prioritize and allocate funds.

WHAT ARE THE ACTIVITIES & WHO ARE THE STAKEHOLDERS?

Phase	Activity	Stakeholder	Stakeholder roles
Phase II: Plan	 **Prepare DPR** Prepare DPR as a final proposal of rural water security programme	VWSC, CSO	Prepare a DPR for interventions proposed by WSP– contains materials required, costs, timelines, roles and responsibilities of stakeholders.
Phase III: Implement	 **Implement interventions** Implement interventions and plan for their continued operation and maintenance.	VWSC, CSO	Channel procured funds into building interventions. Plan for and commit to maintaining interventions post rural water security programme completion.
Phase IV: Assess	 **Monitor and evaluate impact** Conduct baseline and endline surveys, collate and compare data to identify impacts of the rural water security programme.	CSO, Impact evaluation agency	Monitor various Indicators– such as area under irrigation, cultivable area, household incomes, water volumes being harvested, crop yields, etc. Compare baseline and endline data for indicators to study the impact of rural water security programme implementation.

WHY ARE WATER SECURITY PLANS NECESSARY?



WSPs act as a bridge between scientific expertise and community knowledge. Intervention design is informed by the community's needs as well as data analyses. This ensures effective results while encouraging community ownership of water.

WSPs are necessary because they serve as:

- A decision-making tool to evaluate the cumulative effect of land and water use patterns in a watershed.
- A data-driven approach to determine targets for water allocation and conservation as well as recharge within micro-watersheds.

HOW DID WE STUDY WATER SECURITY PLANS?

The purpose of this brief was to analyse WSPs that CSOs prepare to get a deeper understanding of the following questions:

1. What are the components of a WSP?
2. Who prepares WSPs?
3. What can we learn from WSPs?
4. What is the way forward?

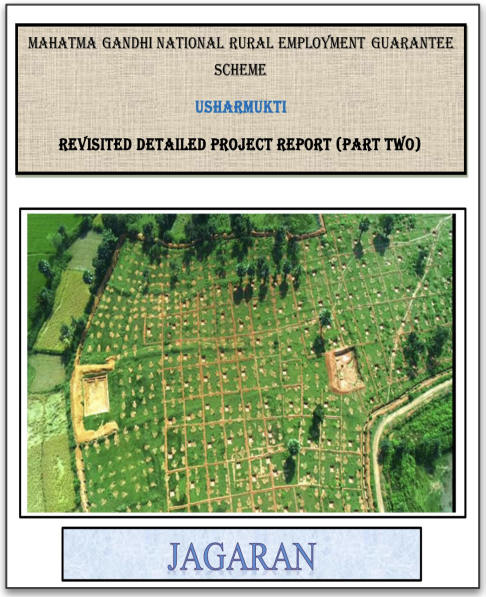
We conducted the following activities:

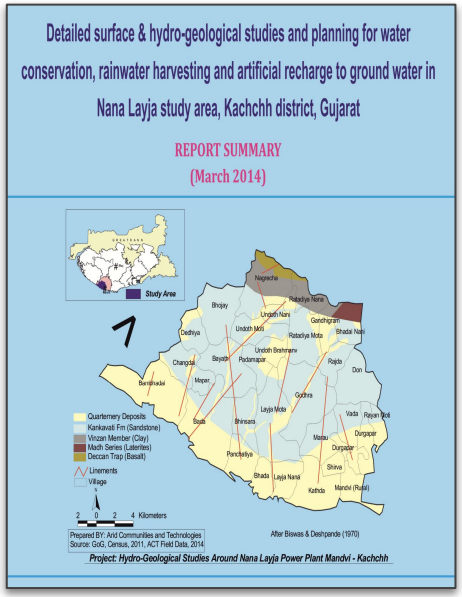
1. A detailed literature review of WSPs available publicly.
2. Review of the WSPs we received from CSOs.

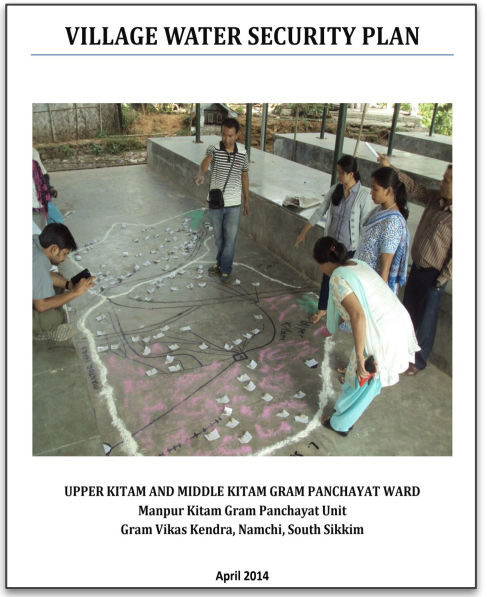
We have used the term WSPs as encompassing many types of documents (listed on the table to the right.)

Sl. No.	Type of document (based on title of document)	Number of documents received and reviewed [DW: Drinking water; WA: Water for agriculture]
1.	Surface and hydrogeological studies	5 (DW: 3; WA: 5)
2.	Detailed Project Report (DPR)	8 (DW: 7 ;WA: 6)
3.	Water Security Plan	7 (DW: 7 ;WA: 7)
4.	Project completion report	3 (DW:3 ;WA:3)
5.	Other titles (Participatory GW management, climate proofing of watershed projects)	2 (DW: 0 ; WA: 2)
TOTAL		**25**

WHAT DO THESE WATER SECURITY PLANS LOOK LIKE?







Examples of the cover page of some of the water security plans we reviewed.

OVERVIEW OF WSPs

This section provides details on the various components of a water security plan.

WHAT IS INCLUDED IN A WATER SECURITY PLAN?

Collect data for planning

Village profile: Location of village, number of households (hh), livestock/hh, landholding size/hh, caste-wise distribution, occupations, infrastructure (schools, hospitals, electricity), drinking water.

Agriculture: Cropping pattern, and irrigation (household-level or plot-level).

DATA COLLECTED FOR PLANNING

Climate: Rainfall and temperature (annual averages for 5 years or longer), humidity, windspeed, solar radiation.

Water resources: Land use/Land Cover (LU/LC) patterns, map of surface water and GW sources (rivers, streams, open wells, borewells), flow of SW, GW levels, water storage structures.

Hydrogeology: Drainage lines, landforms, slope, soil types, lithology, aquifer depth, seasonal well data, run-off estimates, soil type.

Data sources for this include both primary (field data) and secondary data. Detailed explanation about data sources will be shared in our second research brief on water balance estimation.

WHAT IS INCLUDED IN A WATER SECURITY PLAN?

Conduct PRA

	Mutual Learning	Raising Awareness	Community Empowerment
PRA Process	**Build a shared understanding of the watershed:** transect walk through the village, mapping exercises, informal interviews with farmers and village elders.	**Explain inflows/outflows of the micro-watershed**, with focus on stresses and security risks associated with water: group discussions, before and after images	**Encourage stewardship** for local water resources, identify local leaders and build capacity.

PRA Outputs →

1. **Problem map:** Identifies plots with water issues and records needs of landholders.
2. **Solution map**: Proposes potential interventions or strategies for solving the problem in each plot.
3. **Demand assessment:** Builds understanding of **patterns of water use and water demand** in the village and micro-watershed.

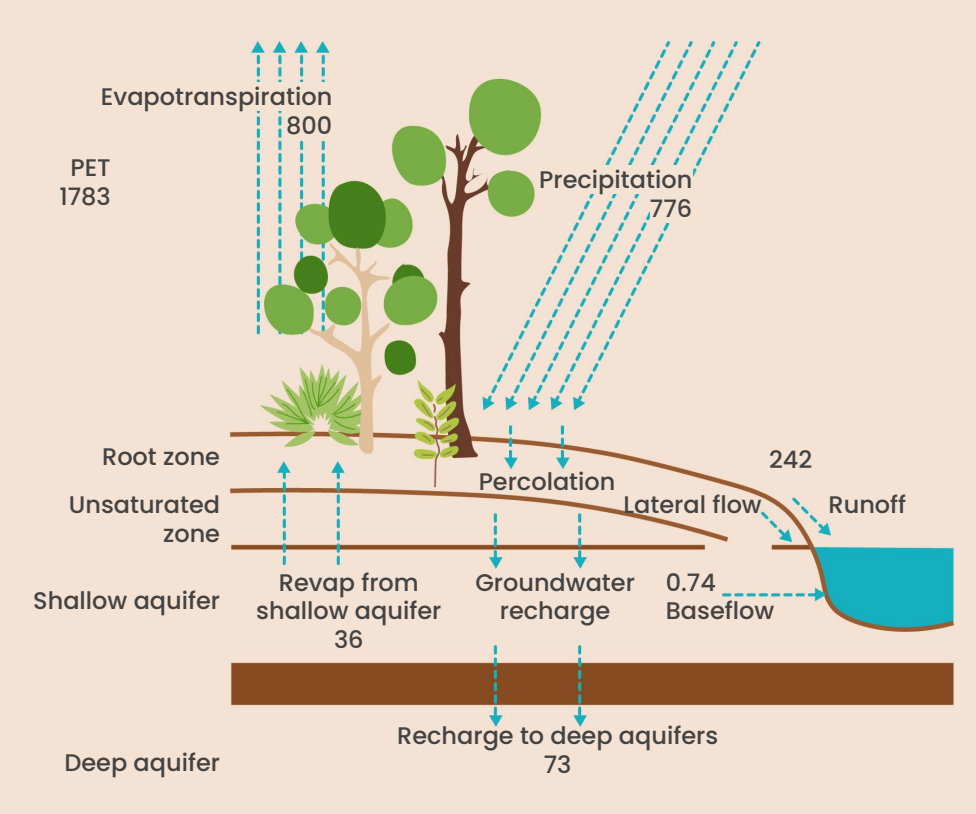
WHAT IS INCLUDED IN A WATER SECURITY PLAN?

Estimate water balance

Water balance studies commonly focus on 'natural' watersheds which have not been altered or have been minimally altered by human activities. As a result, the equation does not account for human abstractions from or returns to the system[7].

The surface and hydrogeological studies feed into the water balance estimation in WSPs*. Water availability is compared with water demand in the region.

Data for both inflow and outflow (figure to the right) are usually collected from primary or secondary sources by the CSO for a programme. These are then used to assess whether a geographical region under study has a water deficit or a surplus. This is often the first step towards intervention planning.



Water flows are in mm/year

WHAT IS INCLUDED IN A WATER SECURITY PLAN?

Design interventions

	Supply-side water management	Demand-side water management
Focus	Increasing water available in the region.	Ensuring efficient water usage by farmers.
Strategy	• Increasing water storage capacity of individual plots and village commons. • Filtration mechanisms that enable water reuse for irrigation. • Rerouting water resources by damming rivers and streams.	• Managing water systems in the project region by manipulating water-use patterns. • Changing behaviours of the water-user community. • Installing more efficient water distribution systems.
Examples	Check dams, farm ponds, forest pond, water storage tanks, rain water harvesting at household and village levels and the maintenance of these structures.	Changing to natural farming/ZBNF, changing cropping patterns, incorporating soil moisture conservation, mulching, micro-irrigation.
Stakeholder	CSOs implementing rural water security programmes.	The community, supported by the CSO (information and monitoring)

WHAT IS INCLUDED IN A WATER SECURITY PLAN?

Prepare DPRs

Most DPRs contain the following three sections:

Section 1. Background information

- Geographical information (latitude and longitude)
- Demography - population by gender, caste, literacy rate
- Land use and livestock data
- Evolution of water infrastructure in the village
- Current drinking water and irrigation supply system, along with beneficiary details

Section 2. Physical asset construction details

- List of activities completed as a part of programme (like formation of water user committees, geological mapping details) proposed recharge areas, technical survey details
- Estimates for the construction of physical assets
- Costing details for implementation and sources of funding

Section 3. Monitoring details

- Details on how the physical assets created by the programme will be monitored over time, and by which stakeholders.

These three sections are eventually used to put together the tenders that are then developed to create the physical assets.

INSIGHTS & SOLUTIONS

This section provides insights derived from our review – about the gaps in WSPs and challenges in the process of making them. It also recommends solutions for each insight.

INSIGHT 1:

There are no standard templates or processes for preparing WSPs, resulting in non-comparable WSPs.

1 (a) The inputs and expected outcomes of WSPs are not standard across all plans.

We found the WSPs we reviewed to be non-comparable due to vast variations between and within their components.

The WSPs we reviewed contained some or all of the following elements:

- Village profile
- Water balance estimation
- Plans for recommended interventions
- Funding details

However, the level of detail with which components of the water system (such as streamflows, groundwater levels, aquifer characteristics, etc) were studied/measured varied across plans. For instance, to estimate aquifer depths, one WSP studied well depths across the village while another WSP used Vertical Electrical Sounding (VES) technology to directly measure aquifer parameters.

The scale and precision of data inputs for each watershed related component thus varies, often drastically, across WSPs.
WSPs also use different metrics to report on expected programme outcomes:

- Total conserved water as a percentage of the total water requirement.
- Total volume of water expected to be harvested by proposed structures.
- Agricultural indicators such as increase in area under cultivation, addition of a second cropping season, etc.
- Economical and social benefits of having enough water.

This makes it difficult to compare WSPs and draw inferences on the effectiveness of different water management strategies across a variety of conditions and contexts. The myriad of inputs and outcomes also make it difficult to compare impact across programmes.

INSIGHT 1:

There are no standard templates or processes for preparing WSPs, resulting in non-comparable WSPs.

1 (b) WSPs make arbitrary and unscientific distinctions between groundwater, surface water and soil moisture.

We found that the way the water budget was estimated in most WSPs was incorrect because of confusion of certain concepts.

1. **Blue vs Green water.** Blue water refers to water in streams, lakes and aquifers that can be abstracted and used for drinking, livestock or irrigation. Green water is water trapped as soil moisture that can only be uptaken by vegetation.

   When it rains, about 25-30% shows up as runoff and about 5-15% as recharge into groundwater. These are "blue" water forms that can be abstracted and used. The rest of the rainwater is soil moisture and is not available for use. Yet a number of water security plans assumed that the difference between rainfall and runoff was in fact available for human use.

2. **Stocks vs. flows:** The amount of water stored in a reservoir or aquifer is a stock. It is measured in m^3. In contrast the volume of water that is available each year as rainfall or the annual water demand are flows, measured in m^3/year.

   Increasing the amount of storage cannot be translated directly as increasing the amount of water available, Yet some plans, estimated the deficit by subtracting the water storage (a stock) from annual water demand (a flow).

3. **Supply vs Need:** Supply is the annual renewable water "available" for use in tanks and groundwater. Demand is how much households need for a decent quality of life or earn a livelihood. Supply is determined by natural endowments of rain or streamflow.

   A few plans were simply assuming that demand would be met by building structures and drilling wells, without establishing if the quantity being withdrawn and stored in these structures was realistic.

INSIGHT 1:

There are no standard templates or processes for preparing WSPs, resulting in non-comparable WSPs.

16 of 25 WSPs surveyed both surface water (SW) and groundwater (GW) availability.

None of these explicitly acknowledge the links between GW and SW resulting in gaps in the understanding of water availability/use and possible double counting.

For instance, a WSP focused mainly on GW and finding potential recharge zones in the village; but did not say how managing GW is going to help the rainfed farmers, who were stated to be the most vulnerable. In another instance, the WSP recommended farm ponds, but it was unclear on the source of water for these ponds and how it was accounted for in the water balance.

1 (c) Some WSPs include community insights, but informally

Insights from the community are often scanned and included as annexures in the WSPs. This community-provided knowledge is valuable but rarely incorporated into the main plan.

The differences in formats and approaches could be due to the following reasons:

WSPs differ regionally. Some of the variations are desirable and reflect real differences in water resources contexts across India.

WSPs reflect donor priorities. Rural water security programmes are funded by a variety of donors including government agencies, corporate units and CSOs, who assign resources based on their own priorities.

WSPs vary according to implementing agency. Implementing agencies have different levels of experience, resource support and capacity. This reflects in the data collection methods and level of detail a WSP is able to achieve.

Variations in priorities and constraints indicate that the design of standard templates needs to allow for customisation suited to local needs.

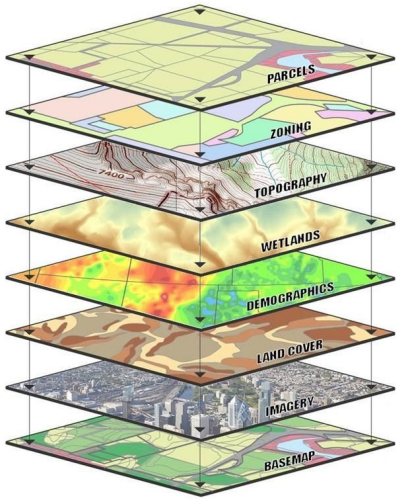
FROM INSIGHTS TO SOLUTIONS : SOLUTION 1

Solution 1

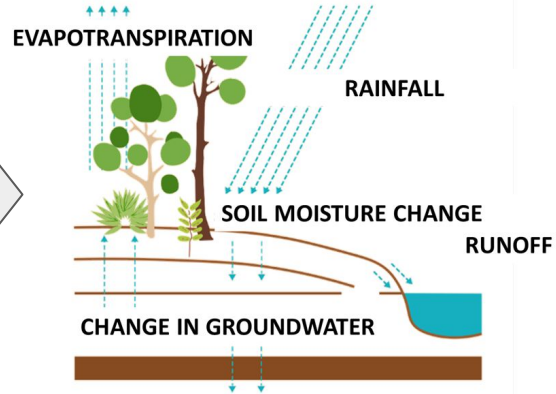
Create customisable yet comparable templates that treat soil moisture, GW and SW as one resource.

Account for the unique geographical and social characteristics of a watershed to make templates for water budget preparation. Provide easy access and training materials for the same.

Input data layers



Water Balance output from Jaltol (QGIS Plugin)



What's next?

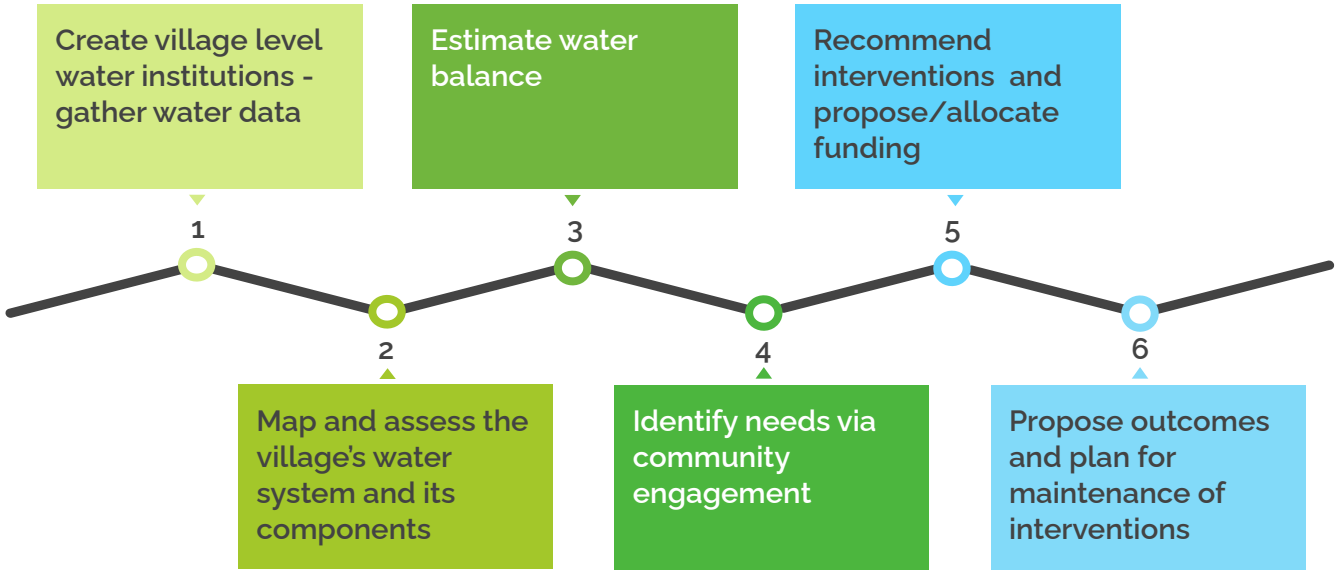
We have developed an open source water budgeting tool "**Jaltol**" (a QGIS plugin) to help estimate water balances using all the variables -- precipitation, groundwater stock, surface water stock, evapotranspiration and surface runoffs.

We have prepared training materials on how to use **Jaltol** for water budget preparation. We are currently running pilot trainings with CSOs across the country. To be an early user, please sign up for the training here.

INSIGHT 2:

The current process of making WSPs does not account for potential changes over time in both farmer behaviour and climate.

2(a) In the current linear planning cycle for rural water security programmes, learnings and data from older interventions and projects are lost. The plans tend to not have historical context.



Most plans include village profiles and detailed assessments of the region (step 1 and 2) such as hydrogeology, land use patterns, water sources, etc. Collecting such data is resource and time intensive and it's likely that some of it must be available from prior projects. Yet the linear approach to WSP creation does not appear to leverage past work. Nor does the process prioritise archiving data for future iterations, suggesting that the whole exercise will have to be repeated for new projects.

INSIGHT 2:

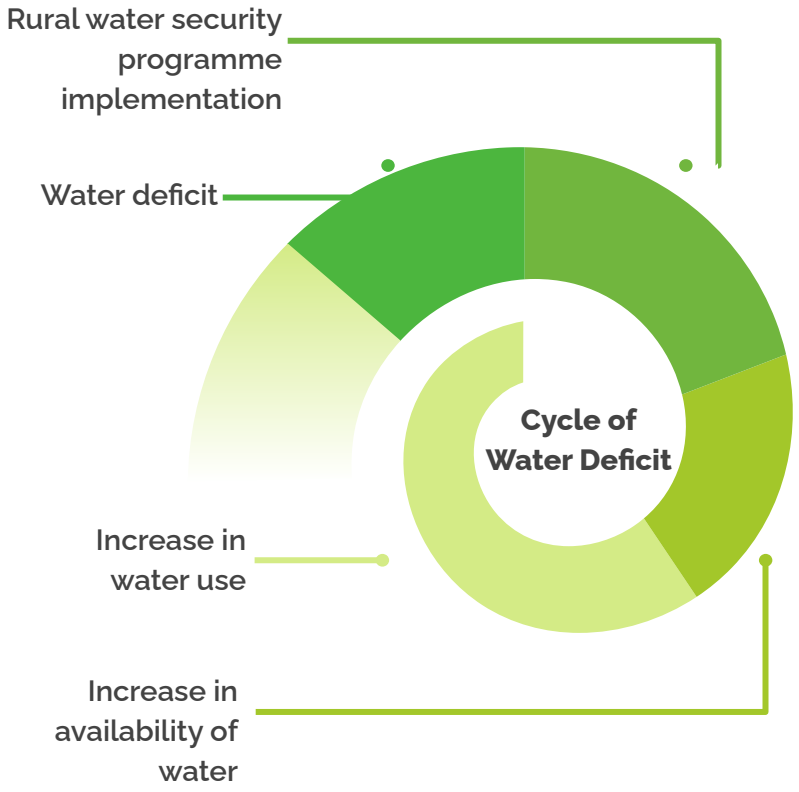
The current process of making WSPs does not account for potential changes over time in both farmer behaviour and climate.

2(b) WSPs estimate the water balance as a static metric, but rarely account for changes in cropping patterns over time.

Most plans we reviewed assumed that water availability and demand in a region remain fixed over time. However, rural water security programmes by design induce changes in water use.

If the interventions undertaken make more water available, farmers will change their cropping patterns. For instance, planting more water intensive cash crops or adding a second crop – simply because they can now afford to do so. This induces a 'cycle of water deficit', where the old water harvesting structures are now insufficient to meet the new demand.

Therefore, what is needed is to understand water demand under different scenarios of water use. These can then be balanced against water availability to formulate the best water security strategy for the region.



INSIGHT 2:

The current process of making WSPs does not account for potential changes over time in both farmer behaviour and climate.

2 (c) Climate variability risks and vulnerabilities are often not accounted for in WSPs

Even if a watershed is in balance in normal years, it may be water stressed in dry years.[8]

Only 2 of 25 WSPs considered the risks associated with climate variability.

In one of these cases, the WSP tabulated historical data over a 40 year period on weather events. It recorded how untimely and erratic rainfall impacts farmers, but did not talk about adaptive strategies in detail.

We found that climate variability related risks to water and agricultural productivity were not an integral part of these WSPs. None of the WSPs mentioned specific actions required during droughts or floods.

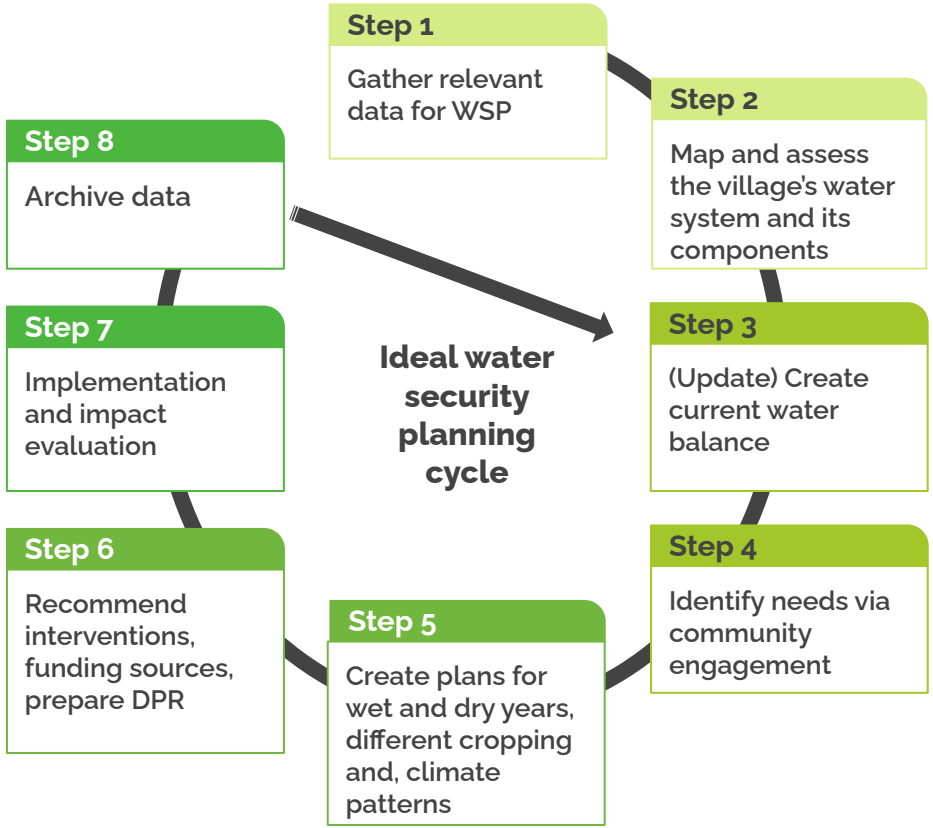
This potentially implies that, without relevant mitigation and adaptive strategies, **GPs continue to remain vulnerable to climate variability and change.**

Summer cyclones, a previously rare phenomenon in India, are now becoming frequent due to climate variability – causing immense losses to crops and soil, among other things.

FROM INSIGHTS TO SOLUTIONS : SOLUTION 2

Solution 2

Conceptualise and prepare Water Security Plans considering both wet and dry years, and under changed cropping patterns.



What's next

We propose conducting training sessions and workshops on preparing and using WSPs on a regular basis to ensure that the plans are prepared for wet and dry years, and under changed cropping patterns.

Water security plans need to be periodically revised. For this, the datasets used to prepare the plans need to be archived to avoid duplication of efforts.

A first step towards creating a "knowledge commons" could be the water budgeting tool we have developed.

INSIGHT 3:

Water budgets are not the only determinants of WSPs; multiple factors influence WSPs to favour supply side interventions.

3(a) Water balances are not the only drivers of intervention planning.

The typical output for WSPs is an intervention plan. This usually includes a list of plot-wise interventions or in some cases a summarised list of interventions for the whole village.

13 of 25 WSPs contained a water balance.

However, almost none of the WSPs clearly spell out how the results of the water balance are used to arrive at an intervention plan. We also found that WSPs recommend supply side interventions even when the water balance shows a deficit in the watershed – implying that these recommendations are influenced by other factors.

Some **contributing factors** we came across were:

- Experiences of implementing agency
- Advice of technical experts
- Time constraints

3(b) The need for demonstrability and current funding structures favour supply side interventions over ones that address water demand.

All 25 WSPs recommended supply side interventions.

WSPs include financial details of planned interventions in terms of costs of materials and labour. Such estimation is feasible for supply side interventions like check dams and farm ponds, but is not well-suited for demand side interventions.

Farm ponds (above) and check dams (on the right) were most commonly recommended by WSPs.

INSIGHT 3:

Water budgets are not the only determinants of WSPs; multiple factors influence WSPs to favour supply side interventions.

Supply-side interventions are favoured by the community and funders. They provide employment and are easy to monitor.

Rural Water Security Programme success is contingent on trust between the implementing organisation and community. NREGA funds, which exclusively support construction work, are often mobilised to employ people for construction work. Thus, communities are naturally partial to tangible supply-side interventions.

Donors track the projects they fund through impact evaluation studies that often focus on quantitative metrics. These are suitable for supply-side interventions (counting structures).

In contrast, demand-side interventions hinge on changing farmer behaviour and require non-traditional investments and metrics. They lack clearly attributable and easily quantifiable impacts, and funders often find it hard to assess their impact.

Only 9 of 25 WSPs recommended demand-side interventions.

Demand-side management is relatively long-term and shifts agency to the community. Such interventions go hand in hand with livelihoods diversification and improved market linkages. **Since their impact is largely invisible, the uptake for these interventions was much lower.**

Implementing demand management requires investing in building capacity within the community and implementing organisations. Hence, while many WSPs acknowledged the need for demand management, most did not recommend such interventions.

Demand-side intervention: Shift in farming from mono-cropping to multi-cropping.

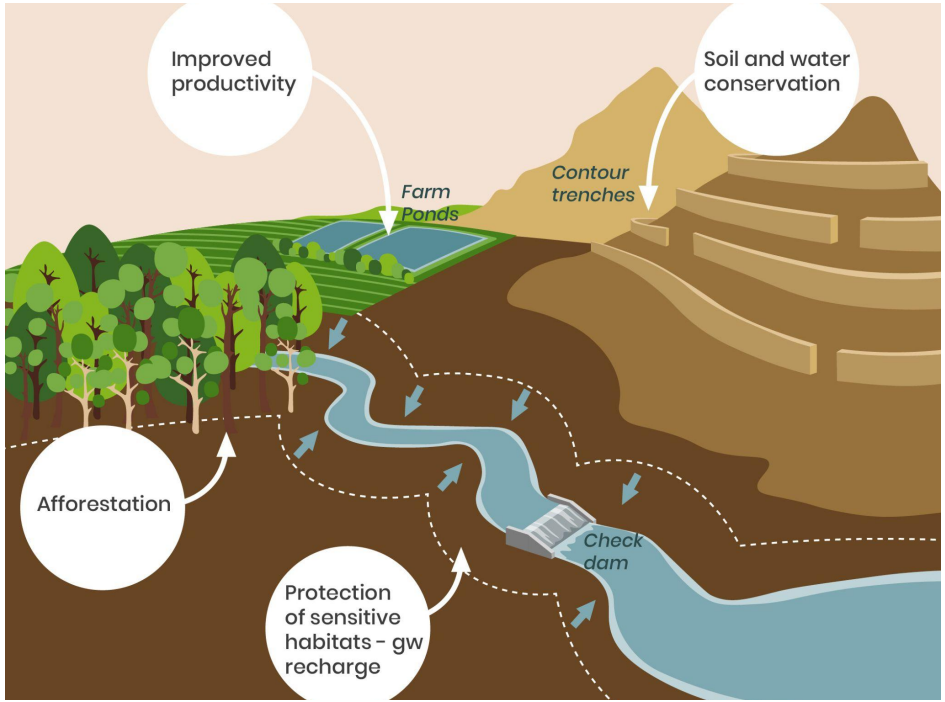
FROM INSIGHTS TO SOLUTIONS : SOLUTION 3

Solution 3

Need new tools that make the invisible "commons" visible, and promote adoption of demand-side techniques.

The fact that farmers prefer supply-side solutions is not surprising. The challenge with proposing demand-side interventions is that they are less visible and are perceived as punitive by farmers.

Solutions library



What's next

We need to develop a "Solutions Library". For a set of 15 to 20 supply and demand side interventions, we will develop:

- A pictorial representation of the theory of change (current vs. future)
- A set of prerequisites for the intervention to succeed and scale (including defining parameters for success and scaling)

INSIGHT 4:

WSP planning processes do not always account for operation and maintenance thoroughly

Only 11 of 25 WSPs made plans for operation and maintenance (O&M) of recommended interventions.

These O&M plans deal with post-implementation aspects of interventions recommended by a WSP. They are meant to answer the following questions:

1) How much will it cost to operate and maintain the assets built?

Most WSPs contain estimates of the funds required for O&M of interventions in a village. Some plans also include estimates for the maintenance of existing water storage structures that have silted up or are in need of repair. It is unclear if these were built as part of other rural water security programmes and had any maintenance funds dedicated to them in the past.

2) How will money be raised for O&M of the interventions that the WSP recommends?

In **5 of the 11 WSPs that mention O&M**, the funds for the same are raised from the village beneficiaries.

The villagers are expected to pay a sum of anywhere between INR 15-25 per month per family to maintain these assets indefinitely.

3) Who is responsible for O&M of recommended interventions?

Once implemented, in most cases, the implementing CSOs hand over the physical assets created to the VWSC, the larger community and GPs. However, the WSPs don't mention any details about their involvement, apart from the financial contributions required from the community.

A lack of maintenance results in the physical assets no longer efficiently fulfilling their purpose, such as in cases of silting of ponds or breakdown of check dams. There is a strong need to build technical expertise within the community to operate and maintain the physical assets built as a result of these WSPs.

FROM INSIGHTS TO SOLUTIONS : SOLUTION 4

Solution 4

Design water security plans to include clear and detailed operations and maintenance (O&M) details

Details to be included in operations and maintenance (O&M) manuals:

1. Stakeholders involved in O&M, along with their roles and responsibilities
2. Budget allocation for O&M
3. Sources of finance for O&M

Conduct training programmes with grassroots communities to ensure easy uptake.

What's next

We propose developing detailed O&M manuals for physical assets and infrastructure that are recommended by WSPs. This will ensure that the O&M details are standard across all water security plans and related documents.

We also propose conducting training programmes to ensure that the manuals can be easily used as a part of field work by implementing CSOs.

INSIGHT 5:

WSPs largely fail to address the problem of inequitable water distribution.

WSPs refer to equity in terms of social and gender equity, and how intervention benefits are shared by the entire community, irrespective of socio-economic status. However, the plans do not go into details of how interventions are expected to improve or preserve water-related equity.

There are various types of inequities and inequalities in water access and distribution:

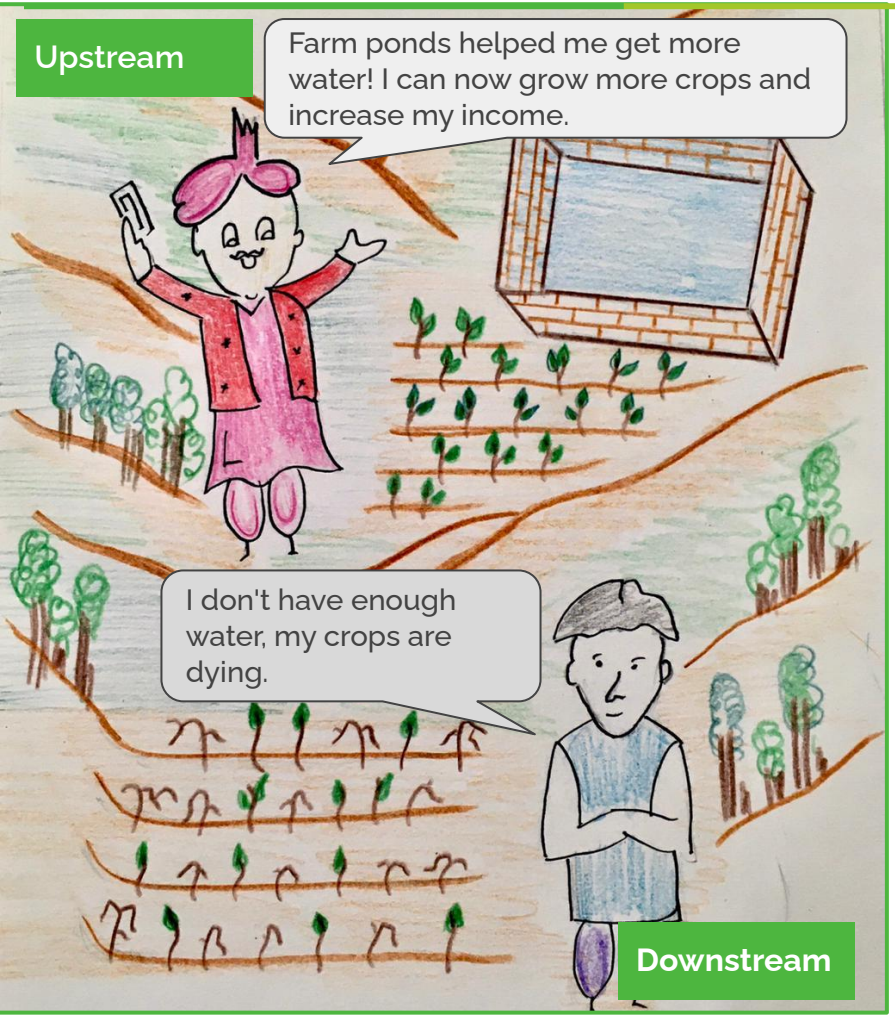
1. **Inequity in access to groundwater** - Farmers with large wells, and high capacity pump sets have better access to groundwater. This limits groundwater to only medium and large farmers who can afford these.

2. **Inequity in access to runoff** - Water from natural catchment areas belongs to the state. However, in water scarce states, governments are promoting decentralised water harvesting structures like check dams, and anicut sand ponds. These have intercepted the water flowing into large reservoirs that often serve small and poor farmers.

3. **Inequality in access to water from canals** - The location and design of public irrigation systems often benefit large landholders and rich farmers, typically upstream farmers. Farmers in the tail-end of the hydrological system often do not receive water. Rich farmers in the tail-end usually have access to wells and borewells to draw groundwater, while the poor and small farmers often have to buy water from neighbouring farms.

Reasons for inequities:

- Geographical positioning of land
- Ownership of land and rural assets
- Low pressure in pipes and inadequate infrastructure
- Inefficient energy pricing policies and access to groundwater



Inequities of supply side interventions

Construction of farm ponds is a supply-side intervention that stores water for future use. If groundwater is pumped upstream to fill these ponds, less groundwater flows downstream. Similarly, if rainwater is harvested in these ponds, less rainwater is allowed to flow downstream. The construction of too many farm ponds under a certain programmes can thus have ramifications in other areas of the watershed.

A better understanding of water flows and farmer behaviour can help avoid this situation.

FROM INSIGHTS TO SOLUTIONS: SOLUTION 5

Solution 5

Formally apply tools and techniques for tracking equity - both before and after implementation.

We propose applying the economic concept of the Gini Index as one way to understand inequality in water use. The Gini Index measures the inequality among values in a population. It typically measures income inequality and has a value between zero and one; Zero represents perfect equality, where everyone has the same income; A value of one is perfectly unequal, implying a single person has everything.

Figure 1

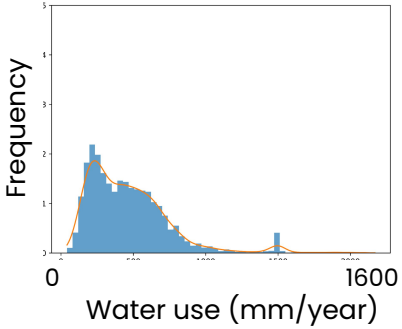
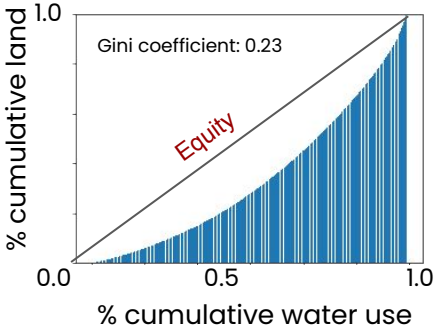


Figure 2



These two graphs above depict equity levels in a watershed/region. Figure 1 is a histogram of water use in a district. It shows that there are many farmers (the peak on the left), who use little to no water (i.e rainfed) but a small fraction of farmers (tail on the right) use a lot. Figure 2 is a % cumulative water use, vs cropland.. The greater the deviation from the "equity" line where all parcels of land have equal amount of water, the more inequitable is water access.

Has the programme implementation improved, retained or worsened equity in water distribution and usage?

What's next

The first step to addressing inequity is to be able to track it.

We propose to make it easy to calculate equity in water use and water distribution using "Jaltol" (the QGIS plugin) described in Solution 1.

SUMMARY: WHAT IS A GOOD WATER SECURITY PLAN?

Water security plans are a labour of effort. They are designed meticulously, despite financial, technical and capacity constraints. The suggestions in brief will ensure further refinement of the WSPs so they continue to be useful and guide programmatic work. The following checks will allow WSP designers to put together more holistics plans:

- Technical soundness check: Does it acknowledge that soil moisture, groundwater and surface water are interlinked? Does it account for stock and flow separately?
- Resilience check: Does it consider wet and dry years in discussions with communities?
- Linkages between data (specifically through water budgets) and interventions check: Does it look at the data in trying to understand what interventions would be most appropriate -- supply side or demand side?
- O&M check: Does it have Operations and Maintenance details?
- Equity check: Does it measure and account for water equity?

SUMMARY: CALL TO ACTION FOR STAKEHOLDERS

Solutions	Philanthropic organisations	Government agencies	CSOs
Solution 1: Templates that treat soil moisture, GW and SW as one resource.	Focus their efforts on demand side interventions.	Adopt tools like Jaltol to prepare water budgets, so they are scientifically correct.	Adopt tools like Jaltol to prepare water budgets, so they are scientifically correct.
Solution 2: Prepare WSPs that consider wet and dry years, cropping patterns, update periodically.	Encourage and provide incentives for CSOs to prepare WSPs more regularly.	Ensure data archival of WSP data through schemes like Atal Bhujal Yojana, Jal Jeevan Mission, etc. to be accessible over time.	Include questions about dry years and consequences of changes in cropping patterns in community discussions.
Solution 3: Tools that show the need for demand-side approaches.	Invest in Solutions Library -- appropriately linking problems to solutions	Ensure that the schemes focus on demand side interventions in over-exploited regions.	Ensure that intervention planning is linked to on-the-ground challenges.
Solution 4: Ensure WSPs include O&M details	Include O&M as an important item to be included in WSPs	Include plans for O&M in govt, schemes.	Estimate detailed O&M costs over a long time horizon.
Solution 5: Track equity - both before and after implementation.	Focus on and track equity to understand the impact of programmes	Focus on and track equity to understand the impact of government schemes	Measure equity using available tools in simple ways.

ANNEXURE

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2. Context/Why do we need to address rural water security? - “Paddy Fields” by Sonia Hoque/REACH, via Flickr https://www.flickr.com/photos/reachwater/32763686602/in/album-72157662327804511/

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