InoCotton GROW

Exploring improvements in water management for the cotton and textile industry – results from a case study in Punjab and its contribution to achieving UN-SDGs in Pakistan

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BACKGROUND

- Interdisciplinary project to address water management problems in the region of Lower Chenab Canal in Punjab, Pakistan
- Irrigation of cotton plants as well as dyeing and finishing processes during textile production require tremendous amounts of water
- Work on technically, economically and institutionally feasible ways of increasing the efficiency of water use along the cotton-textile value chain in Pakistan

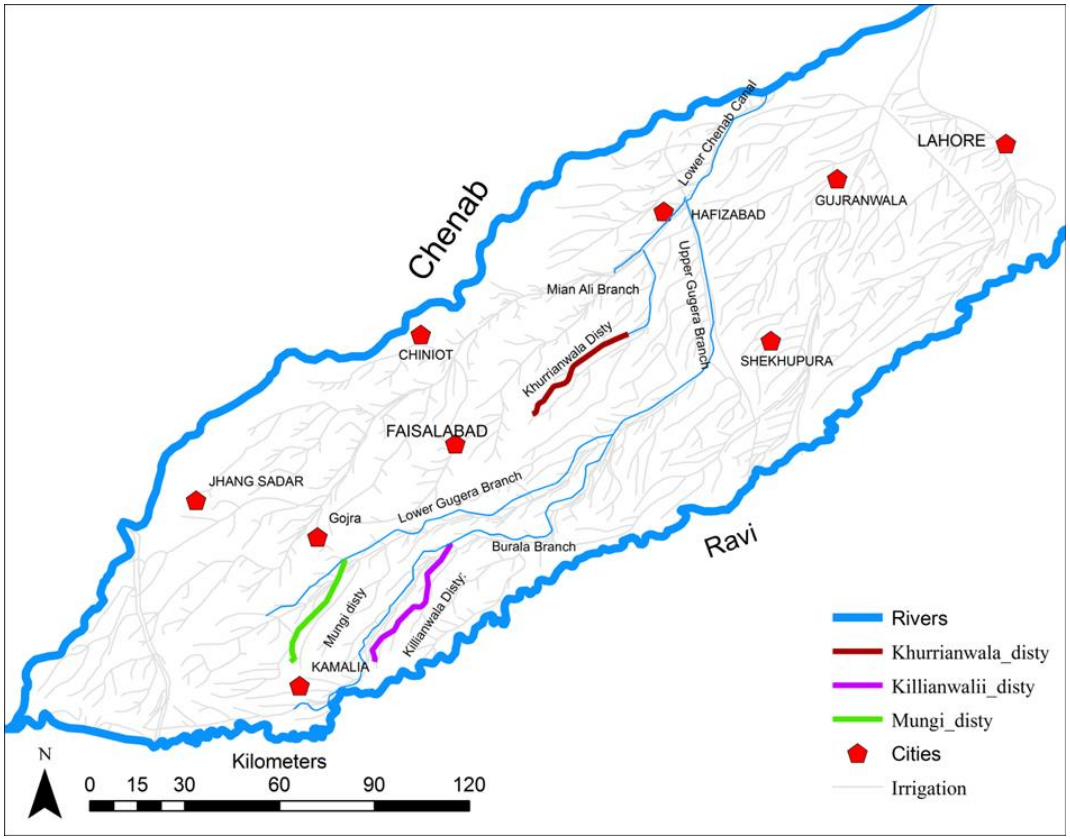

Figure: InoCottonGROW and IWW

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PROJECT PARTS AND LINK TO SDGS

- Hydrological modeling of climate change scenarios to analyze water stress (see EGU2020-8144, Becker et al. 2020)
- Water footprint simulations
- Analysis of irrigation techniques and other adaptive measures (based on site visits and knowledge exchange with scientists, farmers and textile industry in Pakistan)
- Incorporation of hydrological modeling, water footprint simulations, water stress considerations and adaptive measures to future scenarios
- Analysis of interlinkages, synergies and trade-offs of adaptation scenarios with regards to UN SDGs

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SCENARIOS TO CHANGE THE WATER MANAGEMENT (ADAPTATION)

No.	Title	Storyline
1.	Making the most of the current system	Optimize existing system, maximize water efficiency in cotton production, reduce water usage for exhaust dyeing
2.	Many pennies make a dollar	Small scale technological changes, improved irrigation practices at field level, reduce water usage for exhaust dyeing, legislation for improved effluent treatment at medium and large textile processing companies
3.	Think big	Large scale infrastructure projects in water supply and sewage disposal (e.g. lining of main canals and sewers or installation of wastewater treatment plants at central drains), reduction of water and dyes usage in exhaust dyeing
4.	Regional water shifting	Adjusted water distribution including changes in the institutional setup, controlled deficit irrigation
5.	Regional crop shifting	Incentives to modify cropping patterns
6.	Quality instead of quantity	Pesticide reduction, all medium and large textile companies install functioning effluent treatment plants, penalties for non-compliance

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APPROACH FOR A QUALITATIVE ANALYSIS: ADAPTATION OF THE "ICSU-METHOD"

- Analysis based on a methodology proposed by the International Council for Science in 2019: "A Guide to SDG Interactions: From Science to Implementation"
  - Qualitative impact assessment
  - SDG targets assumed to be *influenced by* any scenario or having an *influence on* any scenario
  - scores: +3 = "indivisible";
    +2 = "reinforcing";
    +1 = "enabling";
    0 = "consistent";
    -1 = "constraining";
    -2 = "counteracting";
    -3 = "cancelling".

SDG Targets	Type of influence	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
2.1	on	+1	+1	+2	+2	+3	+2
2.2	on	+1	+1	+2	0	+1	+1
2.3	on/by	+1	+1	+2	+2	+2	+1
2.4	on/by	+2	+1	+1	+2	+2	+2
2.a	on/by	+1	+2	+1	+2	+1	+1
6.1	on	+1	+2	+2	+2	+1	+2
6.2	by	0	0	0	+1	+2	0
6.3	on/by	+2	+3	+3	0	-1/+3	+3
6.4	on/by	+3	+2	+2	+3	+1	+2
6.5	by	0	0	0	+1	+1	+1
6.6	on/by	+2	+2	+1/-1	-1	+1	+2
6.a	by	+1	+1	+1	+1	+1	+1
6.b	on/by	+2	+1	0	+1	+1	+1

Example for SDGs #2 and #6

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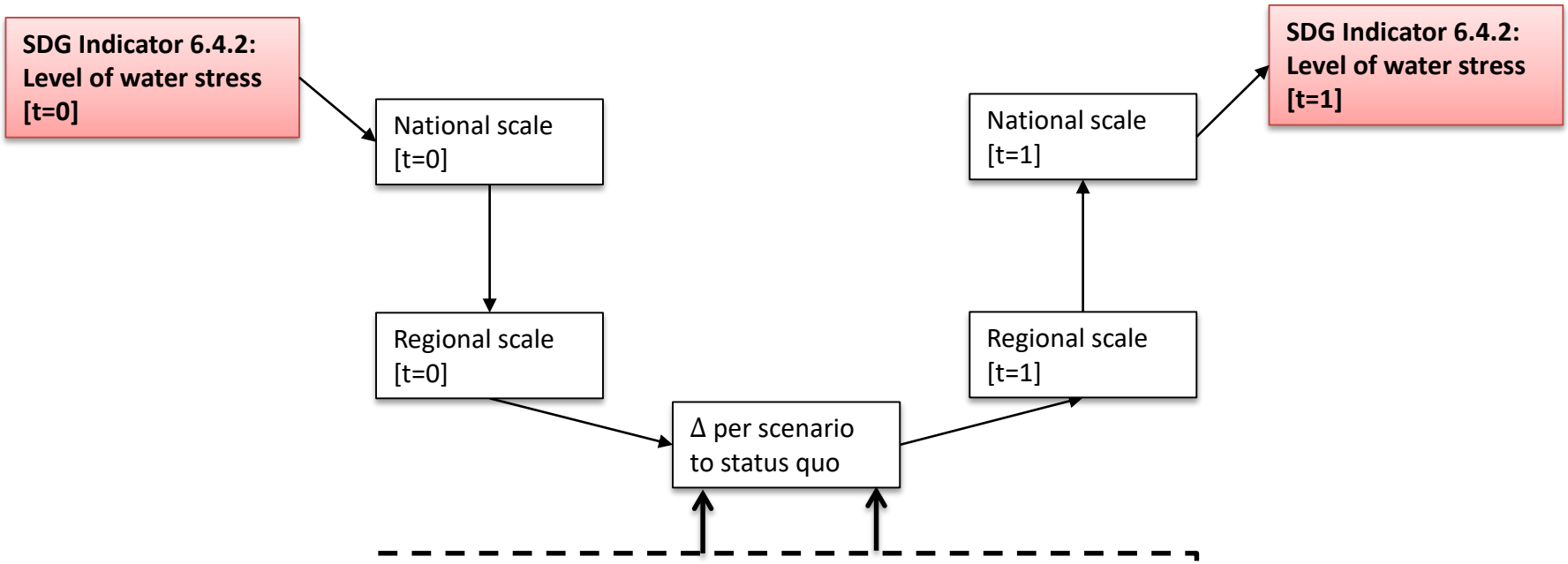
APPROACH FOR A QUANTITATIVE ANALYSIS: FROM HYDRO-MODELING TO SDG IMPACT



Legend:
[t=0] represents point in time with no changes (status quo)

[t=1] represents point in time with changes (water management scenario)

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APPROACH FOR A QUALITATIVE ANALYSIS: FROM WATER FOOTPRINT TO SDG IMPACT

	Intervention	WF	Secondary Effects (relevant for SDG assessment)
Cotton	Promotion of a more flexible irrigation scheduling within Warabandi system	↘	Reduced soil evaporation
	Promotion of drip irrigation techniques	↗	Higher application efficiency, reduced groundwater recharge
	Increased dissemination of storage systems	↘	Indirect effects by supporting measures above
Textile	Promotion of water-efficient machinery in textile processing	→	Reducing water usage (groundwater pumping), additionally energy and time savings
	Promotion of advanced dyestuff and process chemicals	↓↑	Reduce in groundwater pumping, additionally energy and time savings, increased COD concentration without WWT
Wastewater	Installation and operation of effluent WWTPs in all large- and medium-size textile finishing plants	↓	Increased energy consumption, reduced emission concentrations to ZDHC foundational

Example: Effects of scenario 2 (“Many pennies make a dollar”) on the water footprint and SDGs

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PRINCIPLE FINDINGS

- The interdisciplinary approach led to several water management scenarios valuable for decision makers.
- All management scenarios have the potential for highly positive effects on the achievement of several SDG targets.
- Adaptation of the ICSU approach for SDG interactions to case level in Punjab offered a structured method to analyze interactions between high-level SDGs and regional water management changes.
- Highest impacts may occur with regard to water quality (#6.3) and water-use efficiency (#6.4).
- Side benefits became visible for food security (#2.1), energy efficiency (#7.3), upgrade of infrastructure (#9.4), sustainable management of natural resources, chemicals and wastes (#12.2 & 12.4), and waste reduction (#12.5).
- Nevertheless, trade-offs or negative effects might concern the protection and restoration of water-related ecosystem (#6.6), if water is regionally shifted, and marine ecosystems (#15.1-3) in case of adjusted crop cultivation.

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