WATER RESOURCE MANAGEMENT TO ACHIEVE LDN

Karan K, Dr. Ayon Kumar Tarafdar

Land Degradation Neutrality (LDN) —The Neutralization/ Improvement of the lost productive capacity of the soils

WHY? NEED FOR THE STUDY

01 Thematic Rationale

SDG — 15,2030
UNCCD — 2018
UNCED — 2014

Urges to combat desertification

02 Theoretical Rationale

*Urbanization +
Poor WR Management +
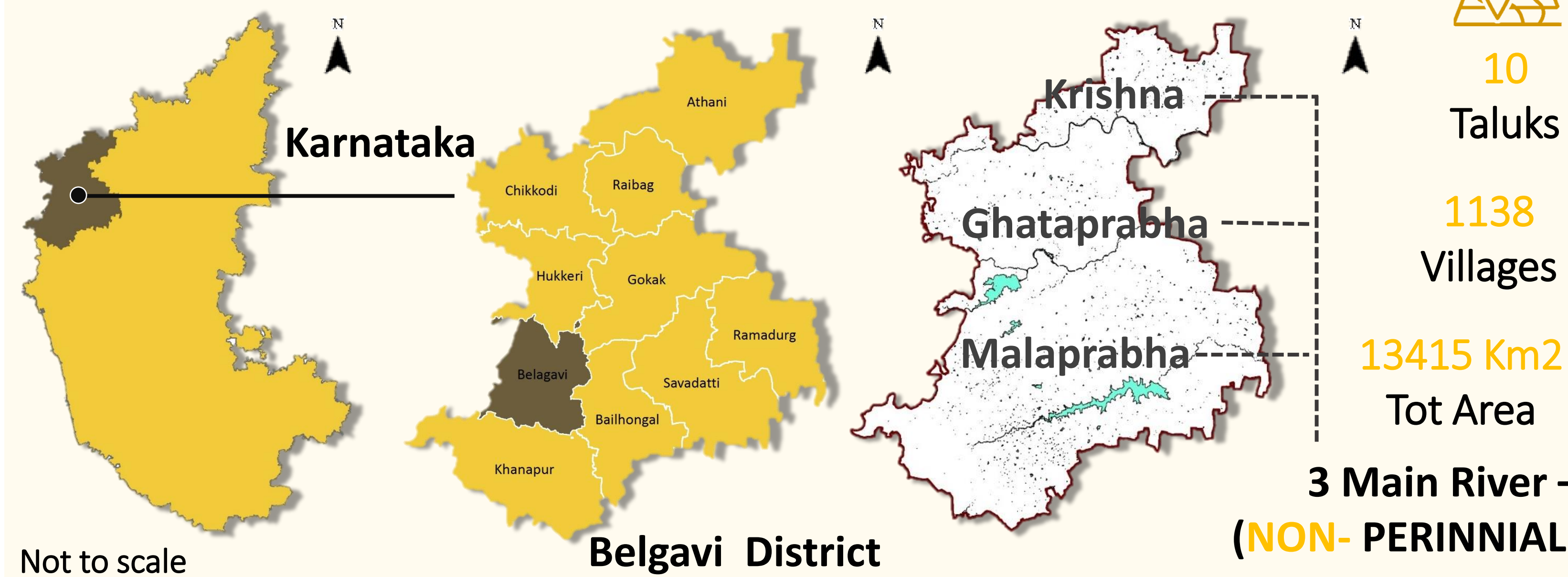Extreme. Weather*

Land degradation increased in last century

03 Contextual Rationale

30% of India – **Land Degraded**

Karnataka contribution is highest (12.2%)

1.6 Million **People affected**

WHERE? SITE AREA DISCRIPTION

Karnataka — Not to scale

Belgavi District

Krishna — Ghataprabha — Malaprabha

10 Taluks
1138 Villages
13415 Km2 Tot Area

3 Main River – (NON- PERINNIAL)

WHAT? MAJOR ISSUES

Water Resource
- 58% Dependency on groundwater supply for irrigation
- 24% decrease of GWT Depth from 2014-2020
- Lack of perennial water resource.

Climate Change
- The climate of the district -semi-arid.
- 1.3% Decrease in Rainfall Intensity over 2001-2019. – IMD

Land Degradation
- 15% of Land resource is degraded
- 14% decrease in crop yield and crop fertility from 2014-2020
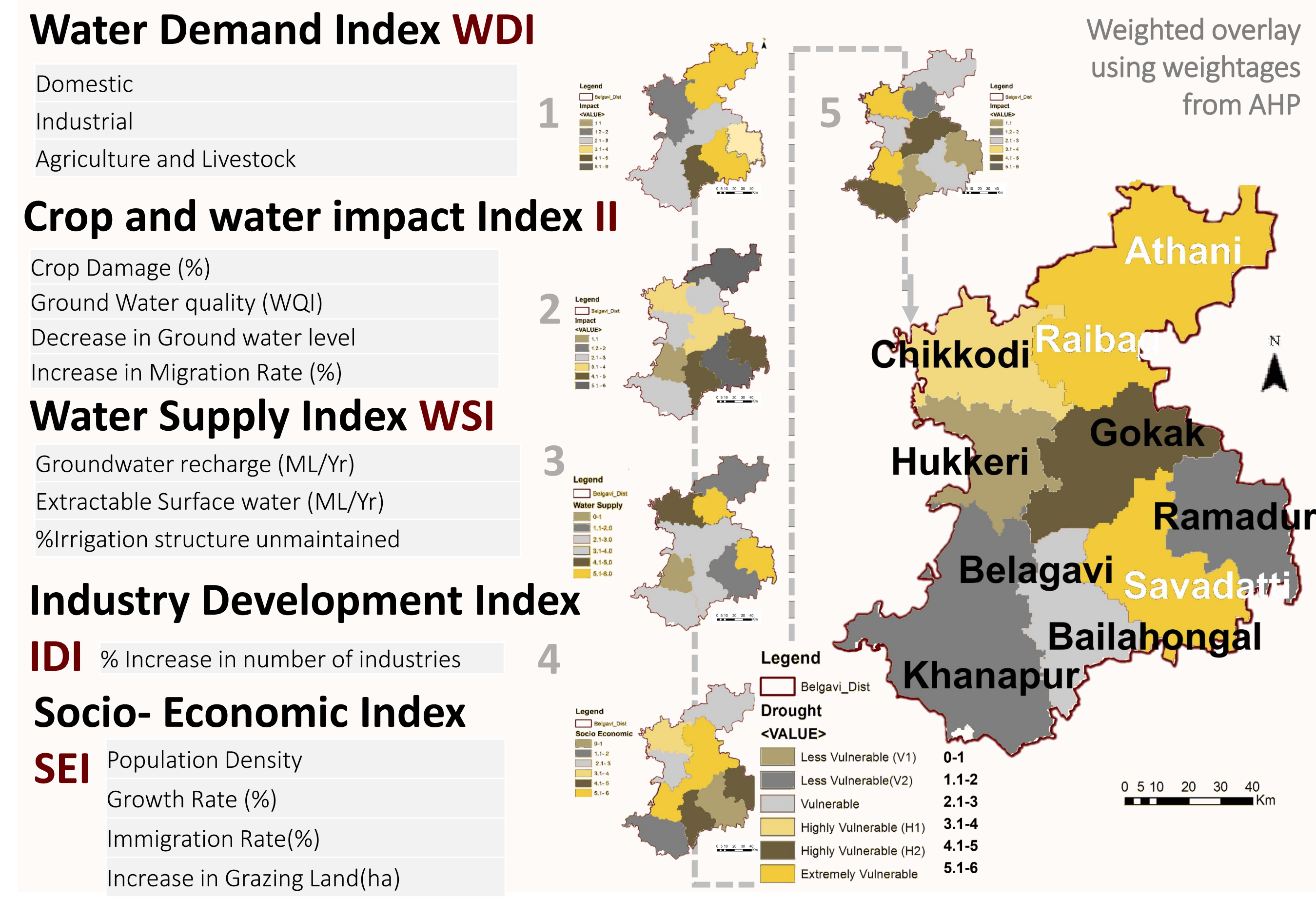
RESEARCH GAP
- No Integrated drought and desertification index to quantify Land degradation
- Lack of On ground effective Water Resource management approach towards achieving LDN
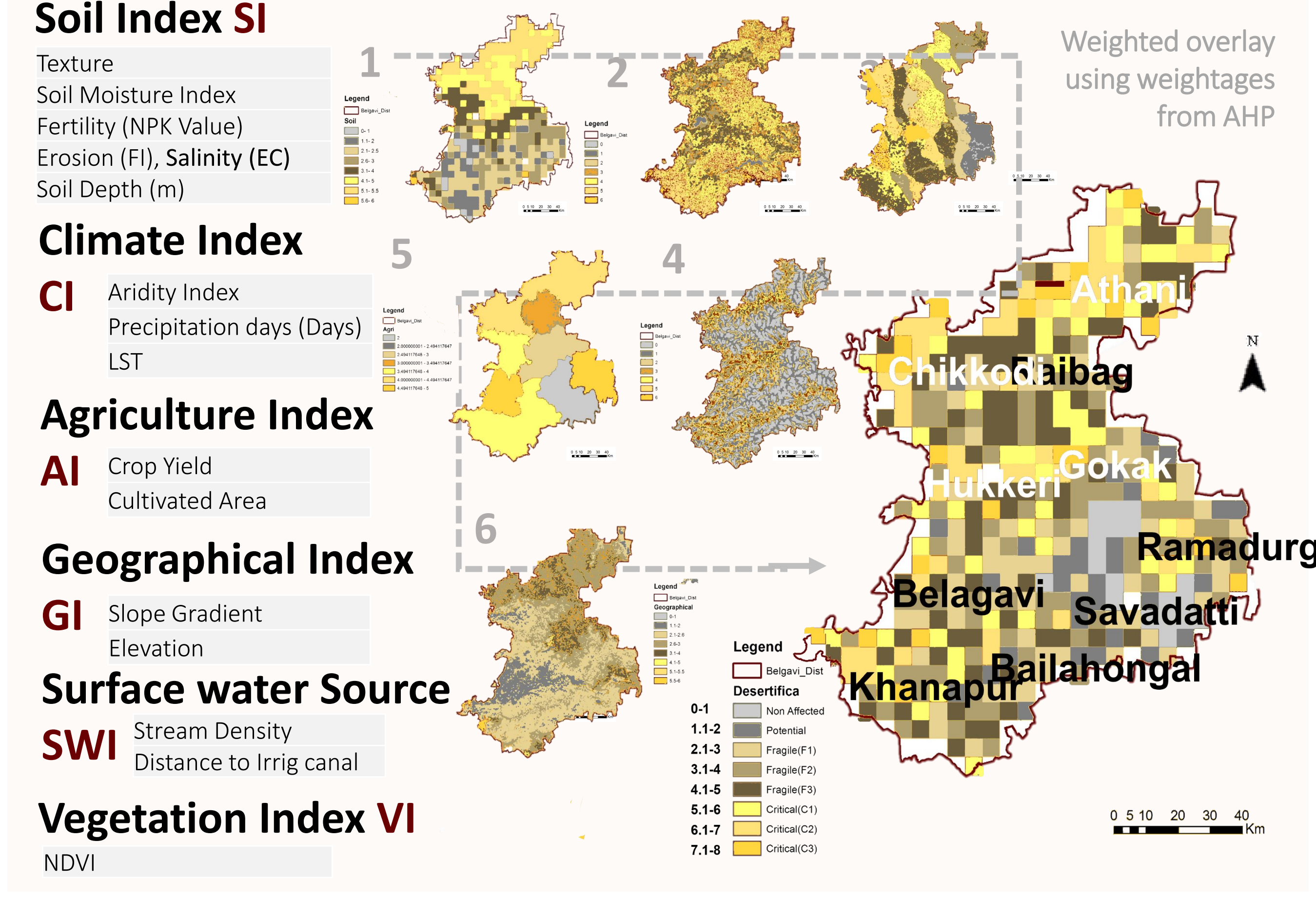
AIM

To Evolve a Integrated Water resource management based on consolidated Drought-Desertification Scenarios through hydrological models towards achieving LDN
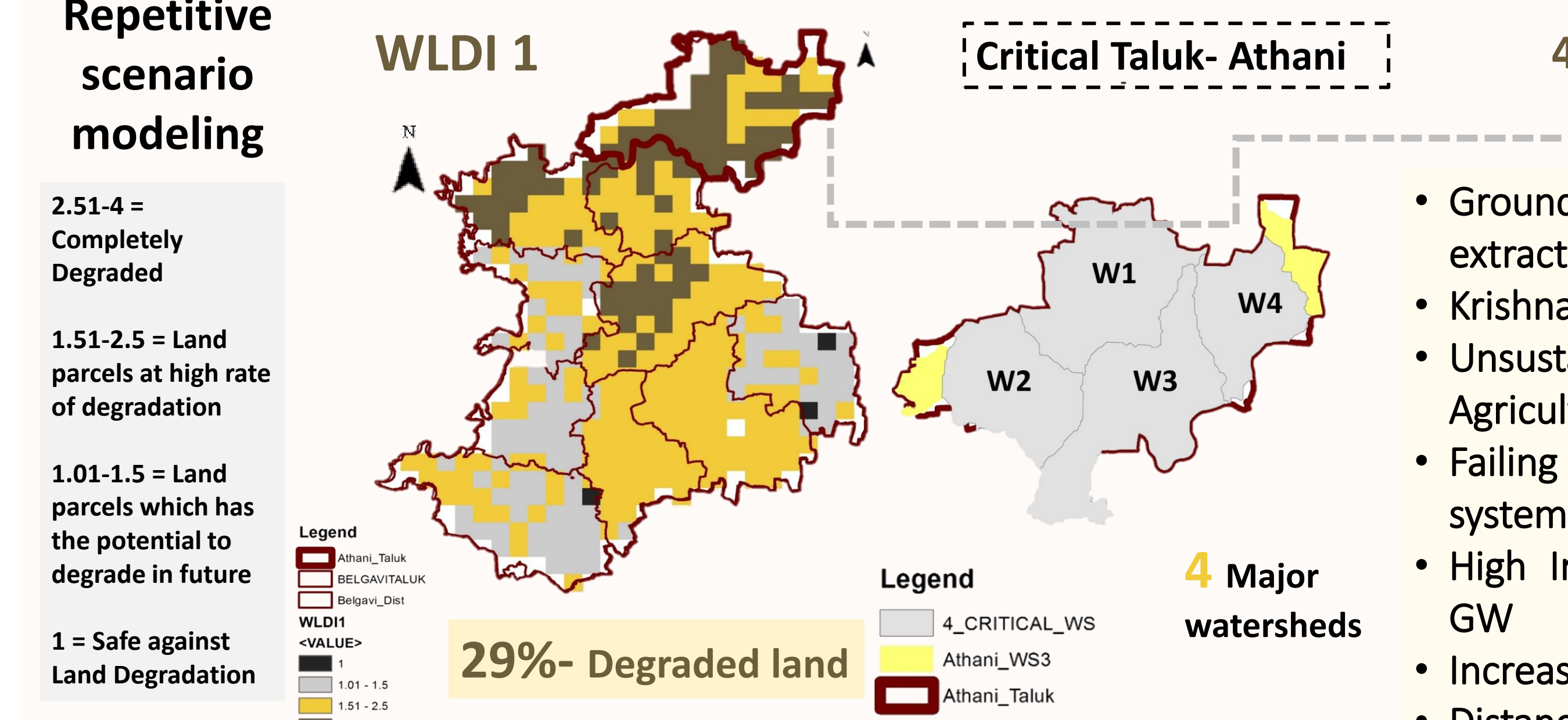
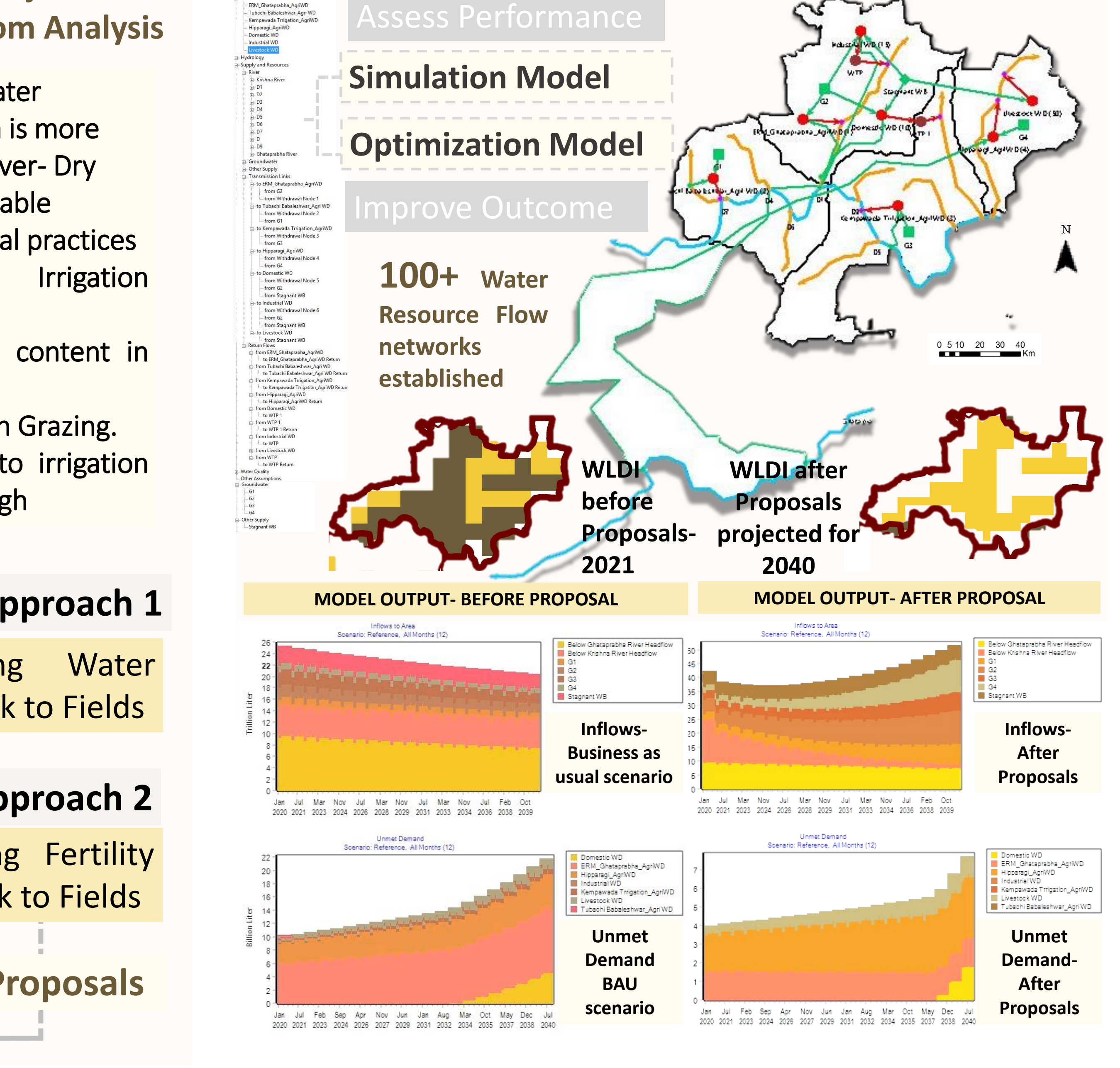## HOW? ANALYSIS

ANALYSIS 1- DROUGHT VULNERABILITY INDEX (DVI)

Water Demand Index WDI
- Domestic
- Industrial
- Agriculture and Livestock

Crop and water impact Index II
- Crop Damage (%)
- Ground Water quality (WQI)
- Decrease in Ground water level
- Increase in Migration Rate (%)

Water Supply Index WSI
- Groundwater recharge (ML/Yr)
- Extractable Surface water (ML/Yr)
- %Irrigation structure unmaintained

Industry Development Index
- IDI — % Increase in number of industries

Socio- Economic Index
- SEI — Population Density
- Growth Rate (%)
- Immigration Rate(%)
- Increase in Grazing Land(ha)

Weighted overlay using weightages from AHP

Athani, Raibag, Chikkodi, Gokak, Hukkeri, Ramadurg, Belagavi, Savadatti, Bailahongal, Khanapur

Legend — Drought <VALUE>
- Less Vulnerable (V1) — 0-1
- Less Vulnerable (V2) — 1.1-2
- Vulnerable — 2.1-3
- Highly Vulnerable (H1) — 3.1-4
- Highly Vulnerable (H2) — 4.1-5
- Extremely Vulnerable — 5.1-6

0 5 10 20 30 40 Km

ANALYSIS 2- DESERTIFICATION VULNERABILITY INDEX (DeVI)

Soil Index SI
- Texture
- Soil Moisture Index
- Fertility (NPK Value)
- Erosion (FI), Salinity (EC)
- Soil Depth (m)

Climate Index CI
- Aridity Index
- Precipitation days (Days)
- LST

Agriculture Index AI
- Crop Yield
- Cultivated Area

Geographical Index GI
- Slope Gradient
- Elevation

Surface water Source SWI
- Stream Density
- Distance to Irrig canal

Vegetation Index VI
- NDVI

Weighted overlay using weightages from AHP

Athani, Chikkodi, Raibag, Hukkeri, Gokak, Ramadurg, Belagavi, Savadatti, Khanapur, Bailahongal

Legend — Desertifica
- Non Affected — 0-1.1
- Potential — 1.1-2
- Fragile(F1) — 2.1-3
- Fragile(F2) — 3.1-4
- Fragile(F3) — 4.1-5
- Critical(C1) — 5.1-6
- Critical(C2) — 6.1-7
- Critical(C3) — 7.1-8

0 5 10 20 30 40 Km

ANALYSIS 3- WATER LAND DEGRADATION INDEX (WLDI)

Repetitive scenario modeling

- 2.51-4 = Completely Degraded
- 1.51-2.5 = Land parcels at high rate of degradation
- 1.01-1.5 = Land parcels which has the potential to degrade in future
- 1 = Safe against Land Degradation

WLDI 1

Critical Taluk- Athani

W1, W4, W2, W3

4 Major watersheds

29%- Degraded land

Legend — WLDI <VALUE>
- 1.01 - 1.5
- 1.51 - 2.5
- 2.51 - 3

Legend — 4_CRITICAL_WS, Athani_WS3, Athani_Taluk, BELGAVI/TALUK, Belgavi_Dist

4 Major Issues from Analysis
- Groundwater extraction is more
- Krishna River- Dry
- Unsustainable Agricultural practices
- Failing Irrigation systems
- High Iron content in GW
- Increase in Grazing.
- Distance to irrigation canal is high

HOW? PROPOSALS

Sce	Inference	Strategy	Proposals
Low	High potential to degrade	1. Prevention	1.1 Policy Level Interventions
Medium	Land parcels at edge of degradation	2. Reduction	2.1 Magnetic pattern drip irrigation 2.2 Change in Crop Pattern –Kharif, Rabi 2.3 RWH Structure (Crop land RWH, Integrated Reservoir with GW Recharge pit (IRGW), Rooftop RWH)
High	Land parcels at high rate of degradation	3. Restoration	3.1 Riparian Zone (8km stretch proposed) 3.2 Restoration of Stagnant waterbodies 3.3 Crop –Livestock integration 3.4 Crop Rotation (Innovative 4 season app)

ANALYSIS 4 – WATER RESOUCE SIMULATION & OPTIMIZATION - WEAP SOFTWARE

Assess Performance
Simulation Model
Optimization Model
Improve Outcome

100+ Water Resource Flow networks established

WLDI before Proposals- 2021

WLDI after Proposals projected for 2040

MODEL OUTPUT- BEFORE PROPOSAL
- Inflows- Business as usual scenario
- Unmet Demand BAU scenario

MODEL OUTPUT- AFTER PROPOSAL
- Inflows- After Proposals
- Unmet Demand- After Proposals

Approach 1 — Bring Water Back to Fields

Approach 2 — Bring Fertility Back to Fields

8 Proposals