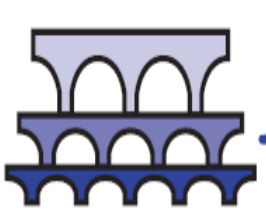


AQUEDUCT

MEASURING AND MAPPING WATER RISK

WORLD
RESOURCES
INSTITUTE

Goldman Sachs

imagination at work

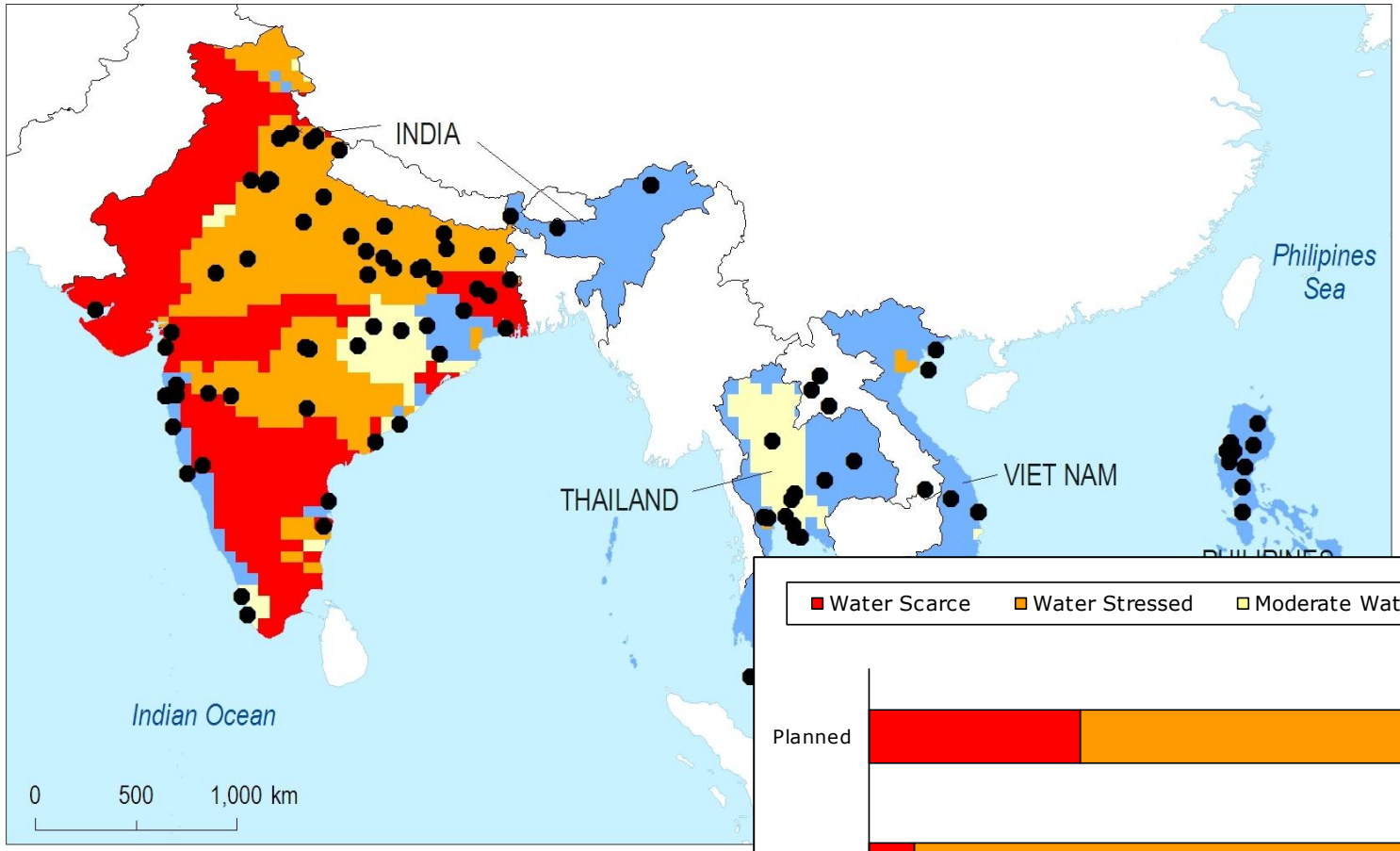
Water risk and economic growth

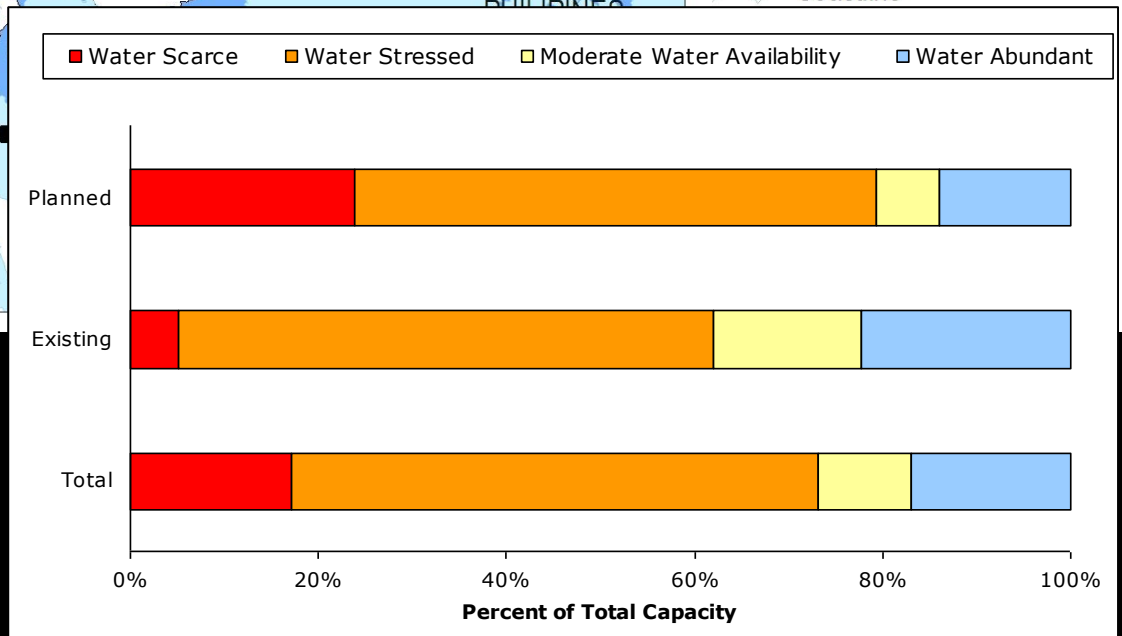
Africa: economic loss due to lack of access to safe water and basic sanitation estimated at 5% of GDP (WHO 2006)

China: external cost of water already amounts to about 2.3 percent of China's GDP, of which 1.3 percent is attributable to scarcity of water, and 1 percent to direct impacts of water pollution (World Bank 2009)

Informing portfolio decisions

Example: Power plant locations and water stress levels

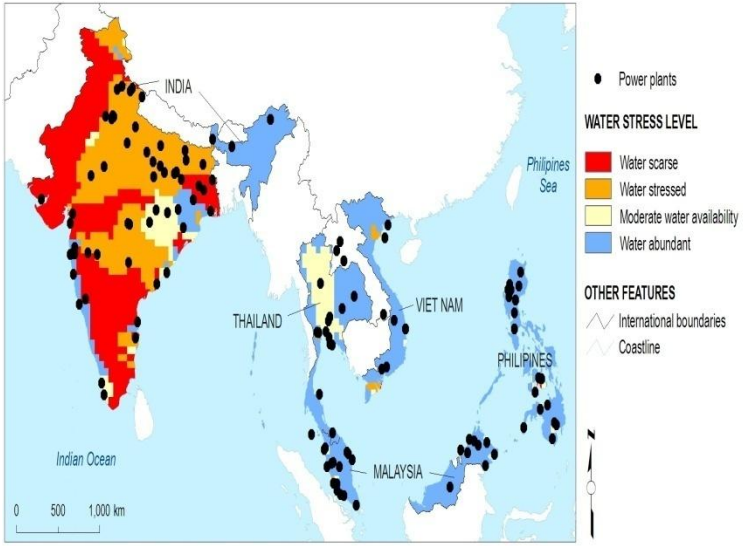




Source: WRI and HSBC, *Over Heating: Financial Risks from Water Constraints on Power Generation in Asia* (2010).

Facility / project level water management

Portfolio risk management



Ranking companies by risk

<HELP> for explanation.

ComdtyOSI

1) Export 2) Alerts

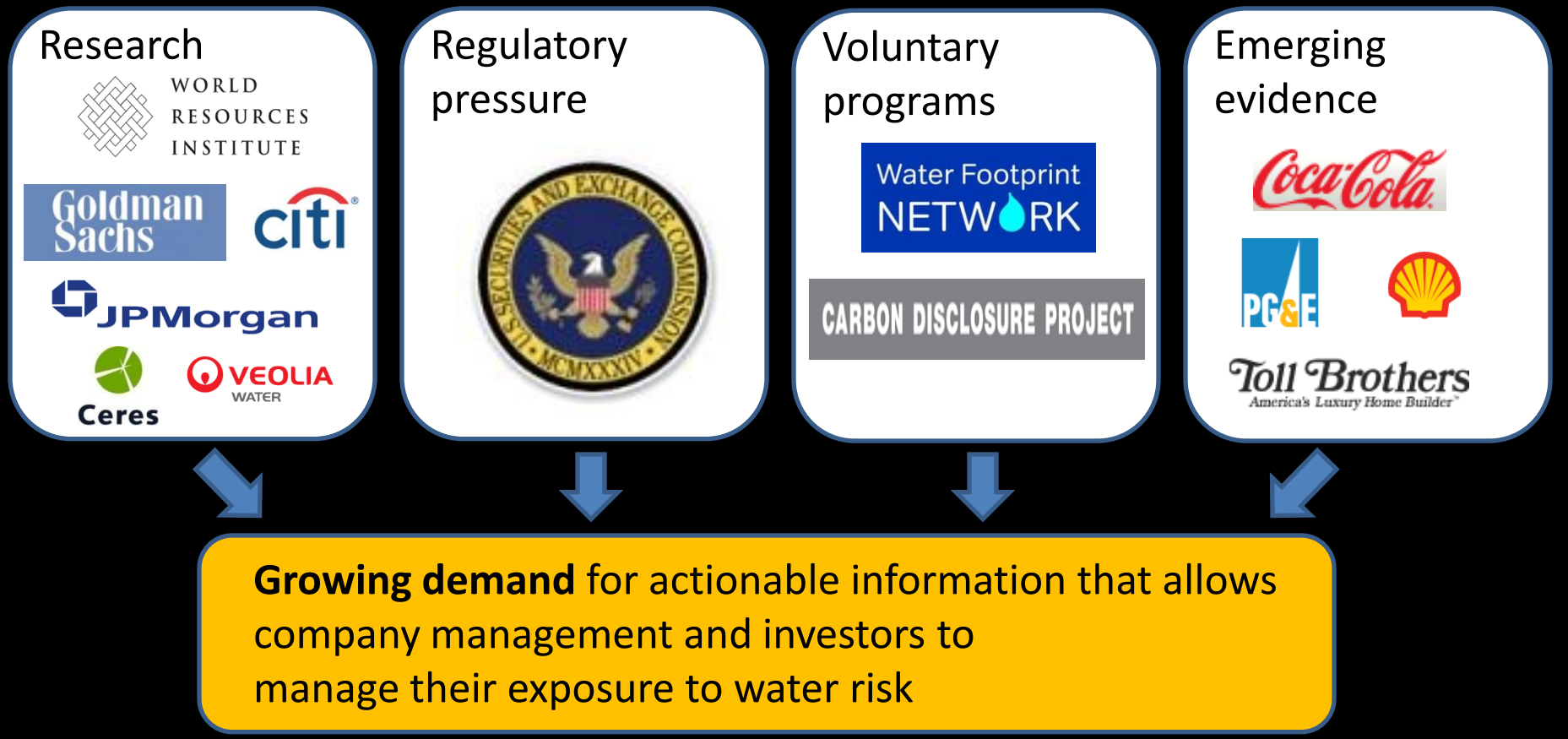
Environmental Impact Overview

Water Scarcity > United States > Southeast > Utilities

Parent Company	% of Regional Capacity by Risk Level				% of Total
	Very High	High	Medium	Low	Capacity
1) Georgia Power C	68.58	31.42	0	0	43.61
2) Alabama Power	50.26	23.08	26.66	0	46.74
3) Mississippi Powe	0	100	0	0	23.45
4) Tennessee Valle	0	42.31	25.76	31.92	64.13
5) Cinergy Corp	0	20.11	79.89	0	19.33
6) Florida Power Co	0	0	100	0	84.68
7) Florida Power &	0	0	62.71	37.29	81.31
8) Progress Energy	0	0	0	100	1.40
9) JEA	0	0	0	100	13.11
10) Virginia Electric	0	0	0	100	72.29

Map Assets Assets by Company Assets by Risk Level

Demand for information



Financial impacts

Load losses
Outages

Revenues
COGS

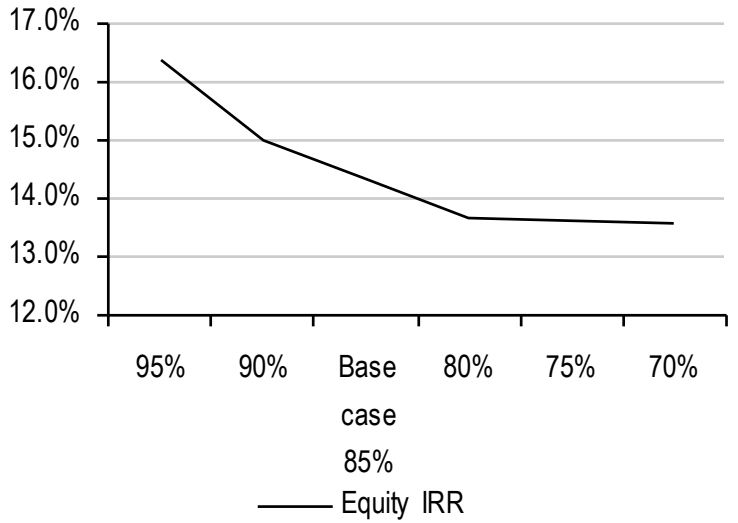
Permitting
Water allocations
Financing

Project
Execution

Moratoriums
New Regulations
Financing

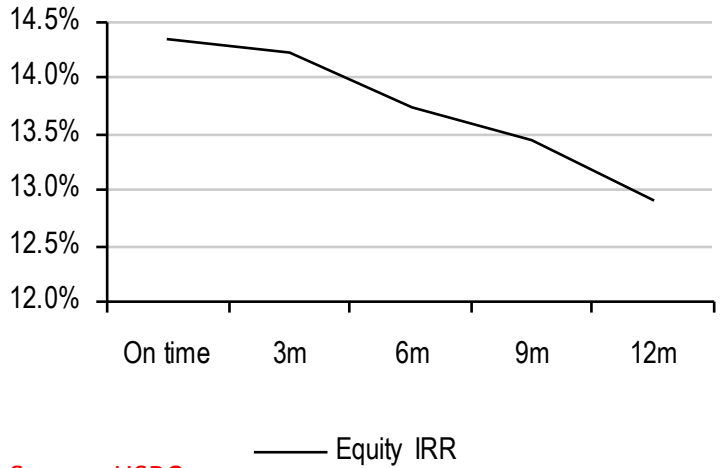
Growth

IRR sensitivity to loss in plant load factor (%)



Source: HSBC

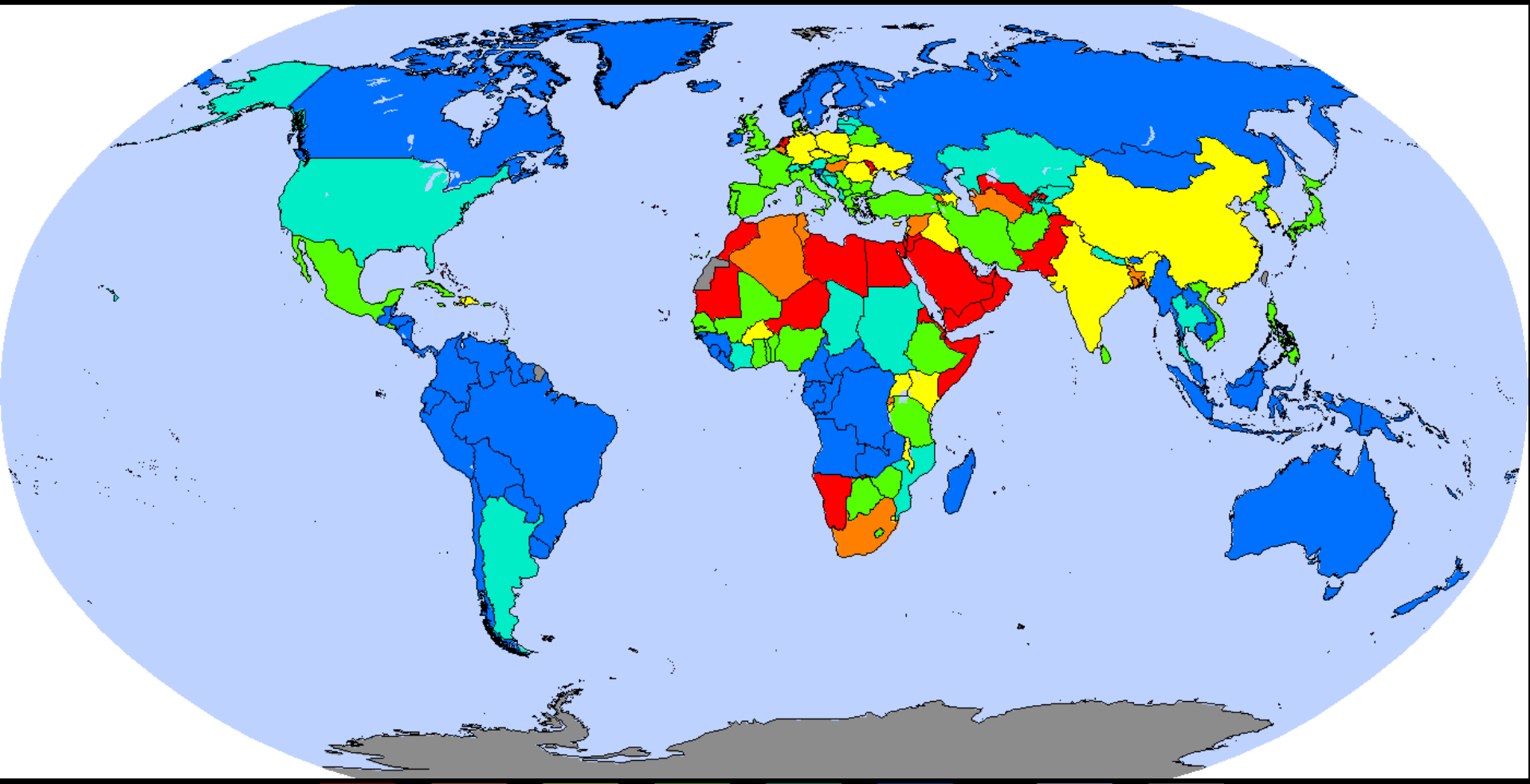
IRR sensitivity to delay in commercial operations (months)



Source: HSBC

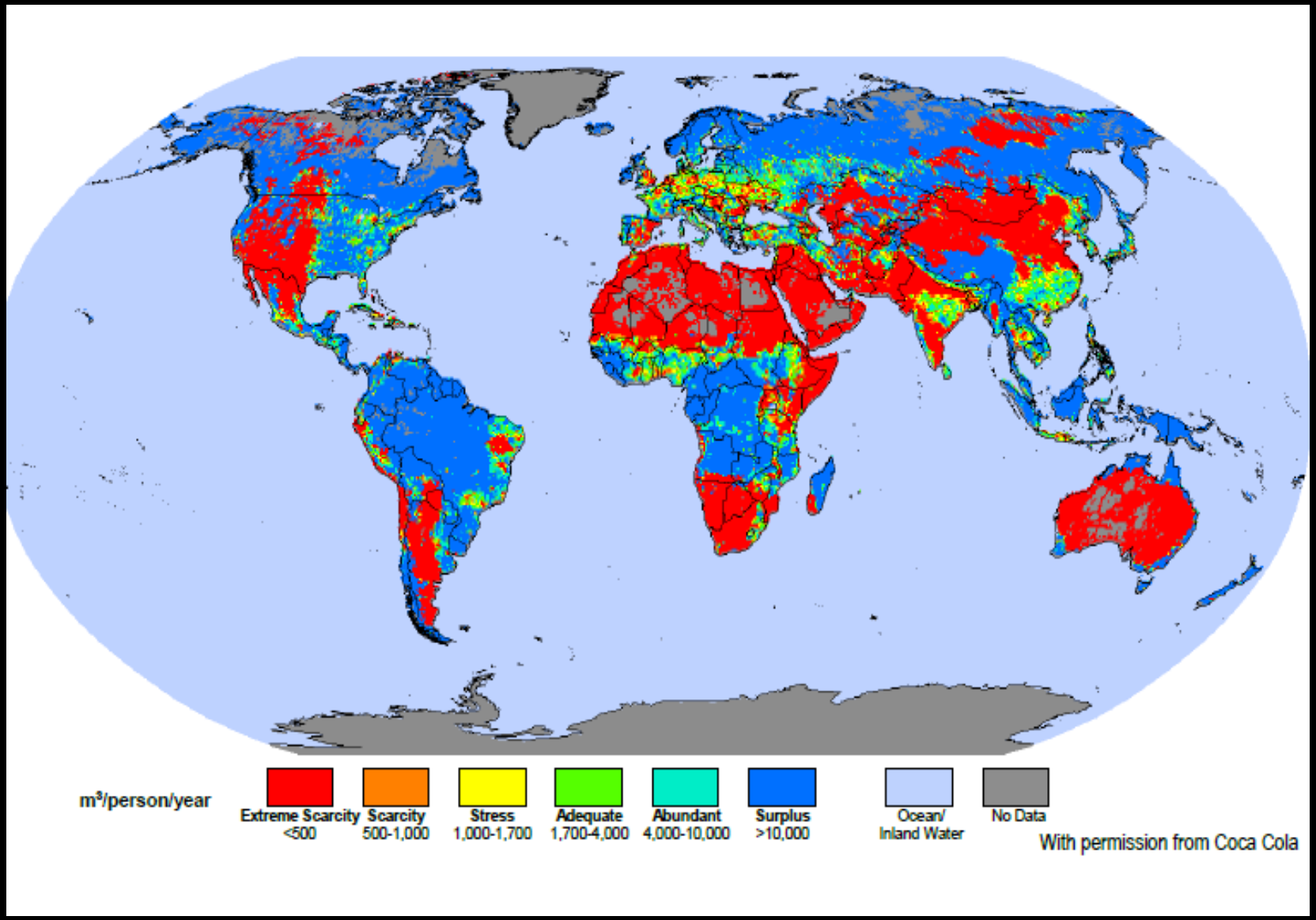
Why are we doing Aqueduct?

Context matters



What level of detail do decision makers need?

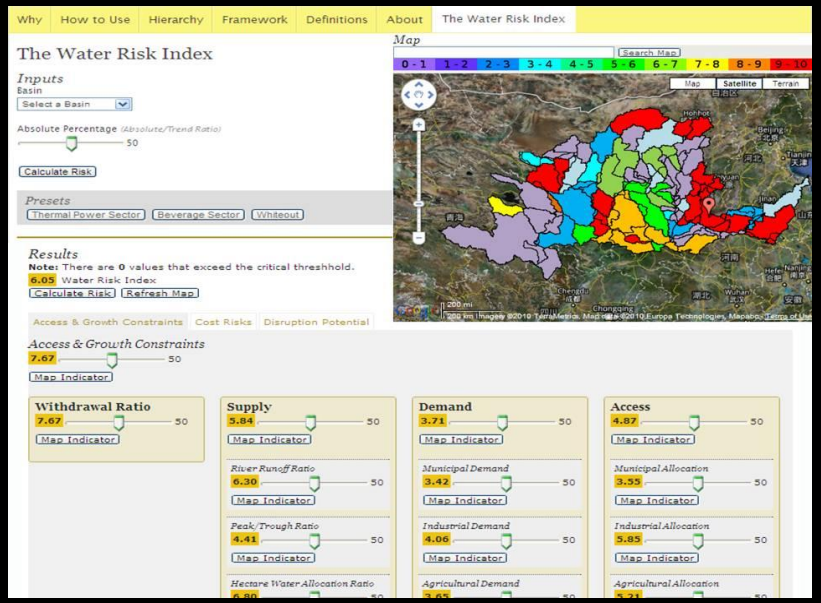
Sub-basin level, across a number of key risk drivers

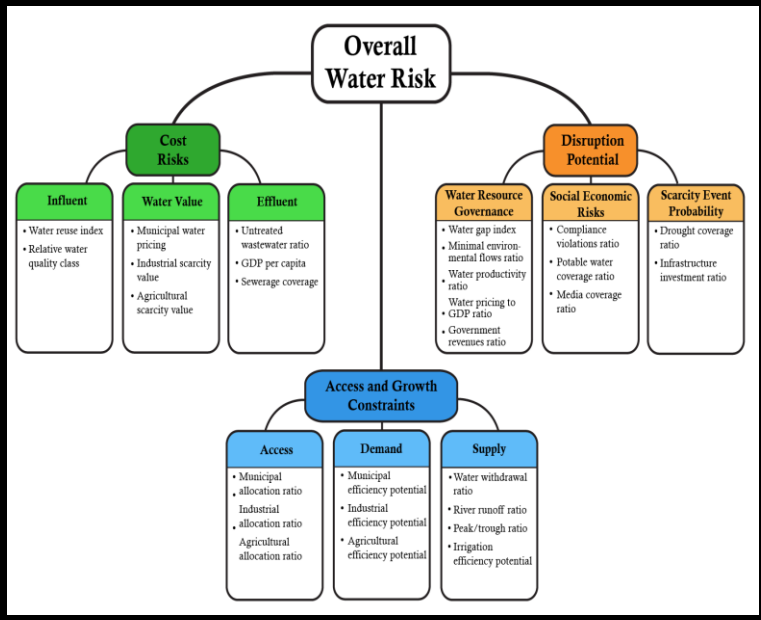


What are the primary project goals?

An online **global database** of **local** level water risk indicators and set of applications

A **global standard** for measuring and reporting geographic water risk





"Making the local globally comparable"

Which basins will we initially focus on?

- Yellow
- Yangtze
- Mekong
- Ganges
- Indus
- Murray-Darling
- Vaal
- Danube
- Colorado
- Rio Grande

Which sectors will we initially focus on?

- Oil & gas
- Power generation
- Food & beverage
- Mining
- Chemicals and coatings
- Other manufacturing
- Agribusiness

Which indicators will we initially focus on?

Access and growth constraints:

- Water withdrawal ratio
- Water withdrawal variability
- River flow trend
- Seasonal variability
- Irrigation efficiency potential
- Non-industrial allocation

Cost risks:

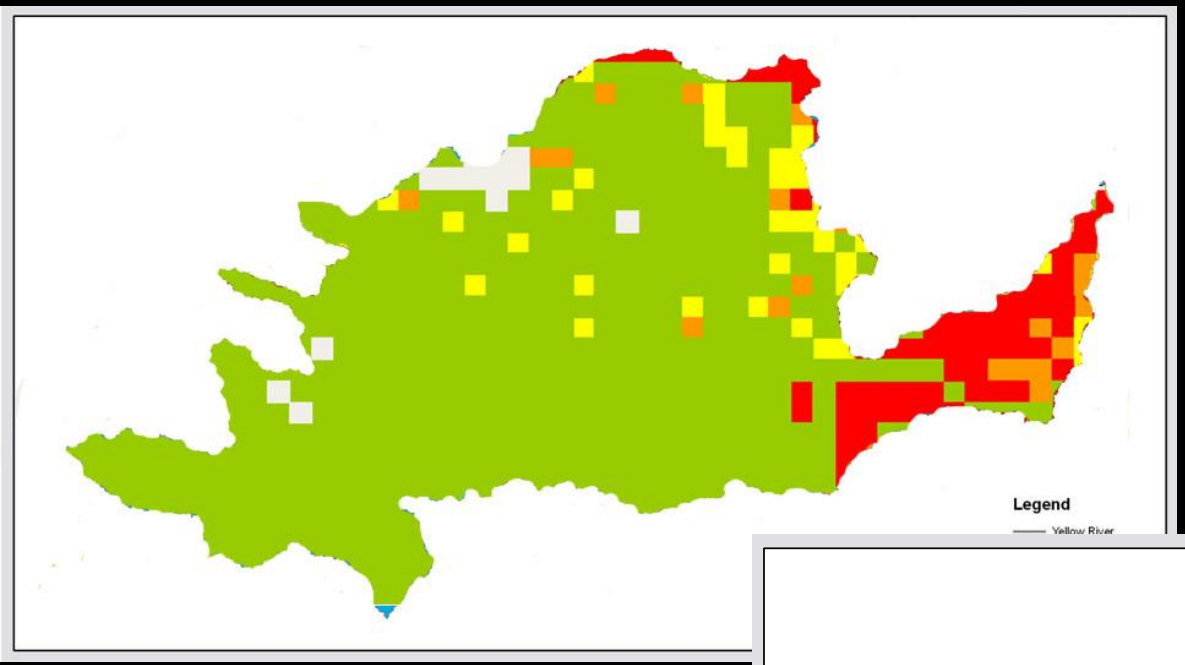
- Water reuse index
- Water quality class
- Treated wastewater
- GDP per capita
- Sewerage coverage
- Municipal water price
- Industrial scarcity value

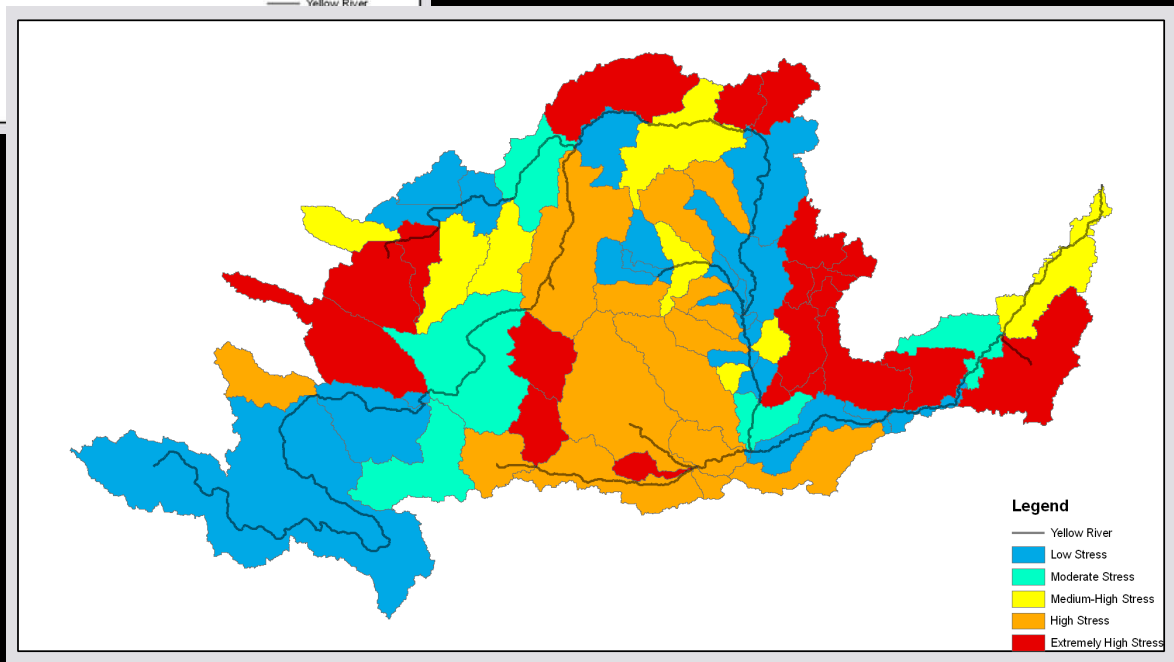
Disruption potential:

- Compliance violations
- Media coverage
- Water coverage gap
- Minimum environmental flows
- Water productivity
- GDP to water price
- Government revenue gap
- Infrastructure investment gap

What Aqueduct Offers

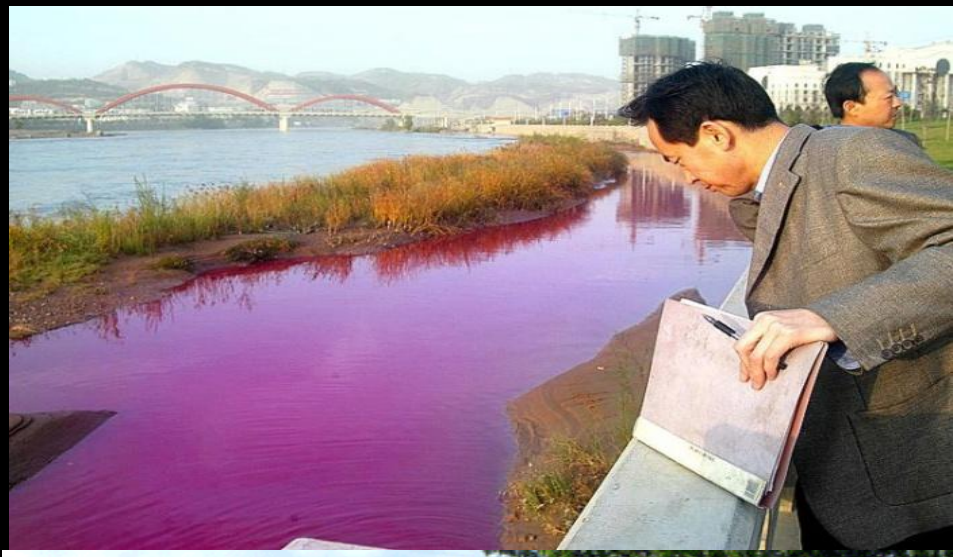
Examines water risk at more local (i.e. sub-basin) levels





What Aqueduct Offers

Examines a broad set of risk indicators (not just physical risk)

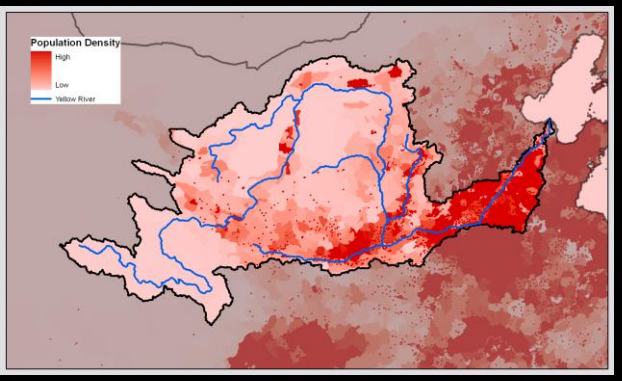


What Aqueduct Offers

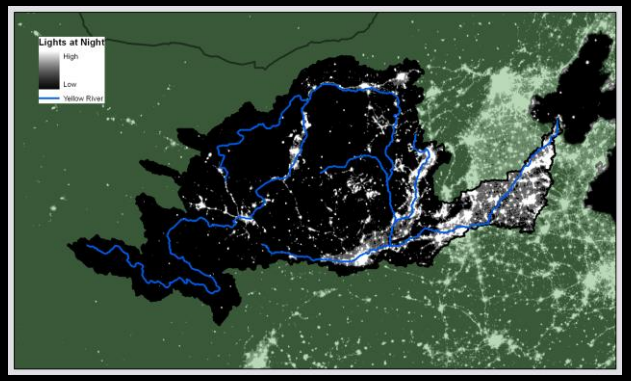
More accurate estimates through refined modeling

E.g. water demands by

People

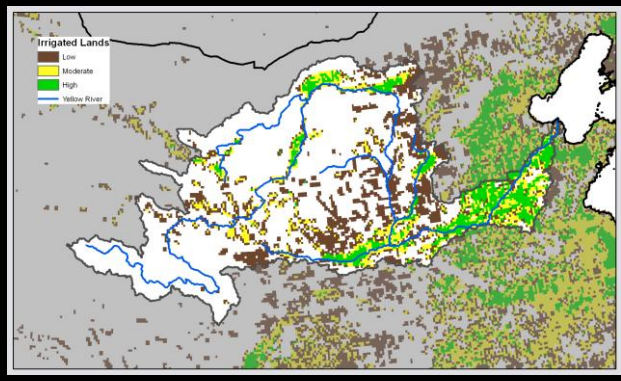


Industries



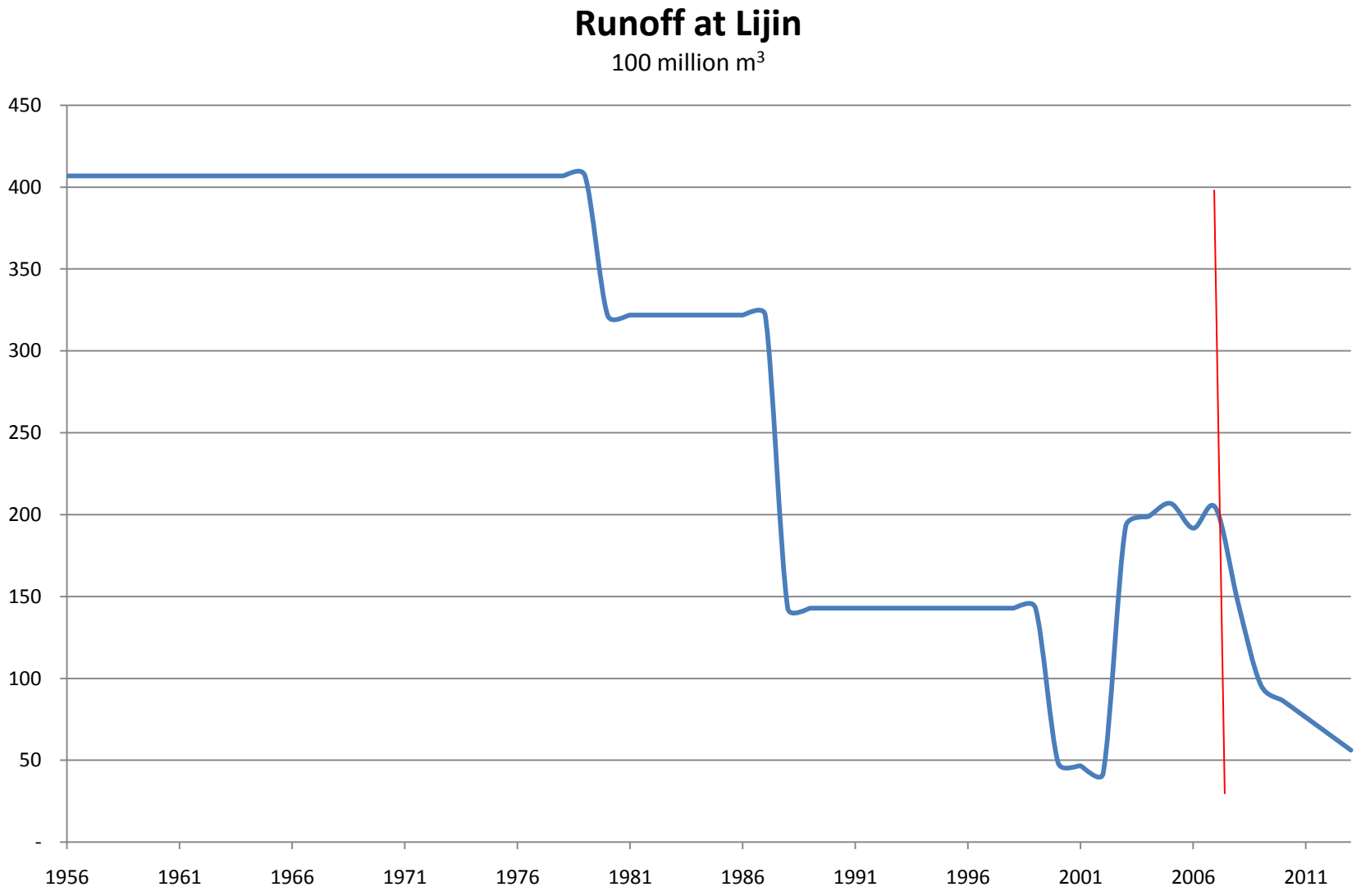
Proxy: lights by night

Irrigated agriculture



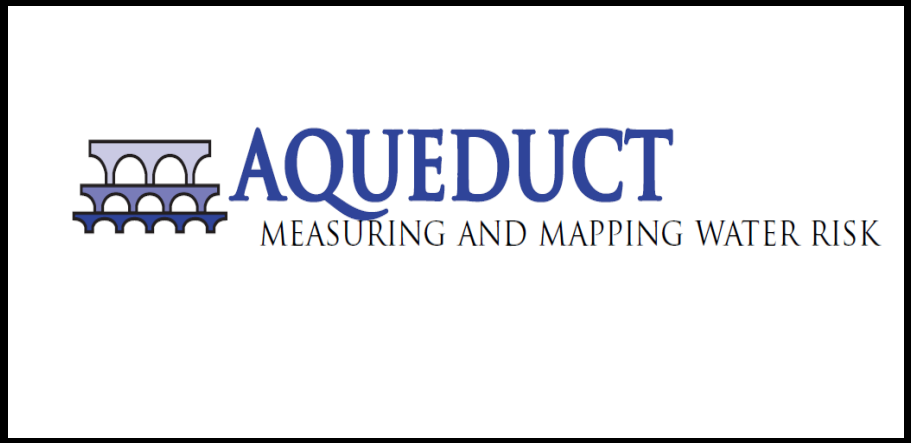
What Aqueduct Offers

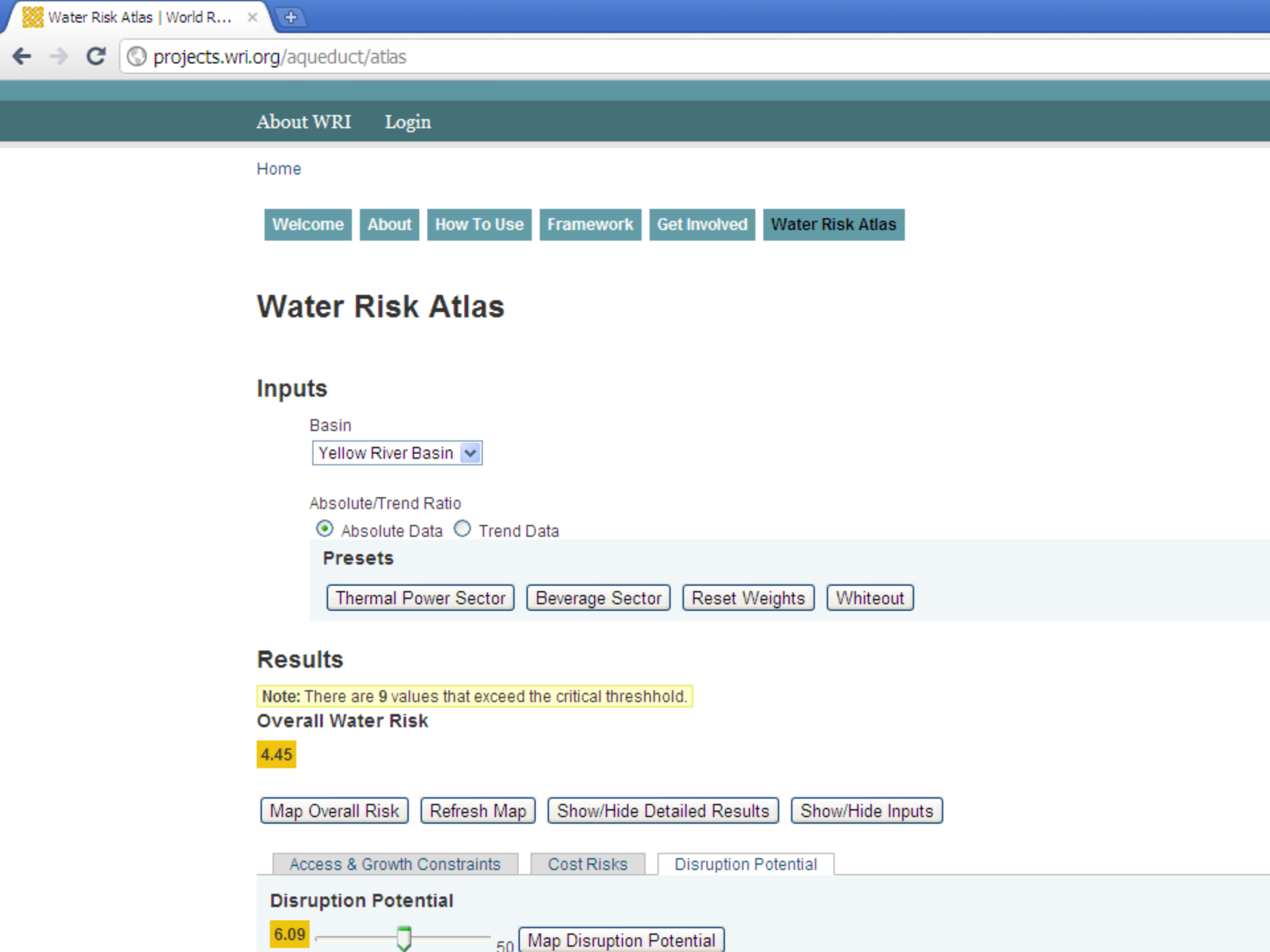
Tracks and projects indicator trends (not just snapshots)

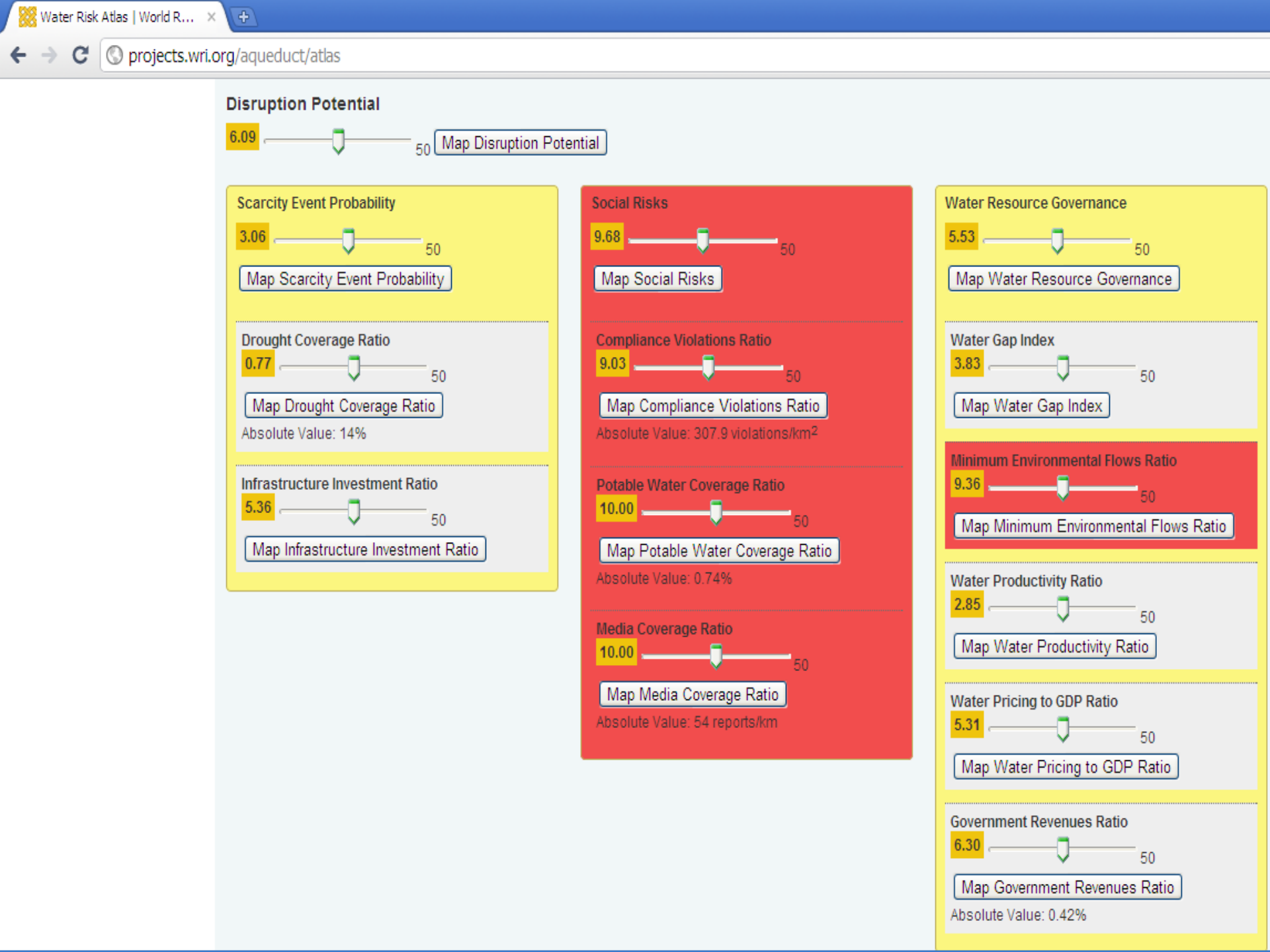


Yellow River prototype

www.wri.org/aqueduct




Water Risk Atlas | World R...
projects.wri.org/aqueduct/atlas
About WRI
Login
Home
Welcome
About
How To Use
Framework
Get Involved
Water Risk Atlas
Water Risk Atlas
Inputs
Basin
Yellow River Basin
Absolute/Trend Ratio
Absolute Data
Trend Data
Presets
Thermal Power Sector
Beverage Sector
Reset Weights
Whiteout
Results
Note: There are 9 values that exceed the critical threshhold.
Overall Water Risk
4.45
Map Overall Risk
Refresh Map
Show/Hide Detailed Results
Show/Hide Inputs
Access & Growth Constraints
Cost Risks
Disruption Potential
Disruption Potential
6.09
50
Map Disruption Potential

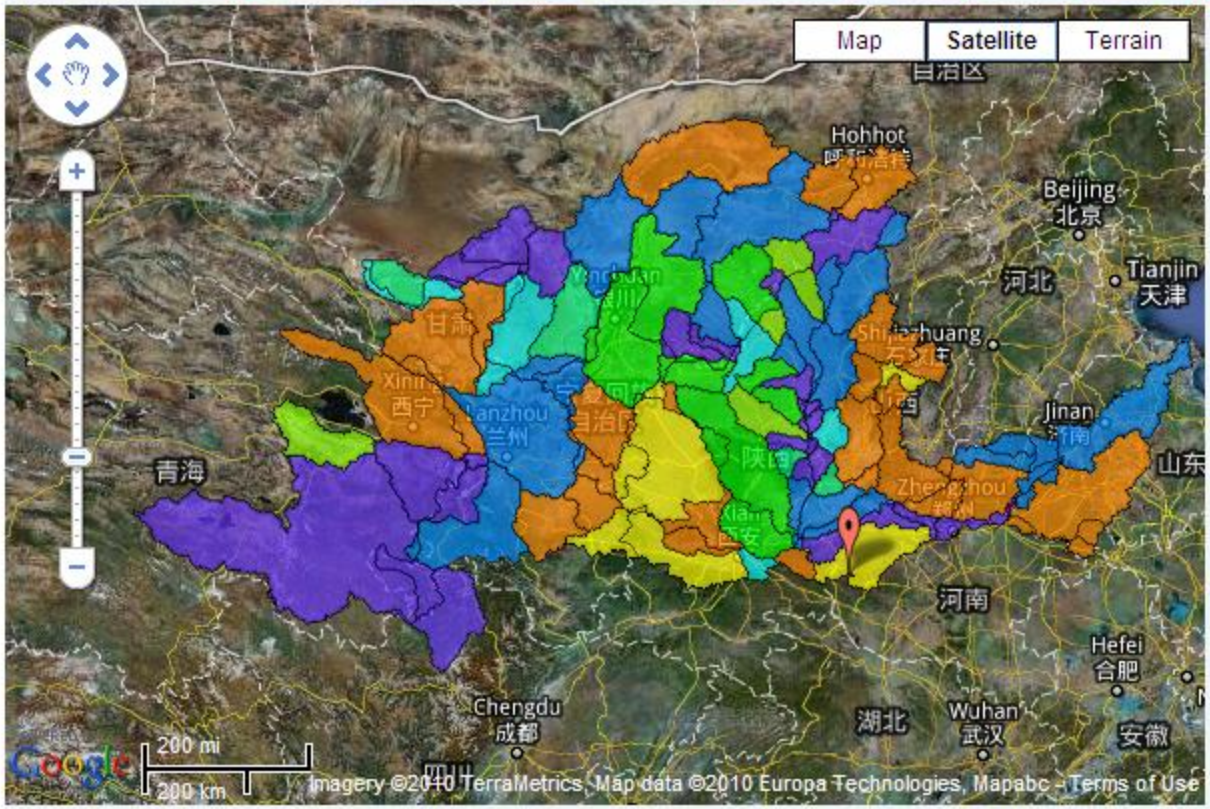

Water Risk Atlas | World R...
projects.wri.org/aqueduct/atlas
Disruption Potential
6.09
50
Map Disruption Potential
Scarcity Event Probability
3.06
50
Map Scarcity Event Probability
Drought Coverage Ratio
0.77
50
Map Drought Coverage Ratio
Absolute Value: 14%
Infrastructure Investment Ratio
5.36
50
Map Infrastructure Investment Ratio
Social Risks
9.68
50
Map Social Risks
Compliance Violations Ratio
9.03
50
Map Compliance Violations Ratio
Absolute Value: 307.9 violations/km2
Potable Water Coverage Ratio
10.00
50
Map Potable Water Coverage Ratio
Absolute Value: 0.74%
Media Coverage Ratio
10.00
50
Map Media Coverage Ratio
Absolute Value: 54 reports/km
Water Resource Governance
5.53
50
Map Water Resource Governance
Water Gap Index
3.83
50
Map Water Gap Index
Minimum Environmental Flows Ratio
9.36
50
Map Minimum Environmental Flows Ratio
Water Productivity Ratio
2.85
50
Map Water Productivity Ratio
Water Pricing to GDP Ratio
5.31
50
Map Water Pricing to GDP Ratio
Government Revenues Ratio
6.30
50
Map Government Revenues Ratio
Absolute Value: 0.42%

[1] Facility 1 [Active] Delete

Map - Overall Water Risk

Search Map

0 - 1 | 1 - 2 | 2 - 3 | 3 - 4 | 4 - 5 | 5 - 6 | 6 - 7 | 7 - 8 | 8 - 9 | 9 - 10



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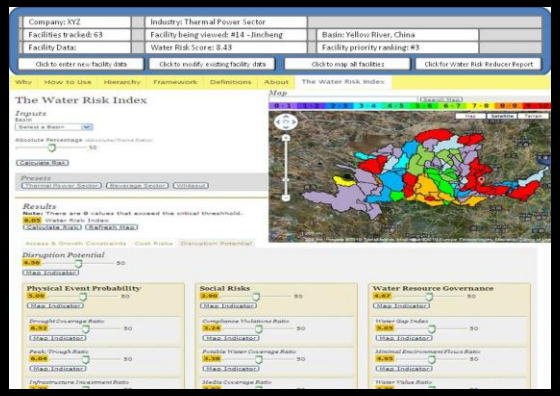
Water Risk Reporter

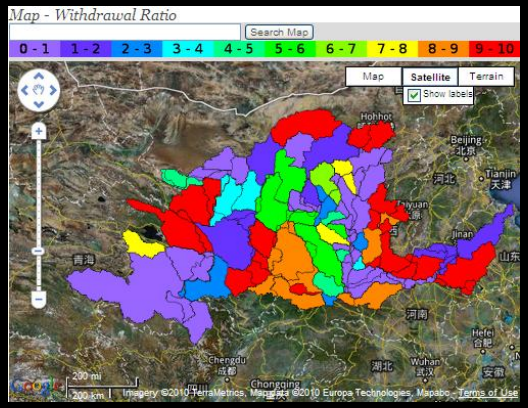


Outside Water Risk Index

Water Risk Atlas

Physical data

Socio-economic, governance data



Company facility risk data

Other stakeholder risk data

Water Risk Collector

Facility performance data ("water footprint")

Impact by the environment

Impact on the environment

Theory of Change

Private interest → Public good

Water Risk Atlas

Expansive definition of water risk:
- physical
- regulatory
- social-economic
- governance

Water Risk Collector

Water Risk Reporter

Internal management decisions:
- siting
- efficiency gains
- smaller impacts
- sourcing
- reporting / disclosure

Interactive Water Risk Atlas + Reporter

External engagement & solutions:
- water policy reform
- spatial planning
- "hydro-smart" business models, investments
- technology development
- infrastructure finance

"No regret": better information for all

"Inside the fence" improvements: lower water dependency

"Outside the fence" engagement: higher water security


MORE AND SMARTER INVESTMENTS IN SUSTAINABLE WATER USE AND RESOURCE MANAGEMENT

Want to know more?

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pklop@wri.org
Tel: (202) 729 7615

Charles Iceland:
ciceland@wri.org
Tel: (202) 729 7746

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imagination at work

Aqueduct represents a significant improvement in measuring and mapping water risk

- More local (i.e. sub-basin level)
- Broader set of indicators: physical (including water quality), regulatory, governance, socio-economic
- More accurate estimates through refined hydrological modeling
- More current data
- Trends (not just snapshots)
- Intra-annual variability (not just annual averages)
- Different risk weightings for different sectors
- Information supplemented by local facility managers and experts
- Map links to water risk news and analysis

<HELP> for explanation. EquityOSI

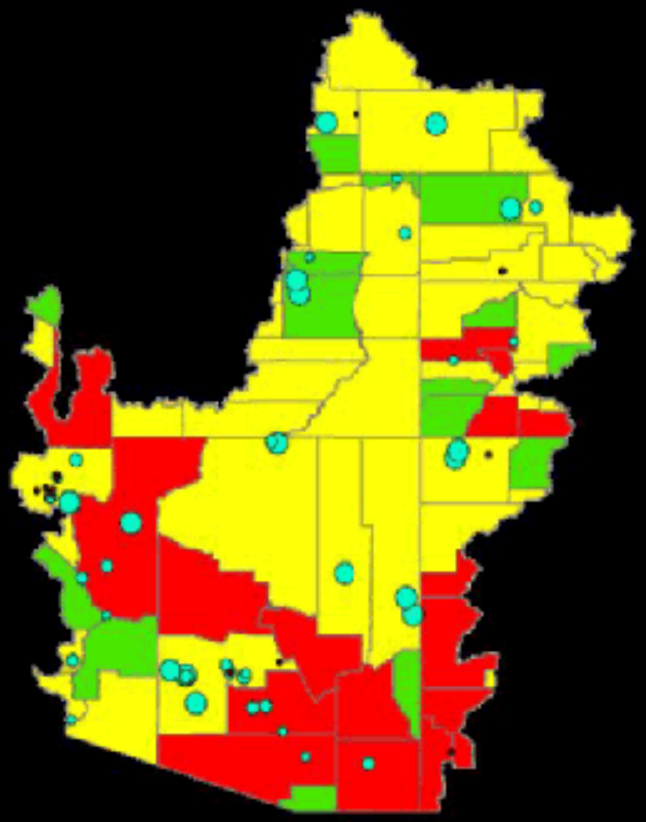
Screen saved as C:\Documents and Settings\robert.kimball\Desktop\Bloomberg OSI S

1) Export | 2) Alerts | Enviromental Impact Overview

Region

Scenarios

- ○ Current
- ◉ Long Term
- ○ Medium Term
- ○ Short Term



Risk Level	# Plants	% Capacity
High	4	8.82
Medium	18	54.79
Low	27	36.38

Power Plants Risk Level

- No Data
- Low Risk
- Mid Risk
- High Risk

Current Water Risk Index

- 1-3 low risk
- 4-5 mid risk
- 6-7 high risk

1) Map | 2) Companies | 3) Assets | 4) Regulatory | 5) News | 6) Winners & Losers