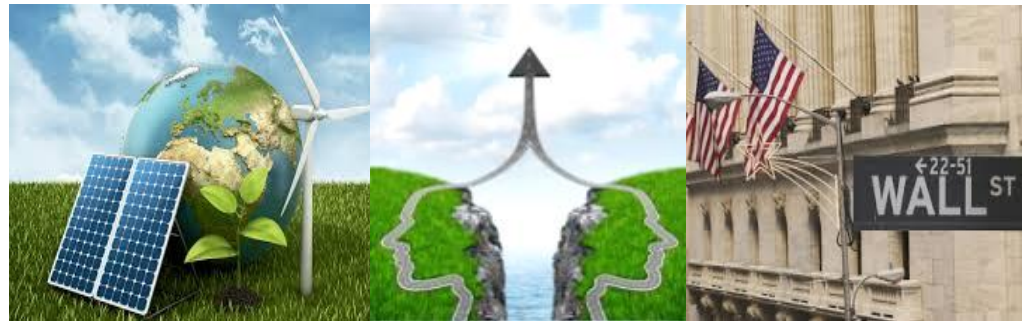




Integrating Water Risk in Corporate Bond Valuation and Portfolio Stress Testing

Simone Dettling, 7th July 2015



1) Tool for Integrating Water Risk in Corporate Bond Valuation



Project Partners

Project
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Expert
Council
(Examples)



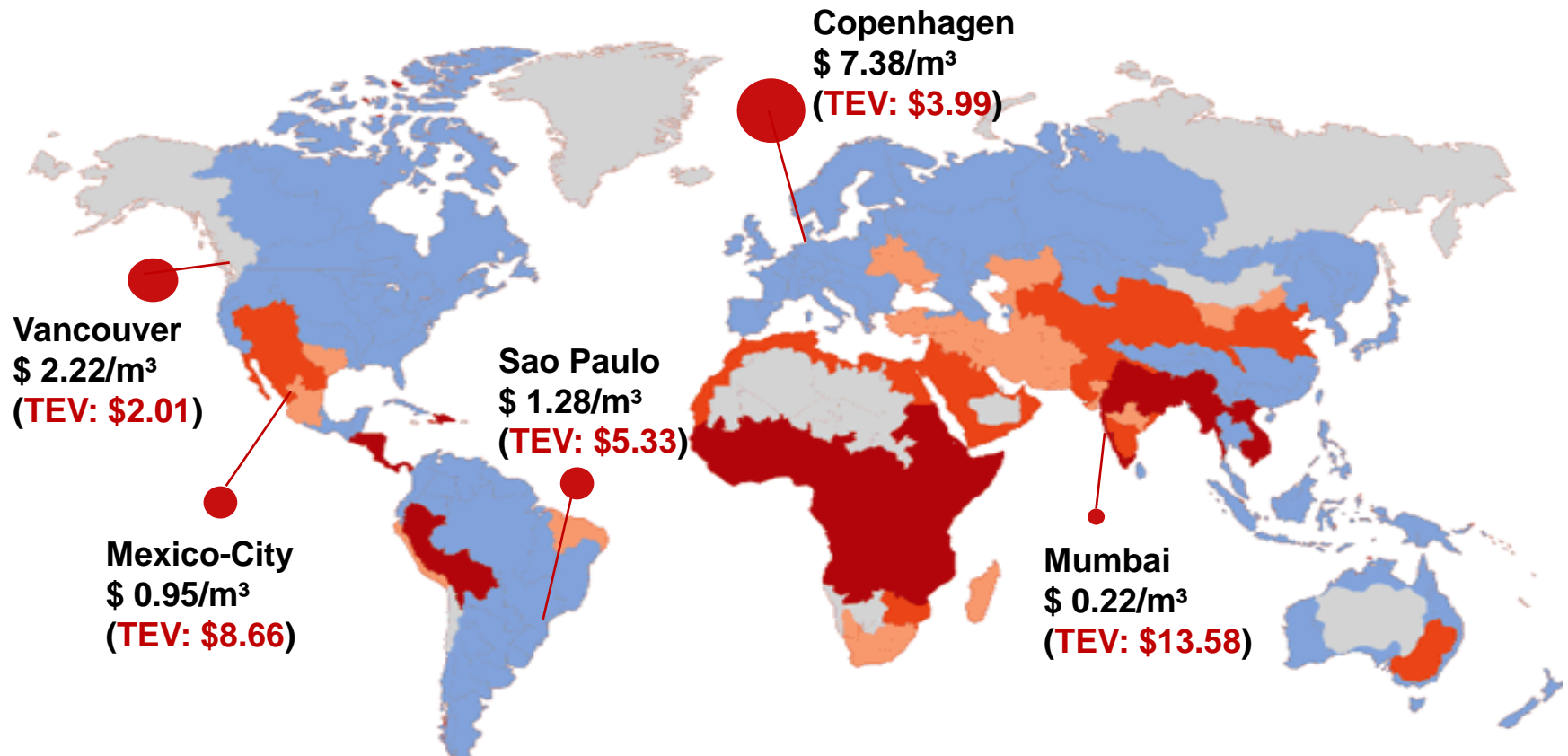
Approach

Purpose: Enable finance professionals to quantify water metrics and **incorporate water risks in the credit risk analysis**, e.g. for corporate bond valuations.

Approach - Overview:

- 1) Calculate **shadow prices** for water worldwide that reflect water scarcity and demand drivers.
- 2) Combine company data on **location of operations** and water use by location with the location-specific shadow price for water.
- 3) Model potential impact of increased water costs on company financials and **adjust credit ratios**.

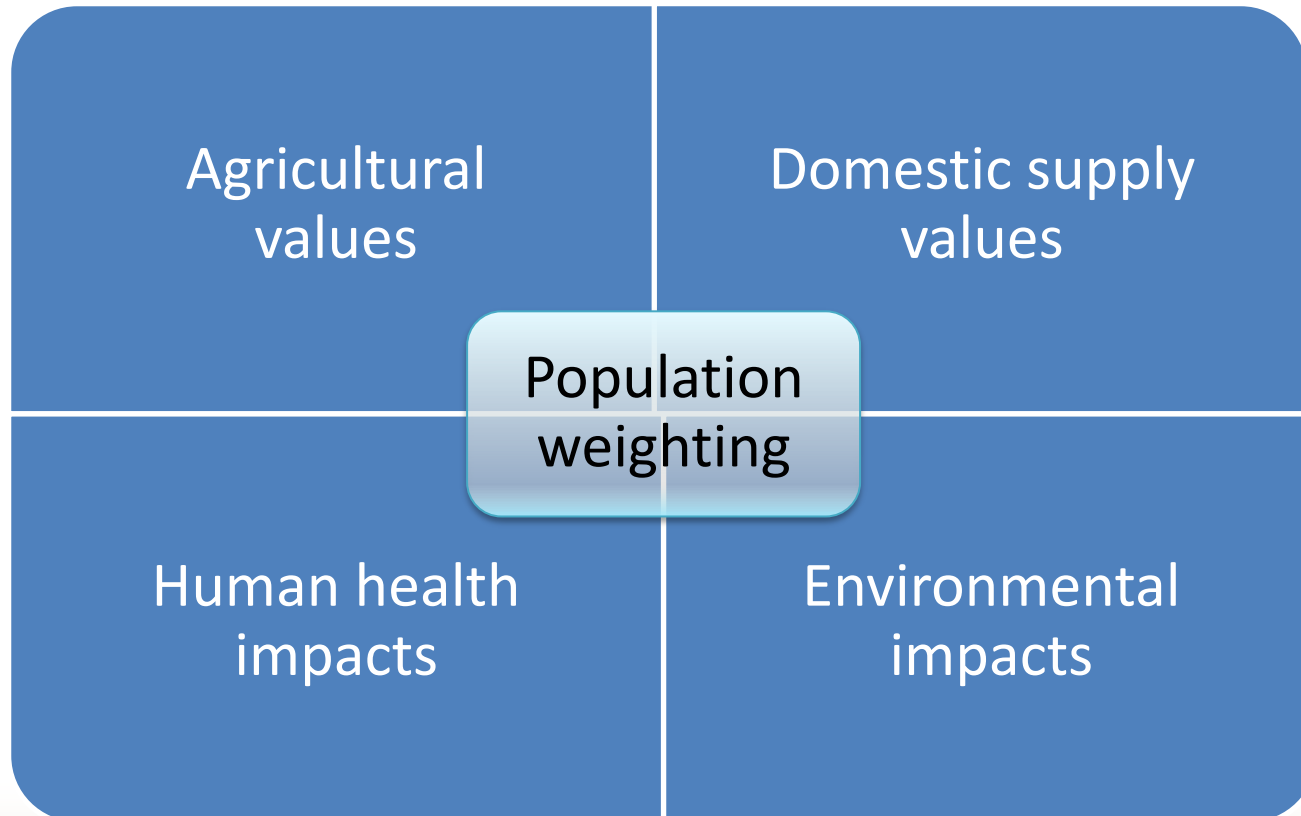
Water Stress vs. Water Prices



→ Gap between shadow price and current cost as measure for risk

The Value of Water

→ Opportunity cost based on level of water stress (WRI)



Example: Mining Companies

Barrick Gold

Location Name	Latitude	Longitude	Water Use in Thousand m ³	2010 TEV \$/m ³	2020 TEV, \$/m ³
Hemlo, Ontario, Canada	48.68	-85.98	1,042	0.11	0.11
Lagunas Norte, Peru	-12.06	-77.1	732	11.56	11.41
Lumwana Copper, Zambia	-11.82	25.13	2,729	0.11	0.11
Nevada, USA	38.8	-116.42	15,158	3.29	3.29
Porgera, Papua New Guinea	-5.46	143.15	32,410	0.51	0.51
Pueblo Viejo, Dom. Republic	18.4	-70.77	18,484	5.54	5.26
Super Pit, Australia	-30.79	121.5	18,631	8.16	8.16
Veladero, Argentina	-27.91	-68.92	1,473	3.29	3.29
Zaldivar Copper, Chile	-33.23	-70.8	6,920	12.69	13.58

Example: Mining Companies

%age Difference With Water Costs

		2014	2015	2016	2017
Barrick Gold	EBITDA/Revenues, %	-8%	-8%	-8%	-8%
	Net debt/EBITDA, X	12%	33%	48%	60%
BHP Billiton	EBITDA/Revenues, %	-7%	-7%	-7%	-7%
	Net debt/EBITDA, X	19%	38%	83%	347%
Rio Tinto	EBITDA/Revenues, %	-33%	-32%	-32%	-32%
	Net debt/EBITDA, X	99%	146%	199%	264%
Vale	EBITDA/Revenues, %	-2%	-2%	-2%	-2%
	Net debt/EBITDA, X	0%	-3%	-7%	-14%
Vedanta	EBITDA/Revenues, %	-20%	-20%	-20%	-20%
	Net debt/EBITDA, X	32%	42%	52%	65%

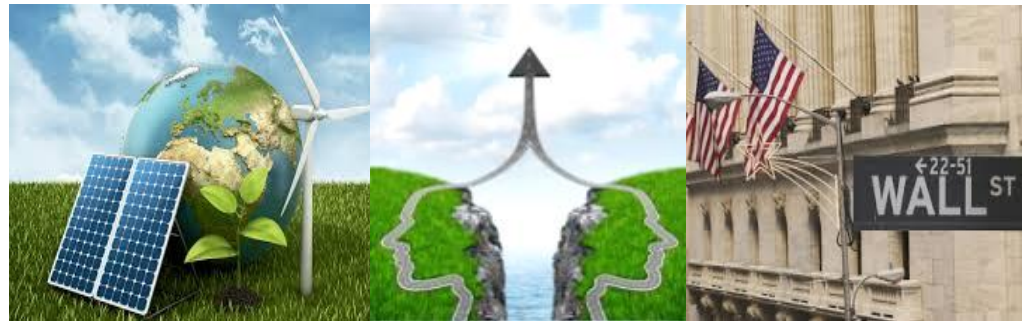
Next Steps

This tool provides:

- a **measure for the water risk exposure** of companies and potential **impact on credit ratios**
- under **average** current and projected **water supply and demand**
- for direct risk exposure **per company** (microeconomic perspective)

Open Questions/Next steps:

- How would companies fare in a specific **environmental shock** scenario, such as a prolonged drought.
- How would your **portfolio/loan book** fare in an environmental shock scenario?



2) Environmental Stress Testing for Lending and Investment Portfolios



Pilot Project: Stress Testing

Starting October 2015, 5-10 Partner FI from G20 Economies

- 1) Develop **science-based scenarios** for droughts in several G20 markets and their impacts on water availability.
- 2) Create **index of exposure** to water scarcity for companies in different sectors and **model** both direct economic **costs** at company level and macro-economic impacts.
- 3) Model impacts to **non-performing loan** rates

Academia
(Cambridge Center for
Climate Change, Stockholm
Environment Institute)

(Re-)Insurance
Industry and
service providers

Output: Methodology to stress-test lending portfolios for drought scenarios



Obrigada!

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