More GDP with less water and pollution

Micro-level water-nomics: evaluating sectoral water risks
Mainstreaming water as a financial risk ...

2012

No water, no power

Is there enough water to fuel China’s power sector?

Nick Robins, Co-Director, UNEP Inquiry

…when at HSBC, the no water, no power report was one of our signature pieces.”

2013

Water for coal

European fund

“We off-loaded our entire coal portfolio after sitting down with you”

2014

Keynote & panelist alongside water laureates

STOCKHOLM WATER PRIZE

2015

Recognition by the Water International Journal

TOWARDS A WATER & ENERGY SECURE CHINA "WATER & ENERGY SECURITY IN CHINA’S STRATEGIC ENERGY SECTOR"

2016

Global policy arena with IRENA & Rare Earths

RARE EARTHS: SHADES OF GREY

Using WEN to start a water-nomics conversation in finance & policymaking

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Macro & micro perspectives …
Water risk for power sector…

3 WATER RISK VALUATION APPROACHES

1. SHADOW PRICING
2. EXPOSURE TO WATER STRESS
3. REGULATORY RISKS

10 ENERGY LISTCO’S

COAL-5
SHENHUA ENERGY
CHINA COAL
YANZHOU COAL
INNER MONGOLIA YITAI COAL
DATONG COAL

POWER-5
HUANENG POWER INTL
DATANG INTL POWER
GUODIAN POWER DEV
HUADIAN POWER INTL
CHINA POWER INTL

>70 INVESTMENT PROFESSIONALS FROM ~50 INSTITUTIONS

14% COAL OUTPUT

19% THERMAL POWER GENERATION
Investors say they are worried about risk ...

Before we start, why are you doing the survey?

- Worried about water risks: 48%
- To embed water risks in valuation models: 45%
- To engage with companies: 35%
- To embed water risks in ESG scores: 31%
- Seeking strategic opportunities: 25%
- Curiosity: 24%

Note: multiple choices possible
1- Exposure to water stress

79 MINES
135 POWER PLANTS

Source: China Water Risk, projected on WRI Baseline Water Stress Map

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1- Exposure to water stress

GLOBAL MAP

<table>
<thead>
<tr>
<th>Company</th>
<th>Exposure to water stress</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenhua</td>
<td>Medium to high</td>
<td>83%</td>
</tr>
<tr>
<td>China Coal</td>
<td>Extremely high</td>
<td>90%</td>
</tr>
<tr>
<td>Yanzhou</td>
<td>Extremely high</td>
<td>87%</td>
</tr>
<tr>
<td>Yitai</td>
<td>Medium to high</td>
<td>100%</td>
</tr>
<tr>
<td>Datong</td>
<td>Extremely high</td>
<td>100%</td>
</tr>
</tbody>
</table>

CHINA MAP

<table>
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</tbody>
</table>

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2. Shadow pricing

3 observations
1. Impact varies across sectors water use power > water use mining
2. Impact varies across companies ≠ water use levels & locations
3. Impact varies across tools ≠ assumptions
2. Shadow pricing

- **Convenient** approach to integrate water in decision making
- Shadow water prices **too high** to be realistic water tariffs (up to 12USD/m3)
- Can be thought as a **proxy** for water risks in general

What investors say: a **good first step, but a first step only**

Using shadow pricing for water risk valuation is...

<table>
<thead>
<tr>
<th>Sufficient to screen out companies' exposure to water risks</th>
<th>Strongly Agree &amp; Agree</th>
<th>Neutral</th>
<th>Disagree &amp; Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26%</td>
<td>50%</td>
<td>24%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A good first step but needs complementary detailed analyses</th>
<th>Strongly Agree &amp; Agree</th>
<th>Neutral</th>
<th>Disagree &amp; Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>82%</td>
<td></td>
<td>18%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Misleading because it is not a real price</th>
<th>Strongly Agree &amp; Agree</th>
<th>Neutral</th>
<th>Disagree &amp; Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13%</td>
<td>42%</td>
<td>45%</td>
</tr>
</tbody>
</table>
3. Regulatory risks & compliance costs

**Water use targets**

<table>
<thead>
<tr>
<th>Method</th>
<th>2002</th>
<th>2012</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air cooling (withdrawal)</td>
<td>0.53</td>
<td>3.84</td>
<td>3.31</td>
</tr>
<tr>
<td>Closed-loop (withdrawal)</td>
<td>2.4</td>
<td>2.4</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: China Water Risk based on CNIS

**Water recycling targets**

- **Shenhua**
  - Target: 75-95% depending on water scarcity

**Impact of Environmental Factors on Credit Risk of Commercial Banks**

- Research and application by ICBC based on stress test
- **74%** in 2012 vs **93%** in 2020

**Water quality targets**

- **58%** of Coal-5 Coal Output
- **24%** of Hai River Basin
- **39%** 70% water reaching Grade I-III quality

Source: China Water Risk based on companies reports, NEA

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A word on disclosure

Mine water recycling rate

Source: China Water Risk based on companies reports, NEA

Freshwater use for coal production - mining & processing
Unit: m³/tonne

Source: China Water Risk estimates based on companies reports and MEP Cleaner Production Standard-Coal Mining & Processing Industry (HJ446-2008). Water use includes coal mining and processing.

Mine water drainage associated with coal production
Unit: m³/tonne

A word on disclosure

The majority of disclosure is only on 1 or 2 of the total 5 indicators analysed, there is still clearly room for improvement.

Two mid-performers are electricity and smelting, with lagging disclosure rates of 47% and 48%. Meanwhile, agriculture is the clear laggard.
Clustered risk – regional & sectoral

Elec Co. C
Electronics

350 Suppliers in China

Lenders / investors / companies should stress test for China pollution regulations
Clustered risk – basin level

Collective action within & across industries?

Embedding environmental risks into lending = basin level risk assessments

China task force on ERA

Jan 2017 ... CWR invited to talk at PBOC & to join ERA task force

Apr 2018 ... China publishes first-ever book on ERA ... CWR invited to write the water risk chapter
Decisions today for water tomorrow
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