SDGs and Scenario Analysis

December, 2018
655 investor signatories

US$87 trillion in assets
Scenario Analysis – a growing business practice
Core Elements of Recommended Climate-Related Financial Disclosures

**Governance**
The organization’s governance around climate-related risks and opportunities

**Strategy**
The actual and potential impacts of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning

**Risk Management**
The processes used by the organization to identify, assess, and manage climate-related risks

**Metrics and Targets**
The metrics and targets used to assess and manage relevant climate-related risks and opportunities
Scenario analysis in CDP’s questionnaires

Climate Change and Water questionnaires contain scenario analysis based questions in 2018.

<table>
<thead>
<tr>
<th>Climate Change</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C3.1</strong></td>
<td><strong>W7.3</strong></td>
</tr>
<tr>
<td>Are climate-related issues integrated</td>
<td>Does your organization use climate-related</td>
</tr>
<tr>
<td>into your business strategy?</td>
<td>scenario analysis to inform its business</td>
</tr>
<tr>
<td></td>
<td>strategy?</td>
</tr>
<tr>
<td><strong>C3.1a</strong></td>
<td><strong>W7.3a</strong></td>
</tr>
<tr>
<td>Does your organization use climate-</td>
<td>Has your organization identified any water-</td>
</tr>
<tr>
<td>related scenario analysis to inform</td>
<td>related outcomes from your climate-related</td>
</tr>
<tr>
<td>your business strategy?</td>
<td>scenario analysis?</td>
</tr>
<tr>
<td><strong>C3.1d</strong></td>
<td><strong>W7.3b</strong></td>
</tr>
<tr>
<td>Provide details of your organization's</td>
<td>What water-related outcomes were identified</td>
</tr>
<tr>
<td>use of climate-related scenario</td>
<td>from the use of climate-related scenario</td>
</tr>
<tr>
<td>analysis.</td>
<td>analysis, and what was your organization’s</td>
</tr>
<tr>
<td></td>
<td>response?</td>
</tr>
<tr>
<td><strong>C3.1g</strong></td>
<td><strong>W7.3</strong></td>
</tr>
<tr>
<td>Why does your organization not use</td>
<td>Does your organization use climate-related</td>
</tr>
<tr>
<td>climate-related scenario analysis to</td>
<td>scenario analysis to inform its business</td>
</tr>
<tr>
<td>inform your business strategy?</td>
<td>strategy?</td>
</tr>
</tbody>
</table>


Key concepts for scenario analysis

- Critical uncertainties
- The 3Ps: Plausible, Probable, Preferable
- Resilience
A Process for Applying Scenario Analysis to Climate-Related Risks and Opportunities

1. **Ensure governance**
   Integrate scenario analysis into strategic planning and/or enterprise risk management frameworks. Assign oversight to relevant board committees/sub-committees. Identify which internal (and external) stakeholders to involve, and how.

2. **Assess materiality of climate-related risks**
   - **Market and Technology Shifts**
   - **Policy and Legal**
   - **Reputation**
   - **Physical Risks**

   What are the current and anticipated organizational exposures to climate-related risks and opportunities? Do these have the potential to be material in the future? Are organizational stakeholders concerned?

3. **Identify and define range of scenarios**
   - **Transition Risk Scenarios**
   - **Physical Risk Scenarios**

   What scenarios (and narratives) are appropriate, given the exposures? Consider input parameters, assumptions, and analytical choices. What reference scenario(s) should be used?

4. **Evaluate business impacts**
   **Impact on:**
   - Input costs
   - Operating costs
   - Revenues
   - Supply chain
   - Business interruption
   - Timing

   Evaluate the potential effects on the organization's strategic and financial position under each of the defined scenarios. Identify key sensitivities.

5. **Identify potential responses**
   Responses might include:
   - Changes to business model
   - Portfolio mix
   - Investments in capabilities and technologies

   Use the results to identify applicable, realistic decisions to manage the identified risks and opportunities. What adjustments to strategic/financial plans would be needed?

6. **Document and disclose**
   Document the process: communicate to relevant parties; be prepared to disclose key inputs, assumptions, analytical methods, outputs, and potential management responses.
What about the Sustainable Development Goals?
CDP’s disclosure framework supports business on SDG 6

- Questionnaire - relevant to 7 targets and 9 indicators of SDG 6

- Helps companies to:
  - Identify opportunities
  - Set targets
  - Track progress
  - Showcase success
Companies are setting SDG-aligned targets & goals

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in consumptive volumes</td>
<td>166</td>
</tr>
<tr>
<td>Watershed remediation and habitat restoration, ecosystem preservation</td>
<td>157</td>
</tr>
<tr>
<td>Reduction of product water intensity</td>
<td>145</td>
</tr>
<tr>
<td>Absolute reduction of water withdrawals</td>
<td>136</td>
</tr>
<tr>
<td>Water pollution prevention</td>
<td>96</td>
</tr>
</tbody>
</table>
In 2017, 16 companies responding to CDP’s forest questionnaire explicitly mentioned the SDGs, such as Inditex and the Kellogg Company.

This has helped to inform better SDG alignment for 2018 and future questionnaires.
SDGs in CDP Forests

1/8 targets
5/11 targets
3/5 targets
7/12 targets
Global Warming of 1.5°C

An IPCC Special Report on the Impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.
### Half a degree °C makes a huge difference

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>1.5°C</th>
<th>2°C</th>
<th>2°C vs 1.5°C impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extreme heat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global population exposed to severe heat at least once every 5 years</td>
<td>14%</td>
<td>37%</td>
<td>2.6x worse</td>
</tr>
<tr>
<td><strong>Forest fires</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts associated with forest fires are reduced substantially at 1.5°C compared to 2°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water security</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5°C instead of 2°C would approximately halve the proportion of the world population expected to suffer water scarcity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sea-ice-free Arctic</strong></td>
<td>At least 1 every 100 years</td>
<td>At least 1 every 10 years</td>
<td>10x worse</td>
</tr>
<tr>
<td>Number of ice-free summers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sea level rise</strong></td>
<td>0.4 meters</td>
<td>0.46 meters</td>
<td>0.06m more</td>
</tr>
<tr>
<td>Amount of sea level rise by 2100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Species loss: plants</strong></td>
<td>8%</td>
<td>16%</td>
<td>2x worse</td>
</tr>
<tr>
<td>Plants that lost at least half of their range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Species loss: vertebrates</strong></td>
<td>4%</td>
<td>8%</td>
<td>2x worse</td>
</tr>
<tr>
<td>Vertebrates that lose at least half of their range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Species loss: Insects</strong></td>
<td>6%</td>
<td>18%</td>
<td>3x worse</td>
</tr>
<tr>
<td>Insects that lose at least half of their range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ecosystems</strong></td>
<td>7%</td>
<td>13%</td>
<td>1.86x worse</td>
</tr>
<tr>
<td>Amount of Earth’s land area where ecosystems will shift to a new biome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Permafrost</strong></td>
<td>4.8 million km²</td>
<td>6.6 million km²</td>
<td>38% worse</td>
</tr>
<tr>
<td>Amount of Arctic permafrost that will thaw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risks of food shortages in the Sahel, southern Africa, the Mediterranean, central Europe, and the Amazon are significantly lower with 1.5°C of warming, compared to 2°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crop yields</strong></td>
<td>3%</td>
<td>7%</td>
<td>2.3x worse</td>
</tr>
<tr>
<td>Reduction in maize harvests in tropics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coral reefs</strong></td>
<td>70-90%</td>
<td>99%</td>
<td>Up to 29% worse</td>
</tr>
<tr>
<td>Further decline in coral reefs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fisheries</strong></td>
<td>1.5 million tonnes</td>
<td>3 million tonnes</td>
<td>2x worse</td>
</tr>
<tr>
<td>Decline in marine fisheries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Economy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic growth is projected to be lower at 2°C than at 1.5°C. Countries in the tropics and Southern Hemisphere subtropics are projected to be most at risk</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: WRI – ‘8 Things You Need to Know About the IPCC 1.5˚C Report’
It will be easier to cope with 1.5C compared to 2C. At 1.5C there is lots of ways we could manage risks. But there are limits to how well some sectors can adapt,
IPCC SR15:

1. By 2030, global emissions need to be halved.

2. Global emissions need to reach net-zero by 2050.

3. The solutions for a 1.5C world are the same as those needed to reach 2C, but require widespread, rapid implementation.

4. Meeting 1.5C is even more important than thought at COP21, and the next 10 years are critical.

5. The impacts of 2C are worse than originally thought, and much more difficult to adapt to than 1.5C.

6. The system transformation that is necessary to limit warming 1.5C is significant. The different routes to get there have very different implications for society.
Sector specifics

Energy supply
- Current investments in fossil fuels extraction and production would exceed the 1.5°C carbon budget
- Coal should mostly be phased out by about 2050
- Use of other fossil fuels also should fall throughout the century
- Solar and wind should continue their current rapid expansion

Land use
- Low-meat, vegetarian and vegan diets could significantly cut land use emissions
- Changing how food and biomass are produced can cut emissions

Industry
- Fossil-fuel powered industry should switch to electricity wherever possible
- Industrial processes like aluminium- and cement-making can be cleaner
- “Remanufacturing” materials and cutting waste can also clean up industry

Transport
- Emissions from transport can be slashed with a switch to electric vehicles
- Better urban planning and more efficient transport will cut demand and emissions

Buildings
- Efficiency rules for new buildings and upgrades to existing ones are essential
- More efficient appliances cut energy use, but more progress is needed
FAQ5.2: Climate-resilient development pathways

Decision-making that achieves the United Nation Sustainable Development Goals (SDGs), lowers greenhouse gas emissions, limits global warming, and enhances adaptation, could help lead to a climate-resilient world.

Countries and communities at different levels of development:
- Business-as-usual: None
- Societal transformation: Some, All

Achieving the SDG’s:
- None
- High emissions
- Low emissions
- Net zero
- Limiting global warming (°C)

Today’s world: Climate-resilient world
Equity and wellbeing for all
1.5°C mitigation options would affect other Sustainable Development Goals in both good and bad ways. Careful management and starting ASAP helps achieve more of the good.

SDG 6 – Clean Water and Sanitation could be impacted by mitigation options. Carbon dioxide removal techniques could lead to an increase in water demand from the energy sector.
A significant number of mitigation pathways underpinning the IPCC SR15 have become available providing a greater understanding of greenhouse gas emission trajectories consistent with limiting warming to 1.5°C (and well below 2°C).

<table>
<thead>
<tr>
<th>Selection of groups</th>
<th>Class name</th>
<th>No. of scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5°C</td>
<td>Below 1.5°C</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>1.5°C low overshoot</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>1.5°C high overshoot</td>
<td>37</td>
</tr>
<tr>
<td>2°C</td>
<td>Lower 2°C</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Higher 2°C</td>
<td>58</td>
</tr>
</tbody>
</table>

Source: IAMC 1.5°C Scenario Explorer and Data hosted by IIASA.

Source: IPCC SR1.5; Chapter 2; Table 2.SM.11
IPCC Special Report on 1.5°C

Transformation pathways
IPCC Special Report on 1.5°C

Transformation pathways

Cumulative emissions to net-zero - SR15 scenario categories

- Below 1.5°C
- 1.5°C low overshoot
- 1.5°C high overshoot
- Lower 2°C
- Higher 2°C

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Year</th>
<th>Cumulative Emissions (GT CO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1.5°C</td>
<td>~2050</td>
<td></td>
</tr>
<tr>
<td>1.5°C low overshoot</td>
<td>~2055</td>
<td></td>
</tr>
<tr>
<td>1.5°C high overshoot</td>
<td>~2070</td>
<td></td>
</tr>
<tr>
<td>Lower 2°C</td>
<td></td>
<td>~2075</td>
</tr>
<tr>
<td>Higher 2°C</td>
<td></td>
<td>~2075</td>
</tr>
</tbody>
</table>
IPCC Special Report on 1.5°C

*Transformation pathways*

**Projected warming - SR15 scenario categories**

- Higher 2°C (58)
- Lower 2°C (74)
- 1.5°C high overshoot (37)
- 1.5°C low overshoot (49)
- Below 1.5°C (9)
IPCC Special Report on 1.5°C

Transformation pathways – additional stress on land use

Lande use for energy crops - SR15 scenario categories

- 1.5C high overshoot
- 1.5C low overshoot
- Below 1.5C
- Higher 2C
- Lower 2C
IPCC Special Report on 1.5°C

Transformation pathways – additional stress on land use

Land use for energy crops - SR15 scenario categories

- 1.5C high overshoot
- 1.5C low overshoot
- Below 1.5C

Land surface – Australia (6th largest country by land area)

Land surface – India (7th largest country by land area)

Land surface – Mexico (13th largest country by land area)
IPCC Special Report on 1.5°C

Transformation pathways – peak oil?

Primary energy use - oil - SR15 scenario categories

Peak in oil consumption within a decade

- 1.5C high overshoot
- 1.5C low overshoot
- Below 1.5C
- Higher 2C
- Lower 2C
IPCC Special Report on 1.5°C

Transformation pathways – gas as a transition fuel?
Why does SG6 matter?
Unlike oil, there is no alternative source
Water matters

On average - takes 32 megalitres to run a medium sized gold mining operation for a day; 1,364 megalitres to run a 500 MW power plant for a day; and 15,145 litres to produce 1 kilogram of beef.
A transition risk

- IPCC report highlights biomass and CCS for 1.5C pathway – both rely on a stable supply of good quality water.
- The IEA predicts a lower carbon pathway could exacerbate water stress or be limited by it.
- 24% of emissions reduction activities depend on a stable supply of good quality water
- 53% report that better water management delivers GHG reductions e.g. Nestlé
A physical climate risk

83% of companies report to CDP that they are exposed to physical climate risks, of which 73% water-related

Companies that are ‘Paris-aligned’ must manage water sustainably
A material risk

- Norsk Hydro – forced to close Alunorte plant, one of the largest alumina refineries in the world after pollution incident
- Share price down 11.7% following the closure
- Global price of aluminium jumped more than 3 per cent to US$2,175 per tonne
Case study: #ClimateisWater

South African mining company Gold Fields Limited was forced to diversify its energy mix as hydropower supply in Ghana failed due to drought. These investments cost the company US$92 million, or 14.5% of the company’s total capital expenditure in 2015.
Exposed to substantive water risk

- Mineral extraction
- Power generation
- Food, beverage & agriculture
- Materials
- Infrastructure
- Retail
- Manufacturing
- Fossil fuels
- Biotech, Health Care & Pharma
- Hospitality
- Apparel
- Transportation services
- Services

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
CDP’s water questionnaire provides a very strong layer of risk management coverage to the CalSTRS Global Equity and total fund portfolios. The companies that receive CDP’s water questionnaire represent 18% of our total investment portfolio and 36% of our global equity portfolio.

CalSTRS
(US$193 billion)
Risk timeframes

- Unknown
- More than 6 years
- 4 - 6 years
- 1 - 3 years
- Current up to 1 year
Thermal asset water stress exposure

2016
- 2% of thermal generation capacity situated in high or extremely high water stress areas.

2030
- 51% of assets expected to remain online to be in high or extremely high water stress regions.
Sector summary: Industrials

Industrials

Current State

24% experienced detrimental impacts in reporting year costing the sector US$19.6 million
58% evaluated how water risks could impact business’ growth strategy

Risk Assessment

29% conduct a company-wide assessment that covers both direct operations and supply chains
- 56% incorporate future regulatory changes at the local level;
- 62% include local communities; and
- Only 21% implement the assessment at river basin scale.

Exposure to Risk

47% report exposure to risk, and the majority are expected to occur in the next 6 years:
- 29% anticipate risks to materialize in <1 year
- 42% anticipate risks to materialize within 1-6 years
- 17% anticipate risks to materialize in >6 years

Top risks reported
- 1. Plant production disruption - reduced output
- 2. Higher operating costs
- 3. Brand damage

Supply Chain

31% request suppliers to report
8% request more than 50% suppliers to report

Opportunities

71% report opportunities
22% report strategies to realize them

Top opportunities reported
- 1. Sales of new products/services
- 2. Improved water efficiency
- 3. Increased brand value