Chapter 2: Externalities -
internalisation
Overview of the book

Part I: What is sustainability and why does it matter?
1. Sustainability and the transition challenge

Part II: Sustainability’s challenges to corporates
2. Externalities - internalisation
3. Governance and behaviour
4. Coalitions for sustainable finance
5. Strategy and intangibles – changing business models
6. Integrated reporting - metrics and data

Part III: Financing sustainability
7. Investing for long-term value creation
8. Equity – investing with an ownership stake
9. Bonds – investing without voting power
10. Banks – new forms of lending
11. Insurance – managing long-term risk

Part IV: Epilogue
12. Transition management and integrated thinking
Learning objectives – chapter 2

- explain the concepts of externality and internalisation
- understand the role of government regulation and taxation
- understand the integrated value approach for measuring externalities
- explain policy and technology uncertainty
- use scenario analysis
Why externalities matter
Impact of people on nature

\[ I = P \times A \times T \]

- \( I \) = Impact on natural resources
- \( P \) = Population (number of persons)
- \( A \) = Affluence (consumption per person)
- \( T \) = Technology (impact per unit consumption)
Non-renewable or abiotic resources $N^a$ are finite

- Speed of depletion $T$ in years depends on annual demand $D^a$
  - $T = \frac{N^a}{D^a}$

- Example: $T = 70$ years for copper (Cu)
  - But depends on new discoveries ($N^a \uparrow$)
  - And intensified use ($D^a \uparrow$) and re-cycling ($D^a \downarrow$)
Recycling rates

<table>
<thead>
<tr>
<th>Periodic Table with Recycling Rates</th>
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</thead>
<tbody>
<tr>
<td><strong>Lanthanides</strong></td>
</tr>
<tr>
<td>La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb</td>
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<tr>
<td><strong>Actinides</strong></td>
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<tr>
<td>Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md</td>
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- Blue: > 50%
- Green: > 25-50%
- Yellow: > 10-25%
- Orange: 1-10%
- Red: < 1%
Social and human capitals

- Goal of **decent work and inclusive economic growth** (SDG 8)
  - Preserve social (S) and human (H) in production process

- **Common language**: link SDGs to capitals (S, H, N)

- Not only negative, but also **positive externalities**
  - **N**: companies investing in renewable energy; material savings
  - **S + H**: companies training employees; sustainable food production and improvement of health care
## Linking SDGs and Capitals

<table>
<thead>
<tr>
<th>SDG</th>
<th>Brief description</th>
<th>Social &amp; human capitals</th>
<th>Natural capital</th>
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<tbody>
<tr>
<td>1</td>
<td>No poverty</td>
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<td>X</td>
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<tr>
<td>2</td>
<td>Zero hunger</td>
<td></td>
<td>X</td>
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<td>3</td>
<td>Good health and well-being</td>
<td></td>
<td>X</td>
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<td>4</td>
<td>Quality education</td>
<td></td>
<td>X</td>
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<td>5</td>
<td>Gender equality</td>
<td></td>
<td>X</td>
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<tr>
<td>6</td>
<td>Clean water and sanitation</td>
<td></td>
<td>X</td>
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<tr>
<td>7</td>
<td>Affordable and clean energy</td>
<td></td>
<td>X</td>
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<tr>
<td>8</td>
<td>Decent work and economic growth</td>
<td></td>
<td>X</td>
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<tr>
<td>9</td>
<td>Infrastructure, industry and innovation</td>
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<td>X</td>
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<tr>
<td>10</td>
<td>Reduced inequalities</td>
<td></td>
<td>X</td>
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<td>11</td>
<td>Sustainable cities and communities</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Responsible consumption and production</td>
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<td>13</td>
<td>Climate action</td>
<td></td>
<td>X</td>
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<tr>
<td>14</td>
<td>Life below water</td>
<td></td>
<td>X</td>
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<tr>
<td>15</td>
<td>Life on land</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>16</td>
<td>Peace, justice and strong institutions</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>17</td>
<td>Partnerships for the goals</td>
<td></td>
<td>X</td>
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</table>
Perspectives on externalities

Economist: a public good which is not priced

Human rights advocate: ensuring every person’s claim to life’s essentials

Ecologist: need to operate within ecological limits

Sustainable development: $I = F + S + E$
Problem: externalities not reflected in market prices

- **Government**: regulation or taxation
- **Civil society**: NGOs can raise awareness (advocacy)
- **Consumers**: buy sustainable products and services
- **Corporates**: incorporate costs of externalities in production
- **Financials**: incorporate ESG factors in investment and lending

Internalisation
Who should act?

- Public; Non-profit
  - State: public goods and values
- Private; For-profit
- Market: private goods and values
- Civil; Non-profit
  - Social goods and values

common goods and values
Why integrate ESG factors?

Anticipation of regulation / taxation (e.g. carbon tax)

Reputation – pressure from NGOs and consumers

Future-proof: transition to SDGs by 2030
Example of reputation risk

- Violating SDG 8 - Decent work, incl. paying ‘living wage’
Internalisation of social and environmental impacts

Impacts

Business

Internalisation rate

Society

Dependencies

Principles of Sustainable Finance © Schoenmaker and Schramade 2019
Government intervention
Government intervention

The climate economy guru - Nicolas Stern (2015):
• “Why Are We Waiting? The Logic, Urgency, and Promise of Tackling Climate Change”

Main recommendations
• Energy infrastructure investments lock in energy use for 20 years ➔ stop investing in fossil fuel powered utilities and networks
• First best: carbon tax of $40-50 per tCO$_2$e by 2020 and $50-100 by 2030
Basic approaches to reduce externalities

- Raising prices through taxation to reduce demand
- Limiting quantity directly through regulatory quotas (letting prices adjust)

They give theoretically the same result unless the demand curve is uncertain
Example regulatory approach

Montreal Protocol

on Substances that Deplete the Ozone Layer
Taxing externalities

- **Carbon tax** is efficient way to get public good of low carbon economy
  - Marginal adjustment cost = tax

- Alternative is **Emissions Trading Systems (ETS)** – cap emissions and trade allowances

- Also **taxes on natural resources** to prevent depletion
Scandinavian countries started in 1990s – now at $50-130 per tCO$_2$e

Result: reduction in emissions, without loss of economic growth

Key is redirecting taxes: taxing carbon instead of labour

Most countries have no effective carbon taxes

Even worse: fossils fuels are subsidised up to $330 bn

Subsidies very inefficient way of income support in low-income countries
Social externalities

Instruments

- **Living wage** (SDG 8) instrumental for other SDGs (poverty, hunger, health care, education), as living wage allows families to live decently

- Taxes to change behaviour: alcohol, tobacco, sugar rich beverages, etc.
Who should act first to internalise externalities?

- **Government** should tax and regulate versus **all parties** should act
Measuring and pricing externalities
How to deal with externalities?

What can business do with remaining externalities?

- Measuring and monetisation is possible through technology (IT, data) and science (life cycle analyses, environmental economics)

- Pricing is possible by optimising across F, S and E dimension
From financial value to integrated value
**True prices of roses from Kenya**

- **Conventional price** € 0.70 (F) and **true price** € 0.92 (F+S+E)

  - **Optimise production process** (reducing S + E)
    - Transport by ship to reduce carbon emissions
    - Solar powered greenhouse
    - Closed-loop hydroponics to reduce water + fertiliser use
    - Training in health and safety to improve workers’ skills
    - Gender committees to reduce harassment + gender discrimination
    - Pay a basic living wage to improve wellbeing of workers

- **Optimised true price** € 0.74
Pitfalls to monetisation

- Calculation done on **efficiency grounds**
  - But also need to invest in **adaptive capacity** to absorb shocks
  - Example: overinvest in safety to protect people & environment and to reduce production losses

- **Ethical aspects** of externalities
  - Difficult to monetise ethical aspects, like human rights
  - Three capitals (F, S, E) are not substitutable

- **Perverse outcomes**
  - Negative impact of deforestation can be offset by large economic gains
  - Use constraint of equation 1.2: \( SEV_{t+1} \geq SEV_t \)
Scenario analysis
Policy uncertainty

- **Timing**: when will labour laws be tightened and carbon taxes be introduced
- **Reversal**: policies may be reversed / changed (e.g. solar panel subsidies)

Technological uncertainty

- **Exponential growth**: new innovations and spectacular rise of renewables (solar PV, wind) ➔ Moore’s law: doubling of capacity each x years
- **Changes** in consumer behaviour and preferences
Exponential growth of renewables
Stranded assets

- Government regulation (e.g. carbon pricing), or
- Technological change (e.g. reduced cost of solar PV or wind)

Which assets?

- Carbon pricing affects all carbon-intensive assets
- Intensive agriculture (fertiliser + irrigation) may lead to degraded land (lower soil quality), species loss and human migration
- Broadly applicable: car parks in cities can become stranded asset (car share)
Environmental exposures beyond energy sector

Source: Calculations based on Eurostat data.
Notes: Real estate emissions include household heating and cooling costs
Scenario analysis

- Scenario analysis to get **insight in development** of externalities over time

- Strategic approach to making scenarios
  1. **Determine most important uncertainties** for the future
  2. **Elaborate the scenarios** with trends, uncertainties and possible actions
  3. **Re-present scenarios** as appealing stories about (paths to) the future

- Analyst reports are the **fortune tellers** of investor community
  - *From* DCF analysis of **main scenario** (often ‘business as usual’)
  - *Towards* DCF analysis of **3 or 4 scenarios** including disruptions and internalising externalities
Impact of scenarios on DCF

Impact on cashflows? (e.g. loss of market share)

Impact on terminal value?

Impact on risk premium?

Discount Rate

Cash in

Cash out

Terminal value
Adverse scenario: disorderly transition

- Shift to low-carbon economy requires **strong reductions** in carbon emissions
- An early and gradual shift can facilitate a **soft landing** in a low carbon economy
- The adverse scenario is a **hard landing** with large emissions cuts implemented over a short horizon
- Amplified by **lack of technical progress**
- A later transition may also pose **larger physical risks** from climate change
Stress testing

- Central banks and supervisors conduct (climate) **stress tests of financial sector** using extreme scenarios

- Goal is to
  1. **Raise awareness** of major environmental exposures at financials
  2. **Monitor major concentrations** at financials in supervision

- Possible instruments
  - **Large exposure rules** for high carbon concentrations
  - **Brown capital charge** for high carbon assets
Conclusions

- **Social and environmental externalities** are relevant, but absent in traditional production function and neo-classical finance.

- **Instruments** to internalise externalities
  - Government: *taxes and regulation* first best, but not always done
  - Business: incorporating S + E in decision making (*integrated value*).

- **Scenario analysis** is tool to deal with uncertainties
  - Calculate *value company* under different scenarios
  - Prompt companies to *reconsider strategy* and *take action*.