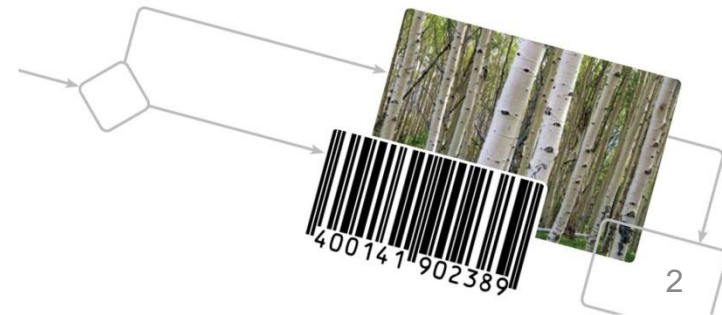




Guide to Corporate Ecosystem Valuation

Content

- Definitions: ecosystem services & biodiversity
- Value of ecosystems
- Ecosystem drivers & business context
- Business risks & opportunities
- How can business respond?
- Guide to Corporate Ecosystem Valuation (CEV)
 - ✓ Step by step incl. one case example
- In summary
- Additional slides



Definitions: ecosystem services & biodiversity

Ecosystem



Functional unit composed of living (e.g. plants, animals, micro-organisms) and non-living environments

e.g. forest, mountain, marine, inland water (rivers, wetlands)

Ecosystem services



Benefits society and business obtain from ecosystems / “goods and services of nature”

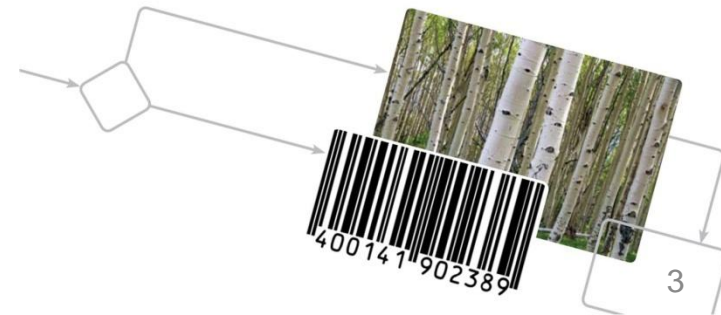
e.g. freshwater, food, fiber, climate regulation, pest and flood control

Biodiversity

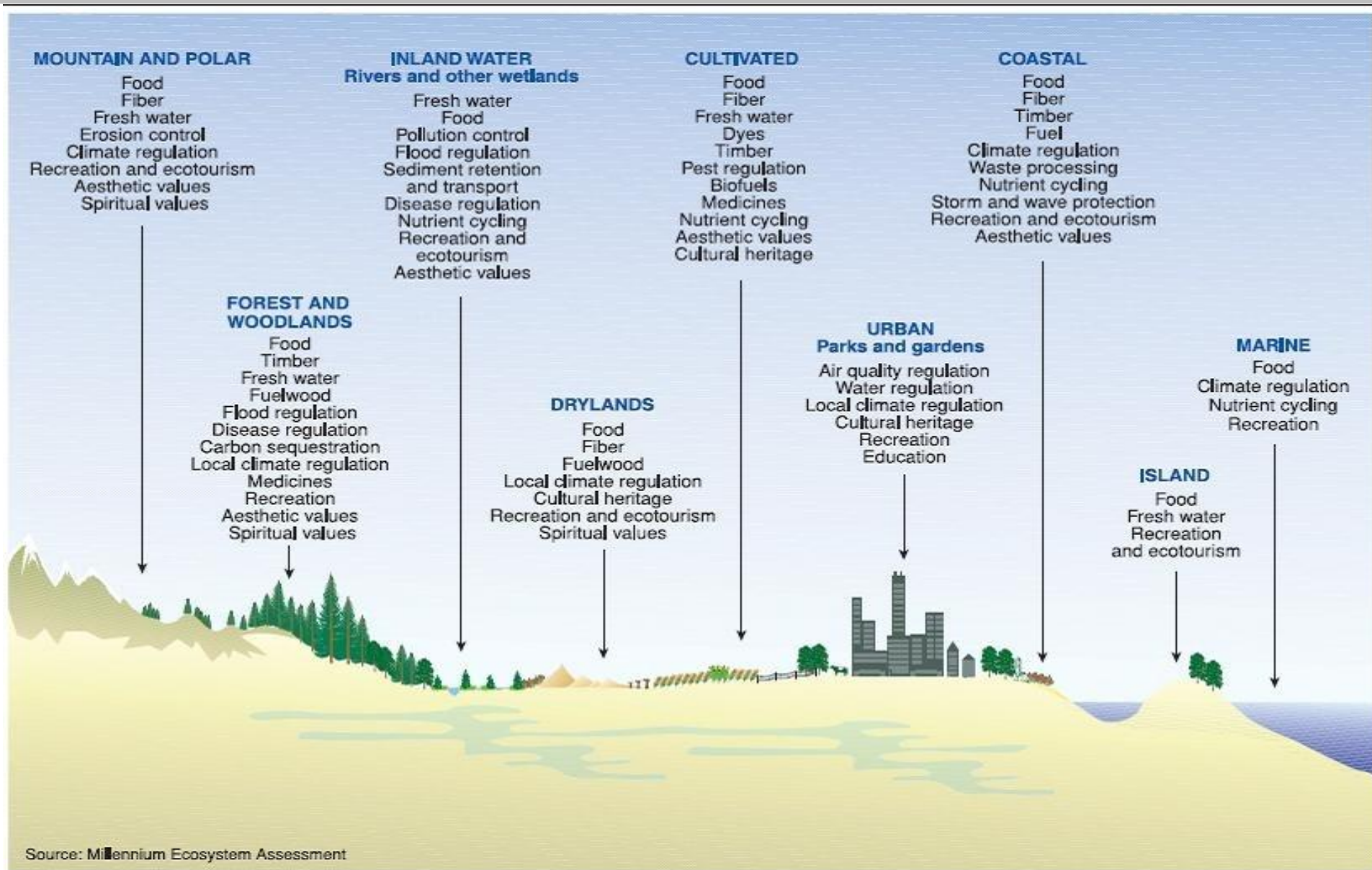


Variability among living organisms

- within species
- between species
- between ecosystems



The ecosystem landscape



Types of ecosystem services

Provisioning

Goods or products produced by ecosystems



Regulating

Natural processes regulated by ecosystems



Cultural

Non-material benefits obtained from ecosystems



Supporting

Functions that maintain all other services

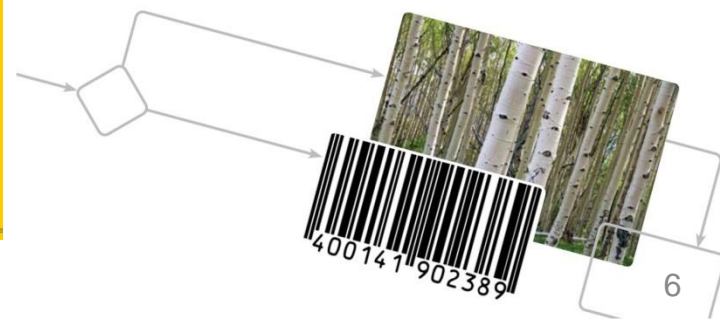
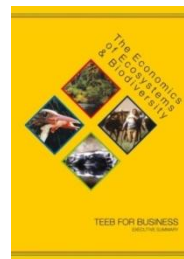


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Value of ecosystems

- **€ 1.35 trillion / year**: minimum estimate of **natural capital loss**, just from deforestation
 - ✓ Approx total GDP of UK or France in 2010
- **US\$ 190 billion / year**: contribution of insect **pollination** to agriculture output
 - ✓ Approx. 8 times Walmart's 2010 total operating income

Source: *The Economics of Ecosystems and Biodiversity TEEB for Business 2010*

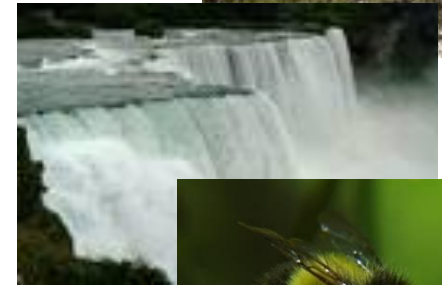


Biodiversity & ecosystem business impacts & dependence

Business impacts on ecosystems and ecosystem services

Ecosystem change creates business **risks** and **opportunities**

Business depends on ecosystems and ecosystem services



Biodiversity & ecosystem risks & opportunities

- **Operational** (e.g. increased scarcity and cost of raw materials)
- **Regulatory and legal** (e.g. public policies like taxes and moratoria on extractive activities)
- **Reputational** (e.g. relationships and image from media and NGOs)
- **Market and product** (e.g. consumer preferences)
- **Financing** (e.g. availability of capital)

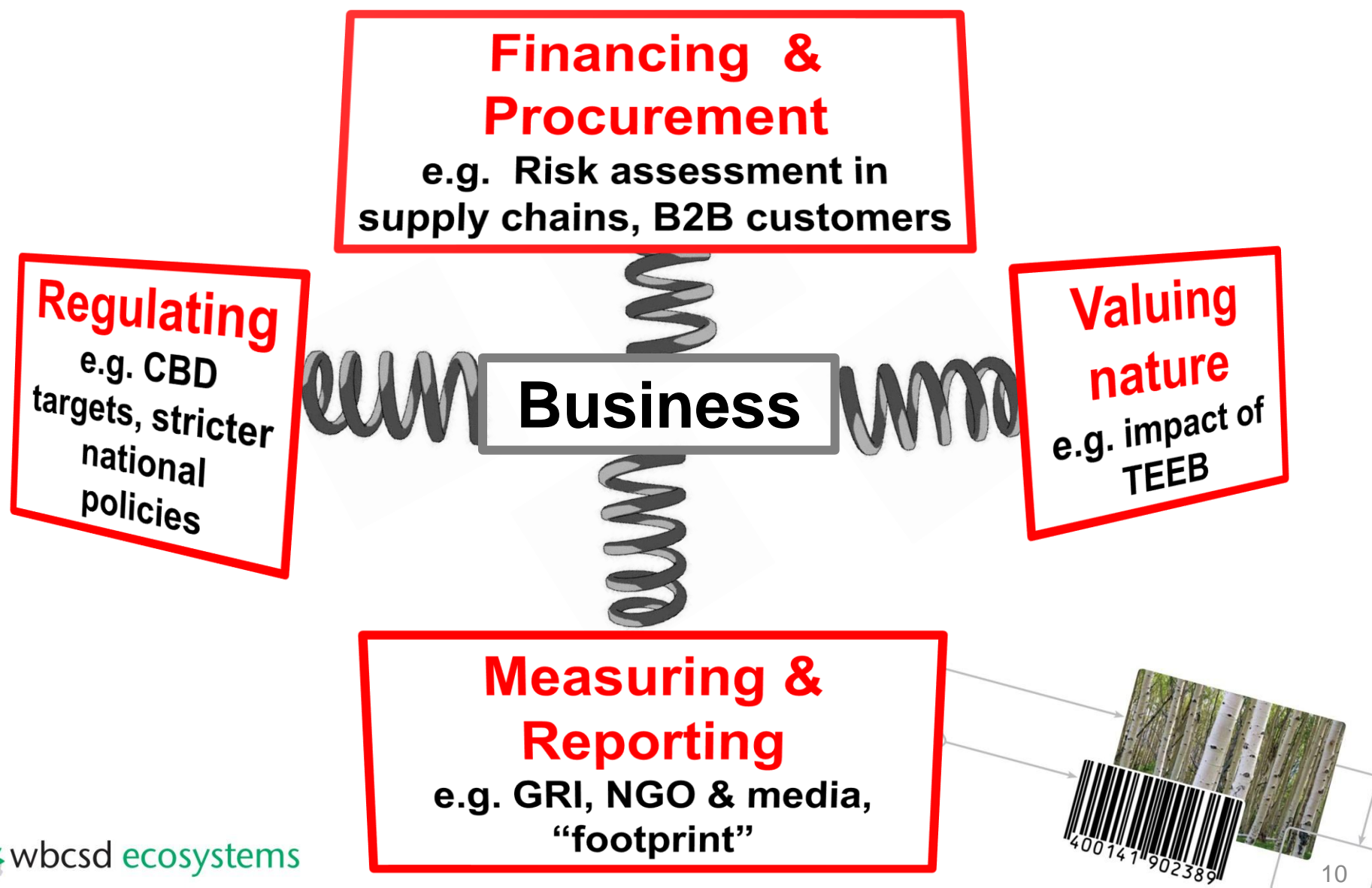


How can business respond to their ecosystem-related issues?

1. Measure, manage and mitigate risks and impacts
2. Improve decision-making by undertaking *corporate ecosystem valuation* to quantify business risks and opportunities
3. Innovate and help develop new markets for ecosystem services and eco-efficient goods, services & technologies
4. Encourage suppliers & purchasers to adopt best practices
5. Enter into local partnerships to address on-the-ground issues
6. Promote “smart” ecosystem regulation that leverages market forces and business solutions that halt degradation and “levels the playing field” for all

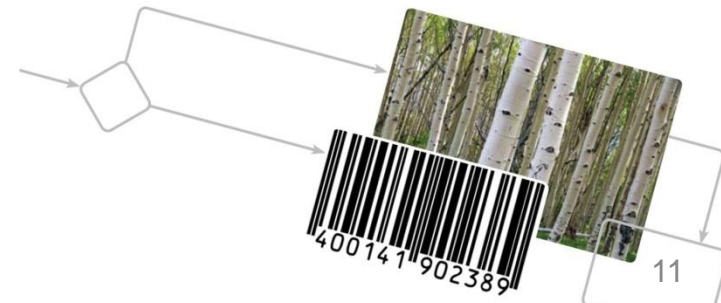
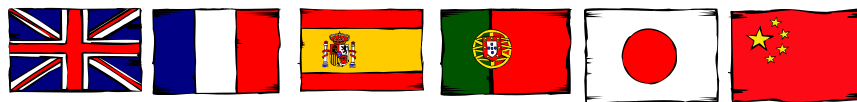
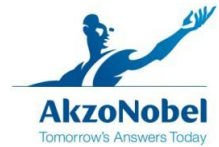


Ecosystem drivers & business context



Corporate Ecosystem Services Review (ESR)

- Helps identify & manage risks and opportunities arising from **dependence** and **impact** on ecosystems
- WRI/ WBCSD/ Meridian Institute
- Approx. 300 c^{ies} using tool since March '08 launch
- 6 languages

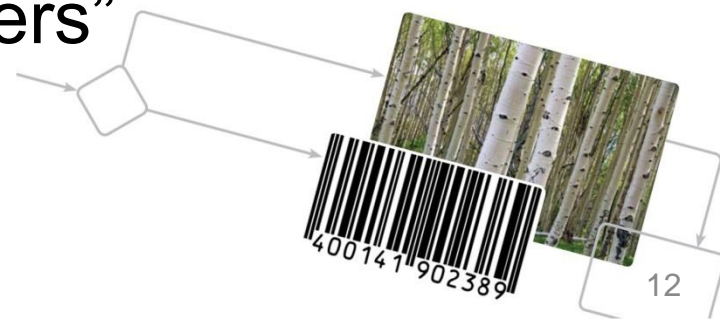


What the Guide is

- ✓ A framework for improving corporate decision-making by valuing ecosystem services
- ✓ A set of resources to navigate through related jargon and techniques

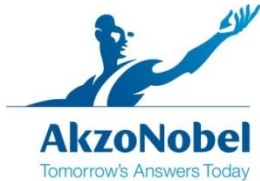
What the Guide is not

- ✗ A price list of biodiversity & ecosystem services
- ✗ A calculator to “crunch numbers”
- ✗ A stand-alone methodology



Partners and Road Testers

Partners

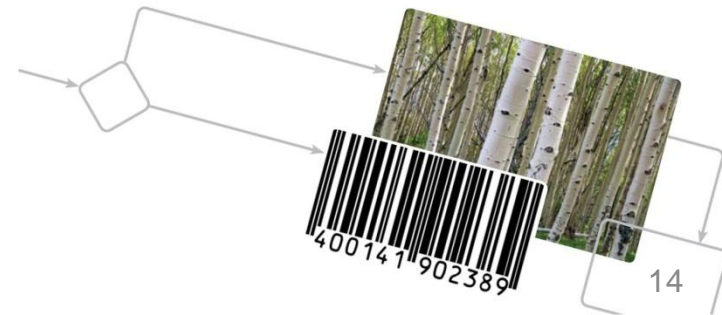


Road Testers

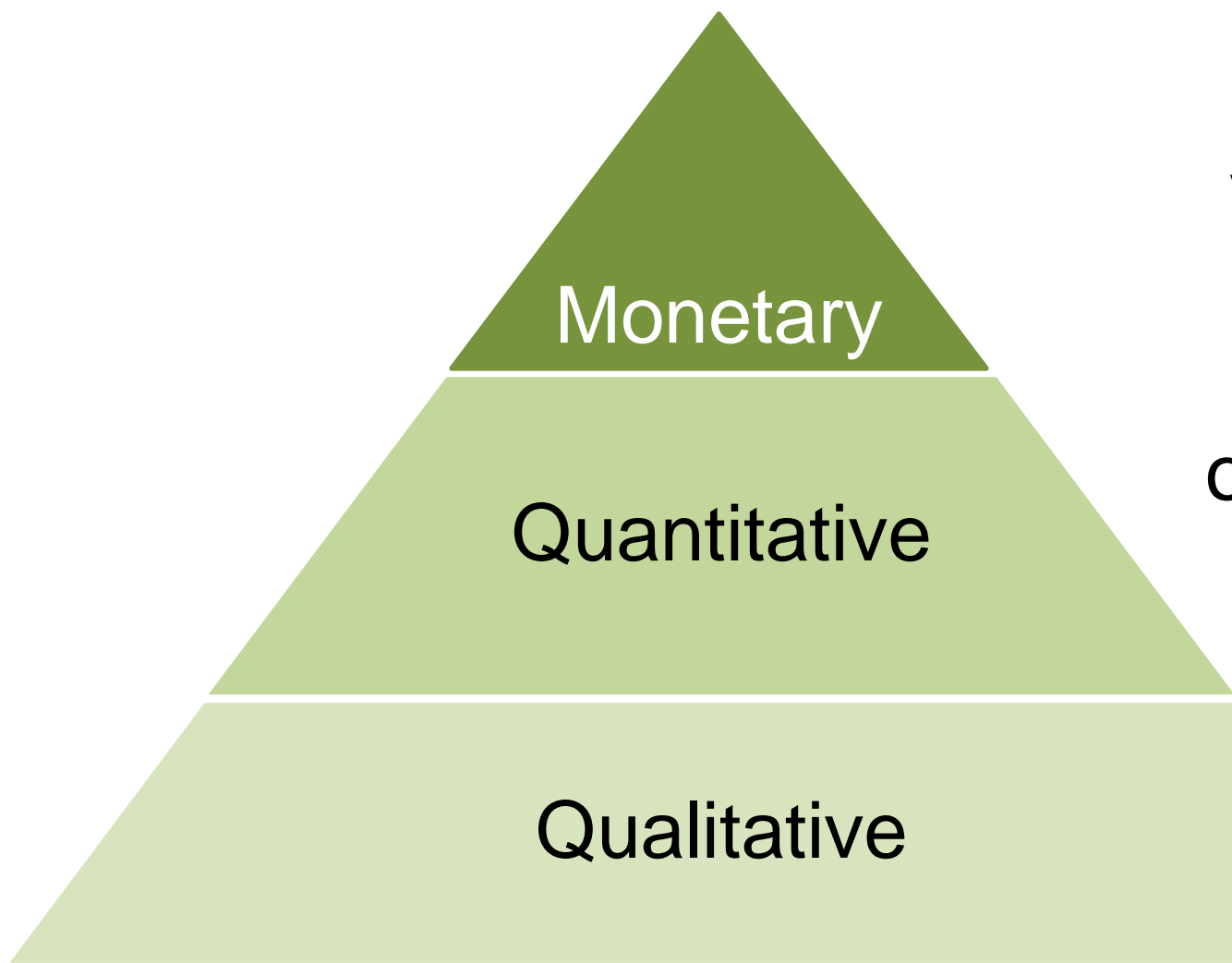


How CEV helps improve decision-making and...

- **Save costs**
 - ✓ e.g. cheaper & more effective waste management options (DuPont)
- **Reduce taxes**
 - ✓ e.g. gain deductions in Federal taxes (Alleghny Power)
- **Get new revenue streams**
 - ✓ e.g. implement a fee-to-access program for recreational users of unused lands (Potlatch Corp)
- **Assess liability & compensation risks**
 - ✓ e.g. calculate oil spill natural resource damages to be used in courts of law (ExxonMobil)
- **and more...**



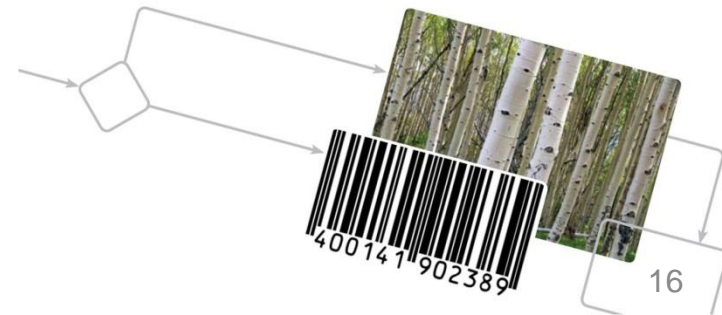
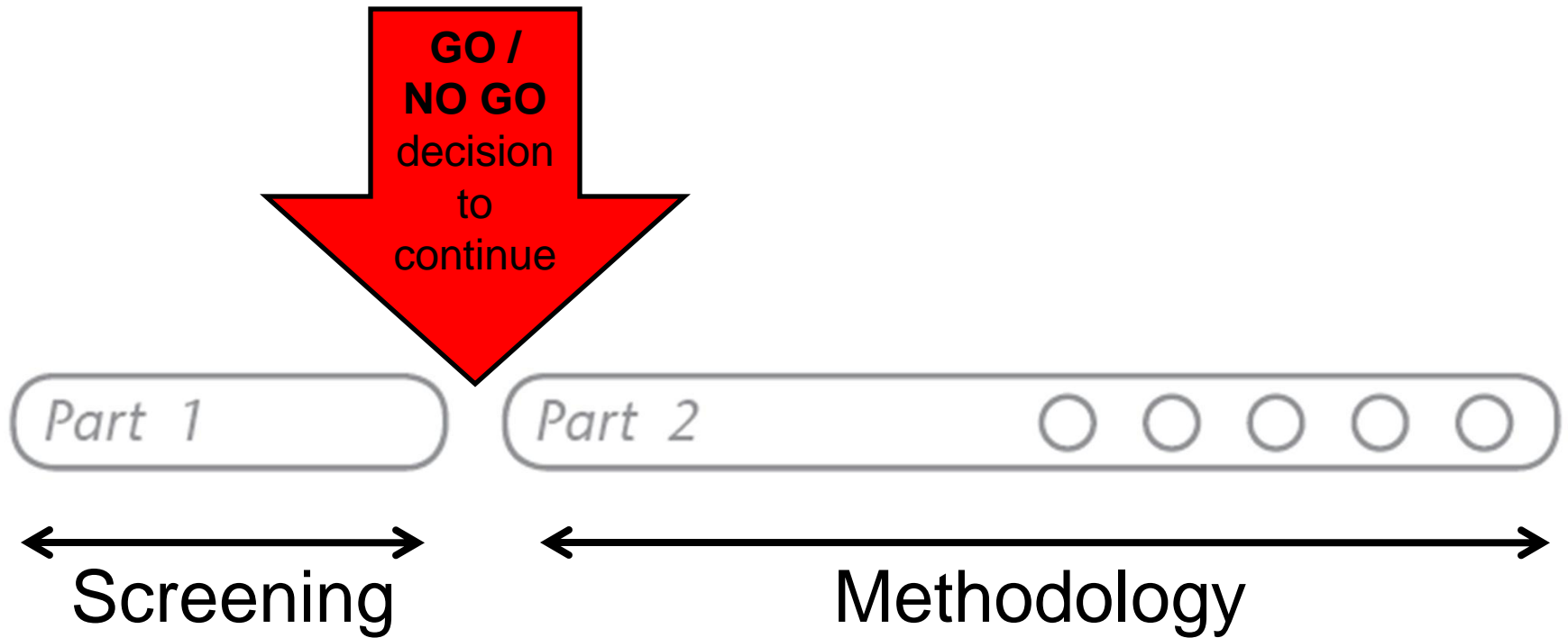
Hierarchy of valuation approaches



Monetary
values not
always
available
or **required**



Guide structure: 2 parts



Part 1: Do you need to conduct a CEV at all?

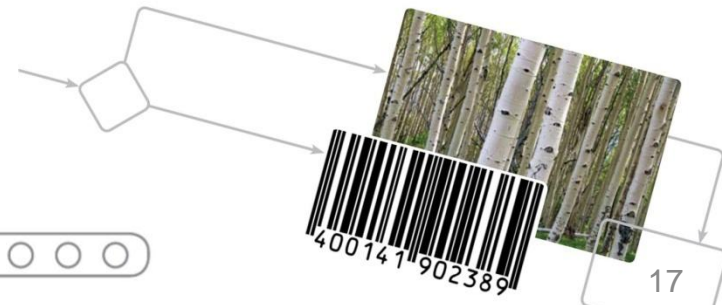
Before using the 5-stage methodology, the Guide asks a number of questions to ensure there is a need for a CEV study, e.g.

- Are your impacts & dependence on ecosystem services “material” / significant?
- Is there a mandatory requirement to value them?
- How will valuation help make your decision?

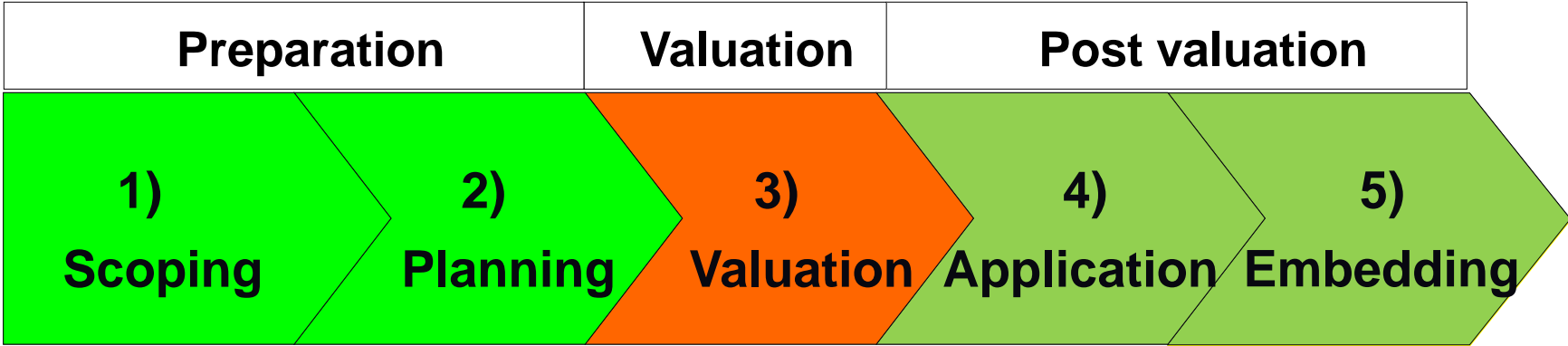
If there is a business case to continue – **GO to Part 2**

Part 1

Part 2



Part 2: Stages to undertake a CEV exercise



define scope for valuation exercise, using checklist of questions

develop suitable plan to undertake valuation effectively

actual valuation: may be qualitative, quantitative and/or monetary

use & communicate valuation results to influence internal & external decision-making

embed the CEV approach within company processes & procedures

Part 1 **Part 2** ○ ○ ○ ○ ○

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One example used to describe steps

- ❖ Water & wastewater service provider
- ❖ Company owns a parcel of land by a river
- ❖ Treated wastewater has been used to irrigate the land, creating green fields, small ponds, etc. which the local community & farmers enjoy
- ❖ New regulation has been enforced = the company can no longer discharge its wastewater directly on the site
- ❖ CEV used to inform which water & land management option would be best

❖ symbol used when presenting this example



1) Scoping

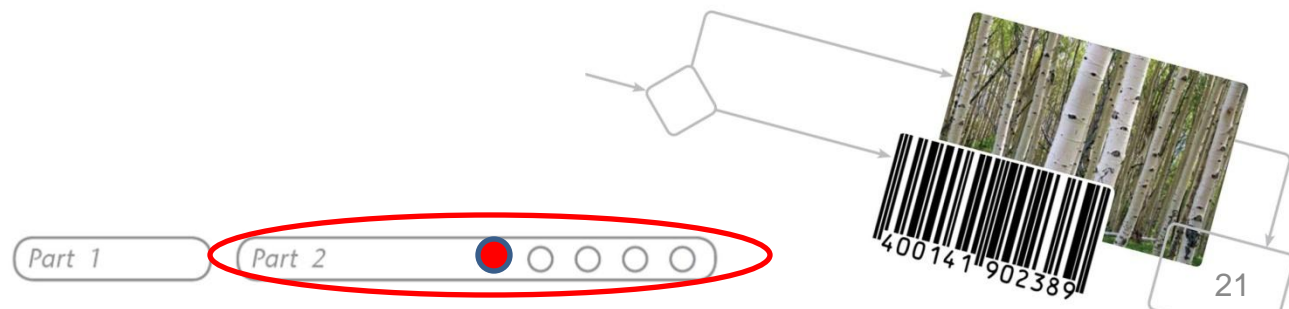
1. What are likely to be the main ecosystem service dependencies, impacts, and other environmental externalities?
2. What is the business case for doing a CEV?
3. What is the business 'aspect' to be assessed?
4. What is the overall objective of the CEV?

- **product** (e.g. wheat, paint or a car);
- **service** (e.g. financing package);
- **project** (e.g. an infrastructure project);
- **process** (e.g. alternative ways of manufacturing a product);
- **asset** (e.g. an operating facility or landholding); or
- **incident** (e.g. oil spill)



1) Scoping – example of water & wastewater company

- ❖ Consider alternative land management options incl. irrigation and growing energy crops on a portion of the land, with some land left for farmers and recreational use
- ❖ Use trade-off analysis to compare scenarios
- ❖ Objective: identify the optimum option from both financial (bottom line) and economic (societal) perspective



2) Planning

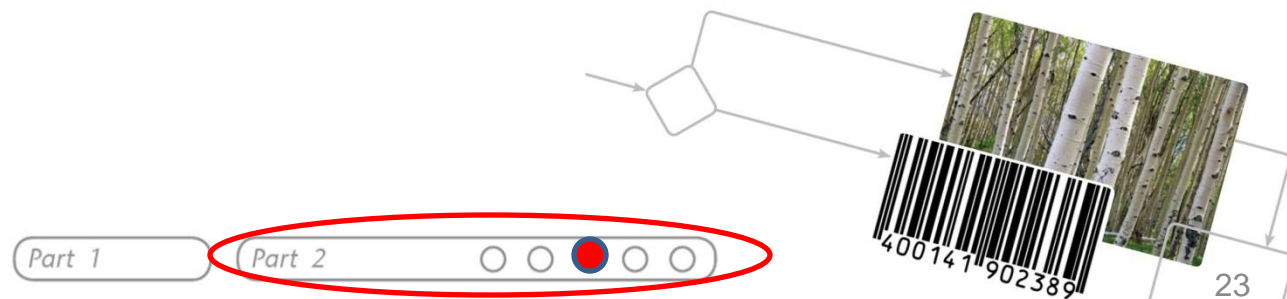
- Context
- Methodology
- Planned reporting outputs
- Team details
- Detailed timeline
- Detailed budget

See Additional
Notes B on Selection
& Application of
**Ecosystem
Valuation
Techniques** for CEV



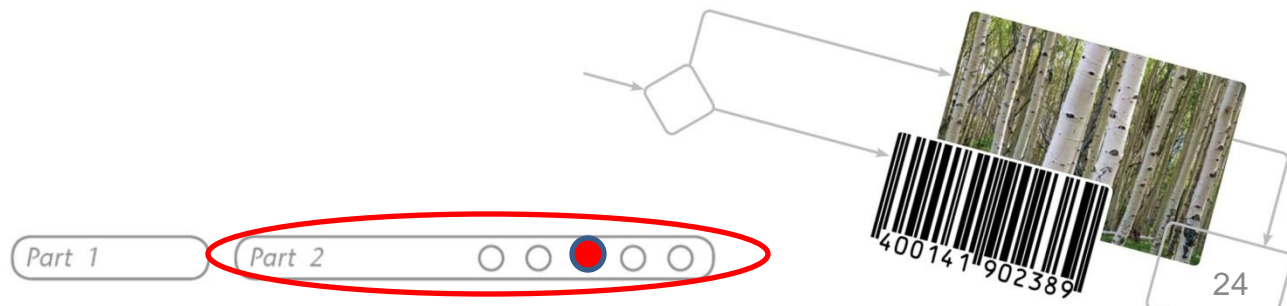
3) Valuation

- 9-step process that adhere to best practice in ecosystem valuation, and also align with the ESIA process.
- Guide focuses mainly on the ‘process’ required for ensuring an appropriate and valid CEV.



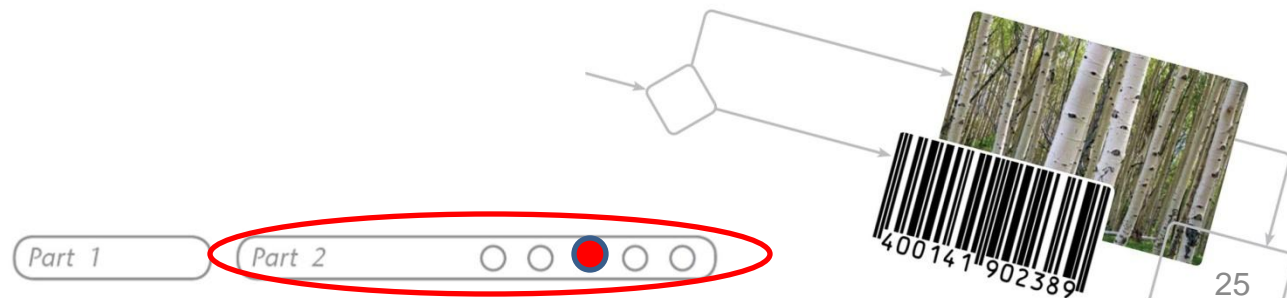
Step 1: Define the company 'aspect' to be valued

- “with” scenario, and other “alternative” scenarios
 - ❖ Aspect = several alternatives scenarios involving energy crops and targeted irrigation at the site
 - ❖ “Without” scenario = “do minimum” scenario where treated water discharged into nearby river (not on site) and minimal management on site
 - ❖ Scenario 2 = grow single energy crop on $\frac{1}{2}$ land with targeted irrigation
 - ❖ Scenario 3 = grow 2 energy crops instead of 1



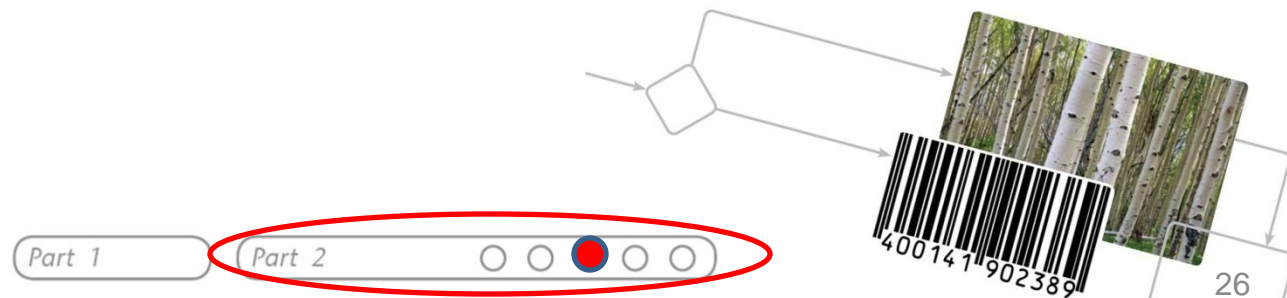
Step 2: Establish the environmental baseline

- status of habitats, species, ecosystem services, emissions, stakeholders, etc.
- consider future trends *without* change, e.g. population growth, decrease water availability
 - ❖ Baseline described current condition & protection status of flora & fauna on the site, stakeholders currently benefiting from ecosystem services – local farmers and recreational visitors



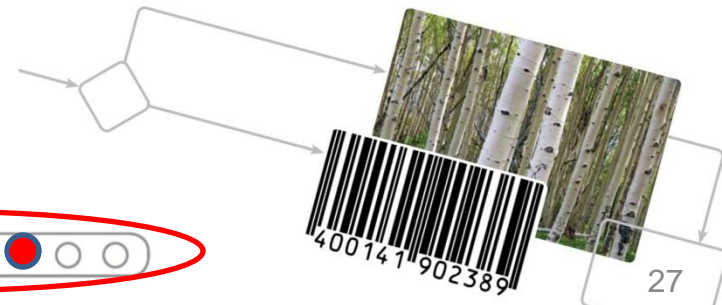
Step 3: Determine physico-chemical changes

- e.g. emissions, discharges, m² habitat destroyed/improved, m³ of water
- ❖ Changes were assessed for agricultural activity (e.g. number of hectares of fodder and energy crops) + changes in volumes of water flowing to the site



Step 4: Determine the “net” environmental changes between “with” & “without” scenarios

- sometimes actual impact on environment not necessary (e.g. CO₂ emissions – change alone can be sufficient)
- ❖ Environmental changes considered under each scenario included increased or decreases in:
 - Crop productivity (hay and wheat fodder, and energy crops)
 - Ground water quality
 - Habitat quality (diversity of plant, insect and bird species)
 - Landscape aesthetics



Step 5: Assess relative significance of ecosystem services affected qualitatively

- will ecosystem service changes be manifested as high, medium or low values? Costs or benefits?
- which stakeholders will be affected?

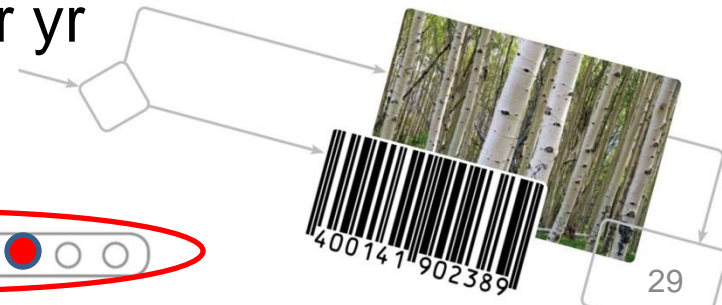
❖ Different ecosystem services were marked on a scale from major positive impact (dark green) to major negative impact (red) for the different scenarios

Ecosystems	Ecosystem services	Existing baseline	Scenario 1 - 'Do Minimum'	Scenario 2 - Single Energy Crop	Scenario 3 - Mixed Energy Crop	Scenario 4 - Low Irrigation Energy Crop
Crops / fallow land	P Hay / crops for fodder	+++	+	+++	+++	+
	P Energy crops	n/a	n/a	++++	+++	++
Woodlands / trees	P Fruit crops	++	+	++	++	+
Above two ecosystems plus natural grassland and wetlands	R Carbon sequestration & avoided emissions	-	+	+++	+++	++
	R Local climate regulations	+	+	++	++	++
	R Assimilation of waste by vegetation	+	+	++	++	++
	C Informal recreation (landscape / biodiversity)	+++	+	++	+++	+
	C Non-use values (landscape / biodiversity)	++++	++	++	++++	+++
	Groundwater	P Quality of drinking water supply	-----	-	+++	+++



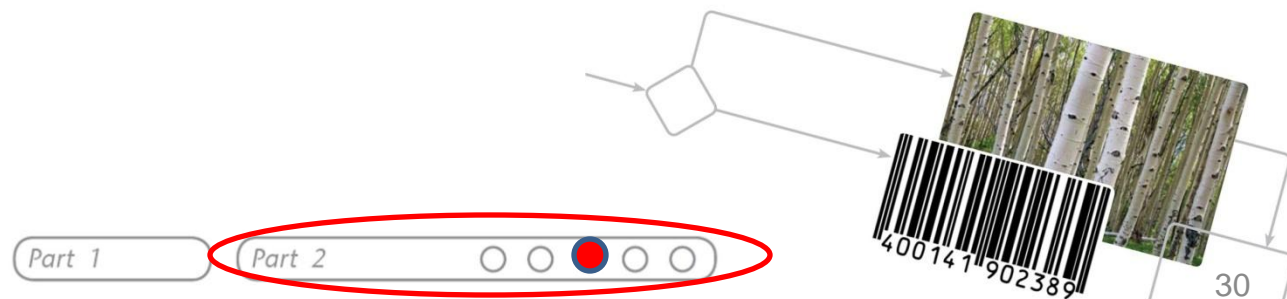
Step 6: Monetize selected changes to ecosystem services

- which ecosystem service values are relevant enough & need to be monetized? Select appropriate valuation technique
 - ❖ “Change in production” approach was used to value agricultural and energy crop outputs
 - ❖ Benefit (value) transfer was used to estimate benefits & costs from reduced CO₂ emissions (using biomass instead of fossil fuels), e.g. € 32 per ton
 - ❖ Contingent valuation / Willingness to Pay survey carried out to estimate recreation & non-use values, e.g. € 1.9 - € 7.8 per person per yr



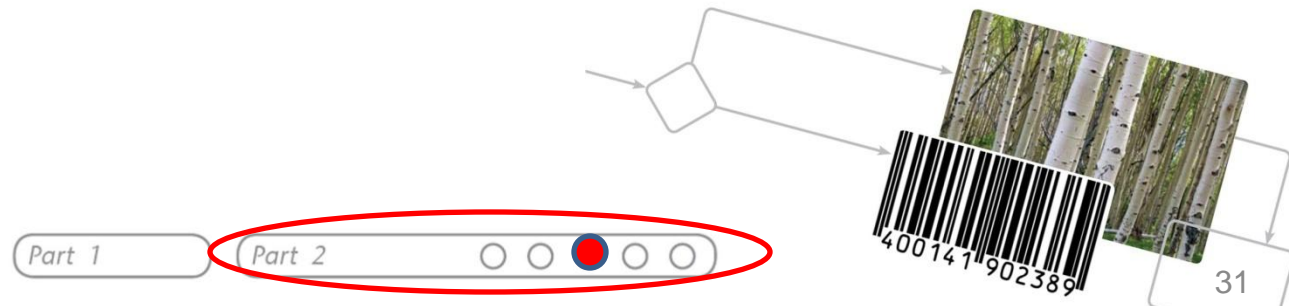
Step 7: Identify internal and external costs and benefits

- distinguish between internal (to the company – direct bottom line) and external (to society) costs and benefits
- which could be internalized in the future?
 - ❖ Financial analyses incl.: asset depreciation, taxes, capital & operating costs, market prices for energy crops
 - ❖ Separate economic analyses estimated net benefits to farmers, recreation values by site visitors



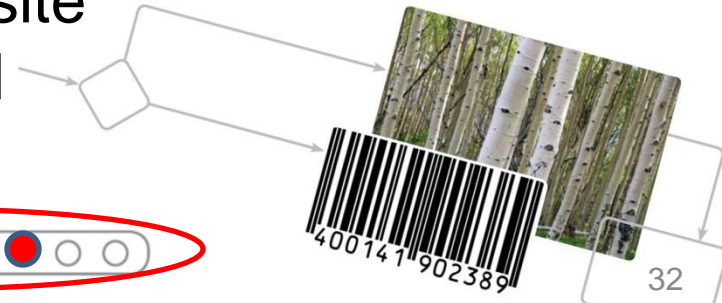
Step 8: Compare all costs and/or benefits associated with “with” scenario

- incl. those that are not valued monetarily
- use appropriate time horizon & discount rate (see on-line guidance)
- benefit cost ratio (BCR)
 - ❖ Compared scenarios over 25 years, using financial discount rate of 5.5% & economic discount rate of 3.5%
 - ❖ When economic (societal) costs & benefits added to financial ones, scenario with 2 crops was best (BCR of 17.4)



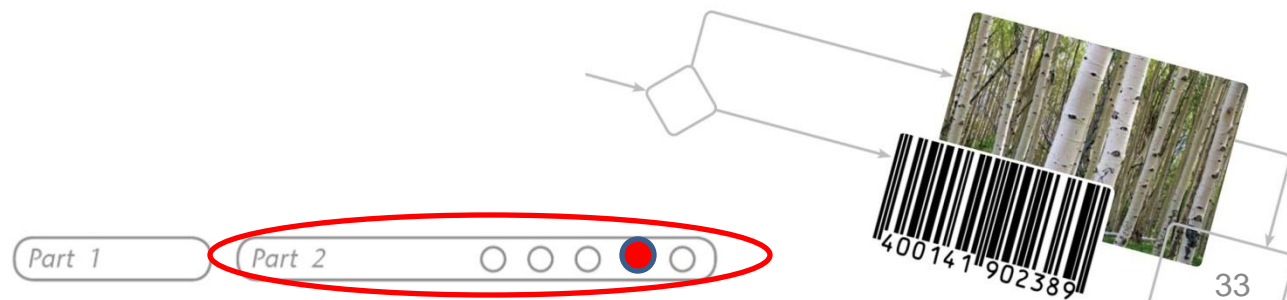
Step 9: Apply sensitivity analysis

- define ranges according to changes in key assumptions, where uncertainty exists
- e.g. determine “switching values” = values a parameter needs to reach in order to change a decision
 - ❖ High, medium & low estimates were determined for a number of the values assessed
 - ❖ Increase in assumed market value of energy crops by 33% tested
 - ❖ Doubling estimated number of site visitors, willing to pay more had little effect on outcome



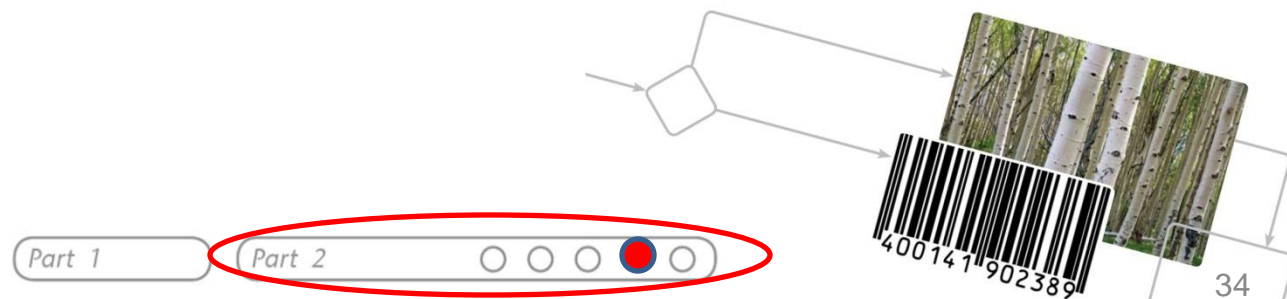
4) Application

- Internal application
- External application
- Communicating the results
- Confidentiality
- Verification



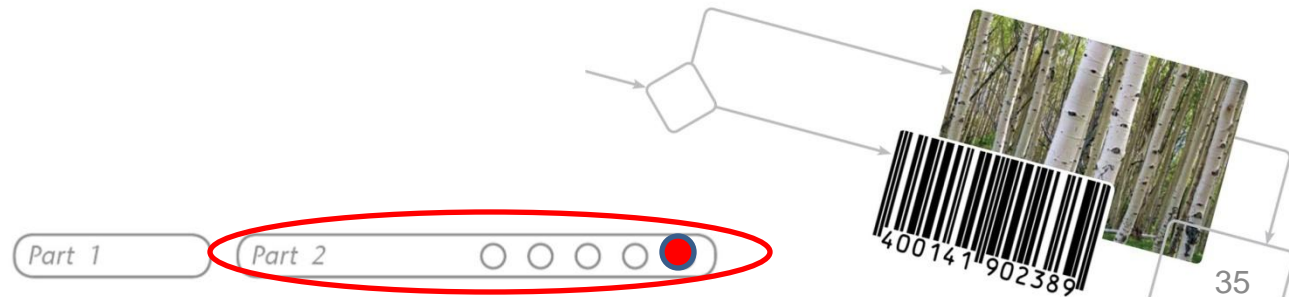
4) Application – example

- ❖ Used process & results to inform discussions with regulating authority to help select best option
- ❖ Consider setting up Payment for Ecosystem Services schemes, e.g. visitors pay entrance fee, add conservation fee to water bill, pay for energy crops



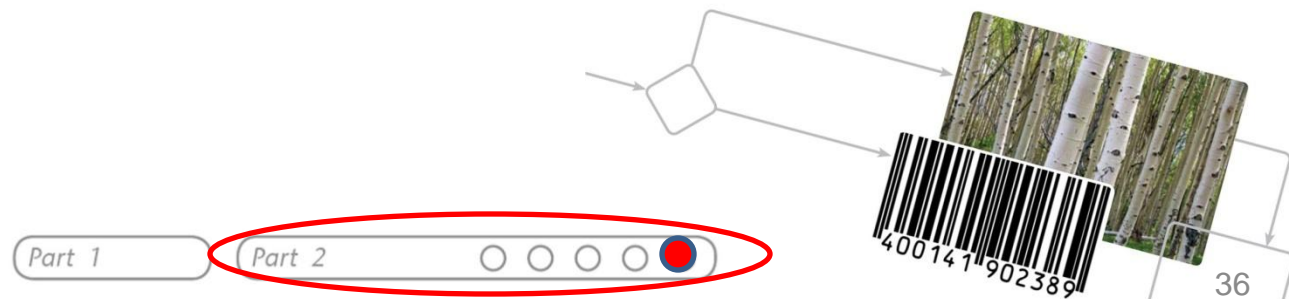
5) Embedding

- Getting internal buy-in
- Linking CEV to existing business planning and financial control processes
- Capacity building



5) Embedding – example

- ❖ Link CEV with Environmental Management System and ESIA's
- ❖ Convert framework into training kit



Reports & guide

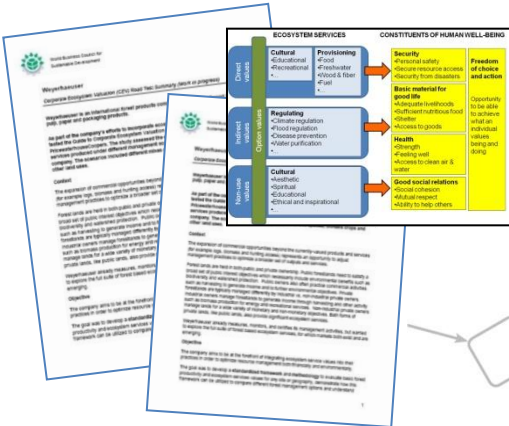
Additional resource notes

- Concepts
- Selection & application of techniques

PPT packs

FAQ

Road tester summaries



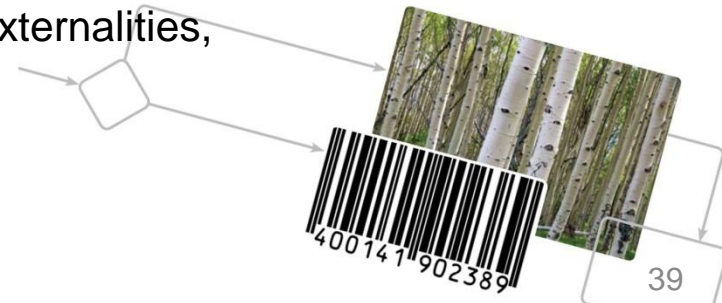
Selected Ecosystem Valuation Concepts and Issues

- Ecosystem Services and Total Economic Valuation
- Other related CEV concepts and issues
 - ✓ E.g. Cumulative effects, discounting, environmental thresholds, intrinsic values...
- Business approaches that CEV can be linked to
 - ✓ E.g. Financial accounting, full (environmental) cost accounting , economic cost-benefit analysis, company reporting, environmental management systems, Environmental and Social Impact Assessment, Ecosystem Services Review, Life Cycle Analysis



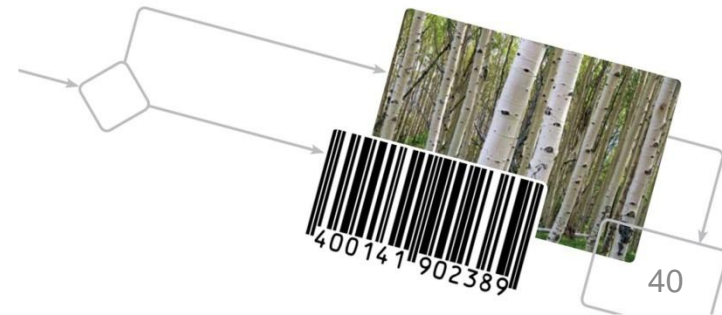
Selection & Application of Ecosystem Valuation Techniques for CEV

- The main categories of ecosystem valuation techniques available
 - ✓ E.g. Revealed preference techniques, market prices, substitute prices, travel cost method, Willingness To Pay, benefit (value) transfer
- Selecting the most suitable techniques
 - ✓ Incl. table comparing techniques incl. data required, time / budget, skills required, (dis)advantages
- Applying the techniques
 - ✓ Incl. steps for how to use: Effect on production, replacement costs, stated preference surveys and benefit (value) transfer
- Approaches for valuing other environmental externalities
 - ✓ E.g. Carbon related greenhouse gas (GHG) externalities, water related environmental impacts
- References (incl. databases)



In summary

- Business **depends** on biodiversity & ecosystem services
- Business **impacts** on biodiversity & ecosystem services
- CEV can help business **manage risk** and consider new business **opportunities**
- Valuing these impacts and dependencies helps business make **better decisions**
- Ecosystem valuation will increasingly be considered by **governments, finance sector** and business-to-business **customers**
- CEV process is **complementary** to other business tools (e.g. ESIAAs, LCAs)



Additional slides



CEV road test examples (1/4)

- Compare the societal costs of atmospheric emissions for three alternative chemicals used in paper production – **AkzoNobel**
- Assess financial and societal costs and benefits of maintaining higher water levels in the canals and reservoirs associated with several hydropower facilities – **EDP**
- Evaluate the ecosystem services impacts and dependencies relating to an existing oil operation and to a new development in a sensitive area near a national park – **Eni**
- Evaluate the cultural services associated with tourism at a conservation area associated with a pumped storage scheme – **Eskom**



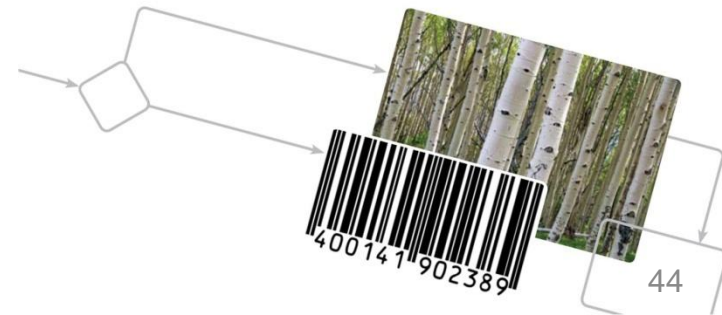
CEV road test examples (2/4)

- Assess the value of ecosystem services provided under several catchment management options – **GHD / SA Water**
- Evaluate the costs associated with carbon emissions for alternative manufacturing processes for multi-layer CCL (Copper-Clad Laminates) used in electronic products – **Hitachi Chemical**
- Inform a rehabilitation plan for proposed extensions to a sand and gravel pit, and examine the net value of ecosystem services under several alternative scenarios – **Holcim**



CEV road test examples (3/4)

- Inform land management planning for reclamation of a quarry – **Lafarge**
- Map and value water dependencies among major water users in a South African watershed – **Mondi**
- Assess the financial and social costs and benefits of conserving areas of rainforest as part of a policy of Net Positive Impact (NPI) on biodiversity – **Rio Tinto**
- Assess the value of natural pollination, and the value of providing habitat buffer strips for native bees – **Syngenta**



CEV road test examples (4/4)

- Quantify physical ecosystem benefits realized through the process of matching undervalued or waste materials from one company with the needs of another – **US BCSD / Houston By-Product Synergy**
- Assess the financial and ecological benefits associated with replacing a storm-water management system with a constructed wetland – **US BCSD / CCP**
- Prioritize water use and land management options relating to biofuel production in an ecologically and culturally important location – **Veolia Environment**
- Assess the economic value of ecosystem services produced under different management scenarios for forested land – **Weyerhaeuser**



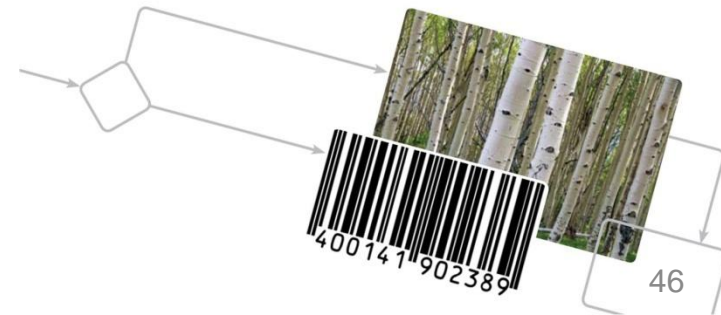
Quotes

- “Applying the Guide for Corporate Ecosystem Valuation will allow EDP to gain a better understanding of risks involved and spotlight new opportunities, in particular, given our 3.5GW Hydro Program in Portugal currently under development.”

*António Mexia, CEO, **EDP***

- “The guide has put forward concrete steps towards the valuing of ecosystem services and within a developing economy – like South Africa – this is something that will further contribute to informed decision making.”

*Brian Dames, CEO, **Eskom***



Quotes

- “We will explore how CEV can be implemented so that the value of the ecosystems we impact and depend upon can be included in strategic and operational decision making.”

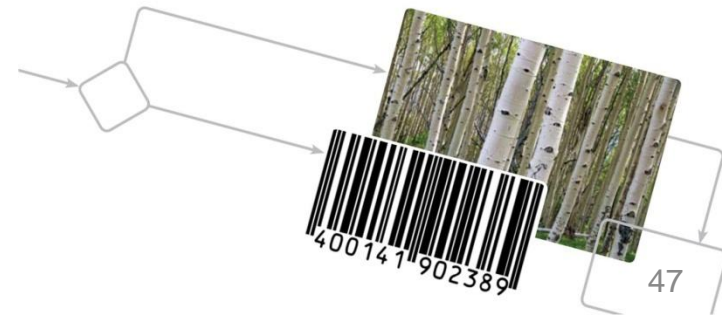
*Andre Veneman, Corporate Director Sustainability, **AkzoNobel***

- “CEV is a structured work procedure to assess the value of ecosystem services. It has potential to become a valuable complement to the sustainability toolbox already in use to support decision-making in AkzoNobel.”

*Karin Andersson Hallden, Eco Efficiency Specialist, **AkzoNobel***

- “CEV can help business both understand and place the issue of biodiversity and ecosystems services high on the company agenda.”

*Maria Norell, Process RD&I Manager & Sustainability Focal Point, **AkzoNobel***



Quotes

- “The guide has directly contributed to developing an Eskom Biodiversity Policy and standard, which takes due consideration of ecosystem services throughout the project lifecycle.”

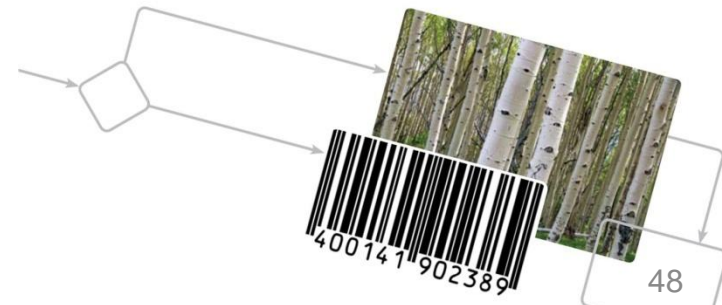
*Steven Lennon, Divisional Executive (Corporate Services), **Eskom***

- “CEV gives us a good opportunity to measure and review our business activities from new aspects and make the business decisions to achieve a more sustainable society.”

*Yoichi Takahashi, Deputy General Manager, Environmental Strategy Office, **Hitachi***

- “CEV will and shall enable the business world to economically demonstrate the relationship between business operations and biodiversity, and strategically connect this relationship to the bottom line.”

*Takeshi Takagi, Sustainability Management, **Hitachi Chemical***



Quotes

- “At Aggregate Industries we aim to be recognized as the leader in our sector in protecting and enhancing ecosystem services. We have a responsibility for more than 1,700 hectares of land designated by government and councils to be protected; and more than 110 protected species which can be found across our sites. Being involved with a dynamic new tool such as these guidelines from WBCSD keeps our knowledge at the forefront of our sector and gives us the opportunity to promote biodiversity as a key environmental challenge for everyone.”

*Alain Bourguignon, CEO, Aggregate Industries UK, part of the **Holcim Group***

- “The Guide to Corporate Ecosystem Valuation is the next critical tool needed by business to evaluate the value creation and financial impacts of various ecosystem services risks, opportunities, and strategies at their operations.”

*Harve Stoeck, VP Environment & Public Affairs, A&C North America, **Lafarge***



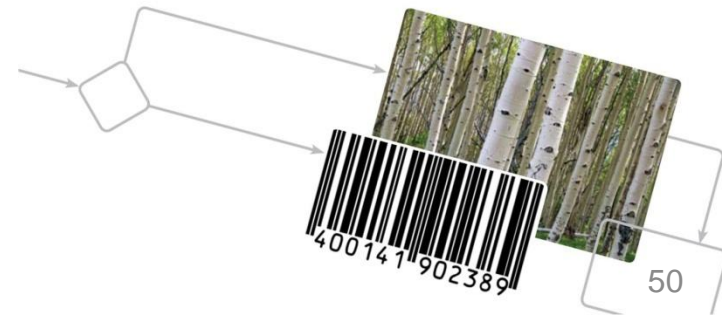
Quotes

- “Forests are increasingly recognized as a viable solution for renewable energy and environmental offsets. With a growing demand for these services comes the need for a broadly endorsed set of valuation methods. The CEV methodology is an important step in the development of markets for forest and other ecosystem services.”

*Thomas F. Gideon, Executive Vice President, Timberlands, **Weyerhaeuser Company***

- “This guide provides companies with an effective tool to begin quantifying opportunities and risks associated with their operations and ecosystem services.”
- “The guide will help clarify reasons for incorporating ecosystem values into business decision making.”

*Andrew Mangan, Executive Director, **US BCSD***



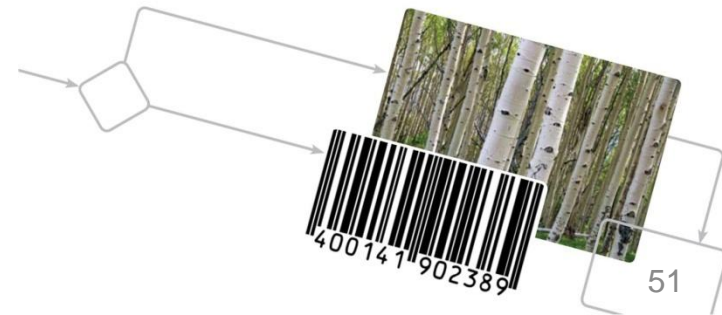
Quotes

- “CEV provides managers a useful, quantitative approach for integrating ecosystem service considerations into decision making.”
- “Used in tandem with the "Corporate Ecosystem Services Review," corporate ecosystem valuation can help companies better navigate the emerging risks and opportunities arising from changes in the ecosystems that underpin the corporate bottom line.”

*Craig Hanson, Director, People & Ecosystems Program, **World Resources Institute***

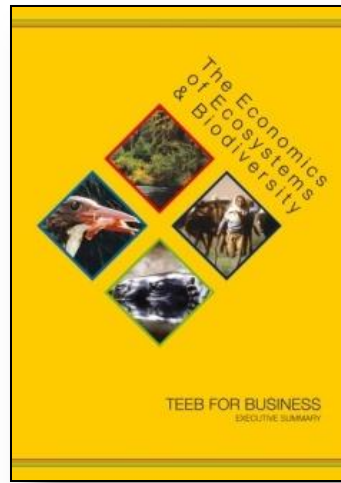
- “For many businesses, ecosystem dependencies are hidden, but leading companies are starting to assess these dependencies, helping to make the invisible visible.”

*Malcolm Preston, Global Leader, Sustainability and Climate Change, **PwC***



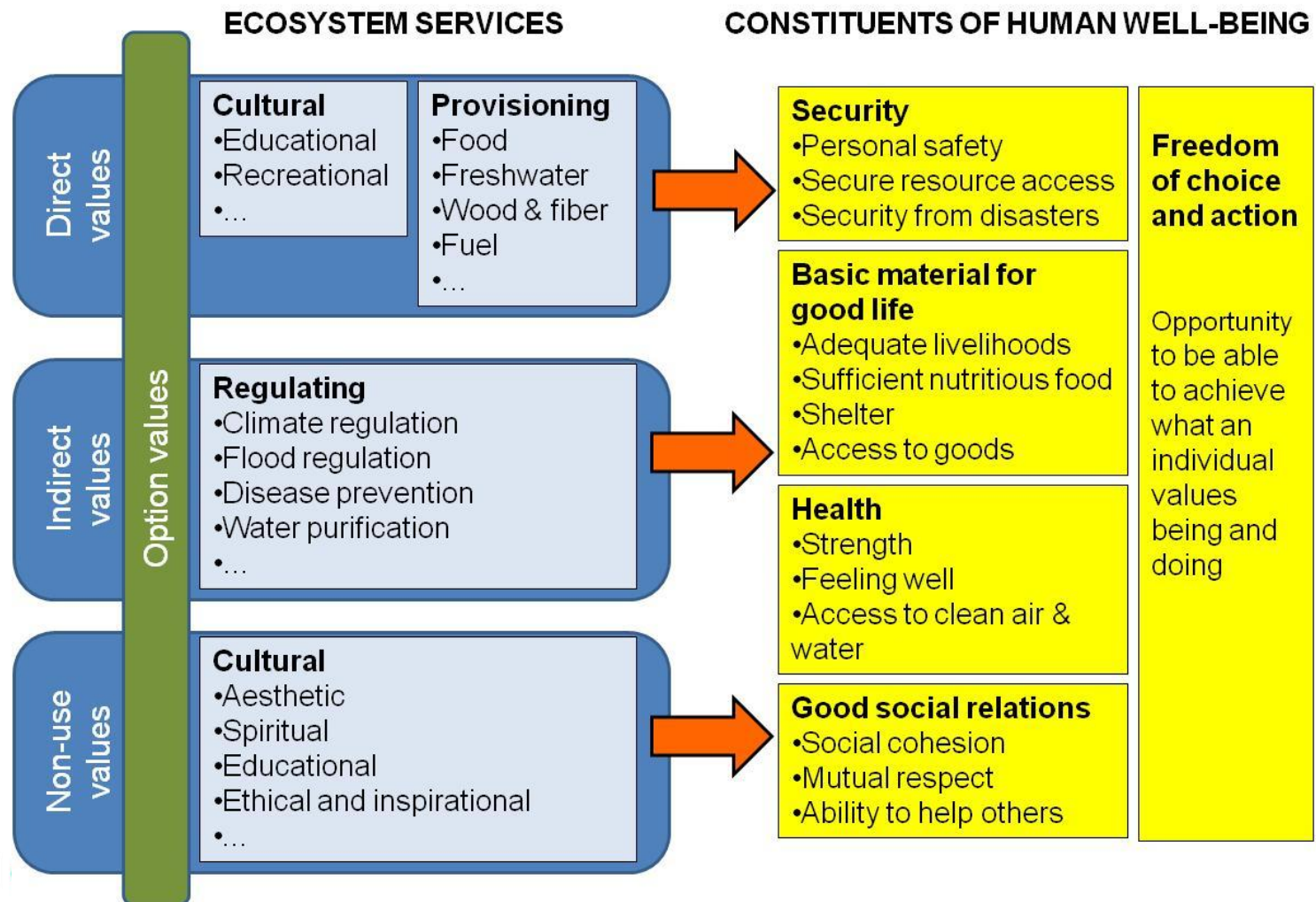
CEV and TEEB link

- WBCSD is “operationalizing” TEEB at the company level
- WBCSD was editor of chapters 2 and 4 in TEEB for Business (D3)



Additional Notes A: Selected Ecosystem Valuation Concepts and Issues

■ Total Economic Value



Other concepts and issues

- Cumulative effects
- Discounting
 - ✓ Selecting a suitable discount rate
- Economic impact
- Economic value
- Environmental thresholds
- Intrinsic values
- Time-periods
- Uncertainty



Summary of business analytical approaches (1/2)

■ Monetary approaches

- ✓ Financial accounting
- ✓ Management accounting
- ✓ Full (environmental) cost accounting
- ✓ Economic cost-benefit analysis
- ✓ Economic (socio-economic) impact assessments
- ✓ Natural resource damage assessments
- ✓ Share price valuation



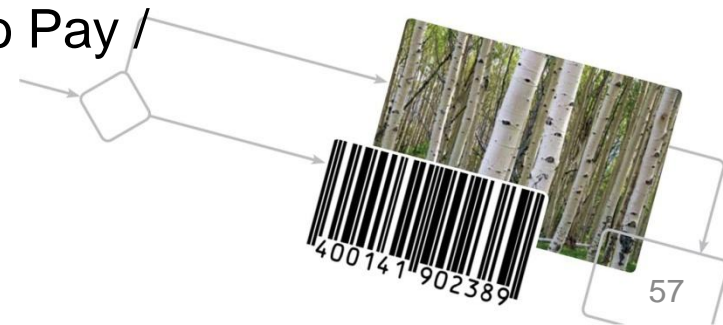
Summary of business analytical approaches (2/2)

- Sustainability non-monetary approaches
 - ✓ Company reporting
 - ✓ Environmental management systems
 - ✓ Environmental and Social Impact Assessment (ESIA)
 - ✓ Strategic Environmental Assessment
 - ✓ Ecosystem Services Review
 - ✓ Multi-criteria analysis
 - ✓ Sustainability appraisals
 - ✓ Risk Assessment
 - ✓ Life Cycle Analysis
 - ✓ Cost-effectiveness analysis



Main categories of valuation techniques

- Revealed preference techniques
 - ✓ Market Prices
 - ✓ Substitute Prices
 - ✓ Effect on Production / Change in Productivity
 - ✓ Travel Cost Method
 - ✓ Hedonic Pricing
- Cost-based approaches
 - ✓ Replacement Cost
 - ✓ Damage Costs Avoided
- Stated preference approaches
 - ✓ Contingent Valuation / Willingness To Pay / Willingness To Accept
- Benefit (value) transfer



Selecting ecosystem valuation techniques

	Total Economic Value	Ecosystem Services		Revealed preference			Cost-based	Stated preference	Benefit transfer
				Market prices	Effect on production	Travel costs			
Confidence? Value?	Direct use	Provisioning		✓	✓				✓
	Indirect use	Regulating			✓		✓		✓
	Direct use	Cultural	Recreation	✓		✓		✓	✓
	Non-use		Aesthetic					✓	✓



Comparison of ecosystem valuation techniques, including following information:

- **Description**
 - ✓ E.g. **Benefit transfer** involves transferring value estimates from existing economic valuation studies to the study site in question, making adjustments where appropriate
- **Data required**
- **Time / Budget**
 - ✓ Days / Low (\$ 100s – 1,000s)
- **Skills required**
 - ✓ Basic or econometric analysis if using bid functions
- **Advantages**
 - ✓ Low cost and quick for estimating recreational and non-use values
- **Disadvantages**
 - ✓ Results can be questionable unless carefully applied. Existing valuation studies better for some services than for others



www.wbcasd.org/web/cev.htm

